COLLEGE OF ENGINEERING AND TECHNOLOGY,
BAMBHORI POST BOX NO. 94, JALGAON – 425001. (M.S.)

NBA Accredited

Website : www.sscoetjalgaon.ac.in Email : sscoetjal@gmail.com

Mandatory Disclosure

Part-II

January 2013

Shram Sadhana Bombay Trust's
COLLEGE OF ENGINEERING AND TECHNOLOGY,
BAMBHORI POST BOX NO. 94, JALGAON – 425001. (M.S.)
Included under section 2 (f) & 12 (B) of the UGC Act, 1956
with NBA Accredited courses & ISO 9001 : 2008 certified

ISO 9001:2008

Website- www.sscoetjalgaon.ac.in
Email: sscoetjal@gmail.com
Phone No. (0257) 2258393.
Fax No. (0257) 2258392.

Principal: **Dr. K.S.Wani**
M. Tech, DBM, Ph.D.

Ref. No. COET/AICTE/MD/ / 13 **Date:**

C E R T I F I C A T E

Certified that all enclosures contained in PART-I , PART-II & PART-III bearing page no. **01** to page no. **1207** are pertaining to our institution which are being submitted in two separate above mentioned bound booklets/box file of Mandatory Disclosure. All xerox copies may be treated as original.

PRINCIPAL

Computing Facilities Existing for the existing programmes 2012-13

Sr. No.	Particulars	Requirements as per Norms	Availability
01.	No of Computer Terminals	732	989
02.	Hardware Specification	PIV Processor	P-IV, Dual core, Core 2 Duo
03.	No of Terminals on LAN/WAN	495	700
04.	Relevant Legal Software	• At least 02 System software packages • At least 08 Application software packages	• 54 system software packages • 69 Application software packages
05.	Peripherals / Printers	74 Printers	• Printers= 81 • Scanners = 9
06.	Internet Accessibility (in kbps & hrs)		• Leased Line = 25 Mbps • Reliance Data card = 2 x 256 = 512 KBPS • Broadband (NMEICT Connections) = 10 x 512 = 5 Mbps = 10 Mbps x 1 = 10 Mbps

College is having Wireless and OFC Connectivity throughout the Campus

Central Computing Facility

1	Number of Systems available	42
2	Configuration of the Systems	HCL EZEEBEE, INTEL CORE 2 Duo, @2.93GHz processor,3GB DDR RAM, 320GB SATA Hard disk, DVD writer,18.5” TFT Monitor, G41 Motherboard, Keyboard , Mouse
3	Total Number of Systems Connected in LAN	42
4	Total Number of Systems Connected in LAN	42
5	Internet band width	• Leased Line = 25 Mbps • Reliance Data card = 2 x 256 = 512 KBPS • Broadband (NMEICT Connections) = 10 x 512 = 5 Mbps = 10 Mbps x 1 = 10 Mbps
6	Major software Packages Available	• Windows 2000 • Novell Small Business suite 6 • Red Hat Linux 8.0 • Borland TC++ suite • Personal Oracle • Visual Studio Dot net • MS Office 2000
7	Special Purpose Facilities Available	• MATLAB 6.0 S/W. in E& TC Department • Ideas s/w. in Mechanical Engg. Department • Auto CAD 2005 in Mechanical Engg. Department. • OrCAD 15.5 in E&TC Department • Rational suit Enterprise Ver.2002.5.20 in Computer Department • ASPEN HYSYS SOFTWARE in Chemical Department • PLC ,SCADA in Electrical Department • ETAP Power Station (Educational Version) in Electrical Department • Language Lab Software in Applied Science Dept. • Attendance Tracking Software in Applied Science Department • Ansys Introductory Multi physics software version 10.0 in Mechanical Department

Department of Computer Engineering

Details of Licensed Softwares :- Year (2012-13)

Name of the software	No. of User License	Price
➢Multi user Operating Systems		
SCO Unix 5.0.4 Enterprise.	16 Users	1,13,000
Win NT 4.0	25 Users	38,000
Windows 2000	25 Users	44,000
Novell Netware 5.12	25 Users	1,30,500
Win XP with IBM M/C	25 Users	Free
Red Hat Linux 7.2	Multi-user	15,000
Red Hat Linux 8.0	Multi-user	5,800
Windows 2000	40 Users	20,550
Novell Small Business suit 6	25 Upgrade + 25 Additional	78,473
Novell Linux Desktop 9	5 Users	13,000
MSDN Academic Alliance S/W Product (Ordered)	Multi User	39,900
Windows Starter 7 SNGL OLP NL Academic Legalization Get Genuine	111 Users	2,55,300
➢Single user Operating Systems		
Win 95	01 User	3,000
Win 98	01 User	3,500
MS-DOS 6.2	01 User	1,500
Tick RTOS with Compiler, debugger etc.	01 User	90,875
SUSE Linux Enterprises Server 9	01 User	12,480
➢Compilers		
TC++	01 User	8,500
VC++	01 User	4,000
VB 6.0 Pro.	01 User	20,000
VJ++ 1.0	01 User	2,500
Boroland TC++ Suite	Multi-user	2,850
Visual Studio .Net (Media kit)	20 Users	61,500
i) ASP		
ii) VC++		
iii) VB++ 1.0		
iv) VJ++ 1.0		
v) C#		
FORTRAN 77 on DOS	01 User	5,000
Ansi COBOL on DOS	01 User	15,000
PASCAL on DOS	01 User	15,000
FORTRAN 77 on Unix	16 Users	15,000
Ansi COBOL on Unix	16 Users	40,000
PASCAL on Unix	16 Users	15,000

Name of the software	No. Of User License	Price
➢ **Applications Packages**		
Rational suit Enterprise Ver.2002.5.20	10 Users	3,00,000
MS Office 2000	01 User	9,500
Antivirus		
Antivirus QH V 5.10	01 User	2,700
Antivirus QH Kit	01 User	3,000
Antivirus Dr. Soloman for Win NT	Multi-user	18,500
Antivirus Dr. Soloman Antivirus V 7.9	01 User	1,500
Antivirus Norton 2001 Symantics for Win 95/98	01 User	1,800
Antivirus Norton 5.0	01 User	1,500
Antivirus Macafee	01 User	3,000
Antivirus Norton 2000 7.5.1 (for NT)	Multi-user	8,500
QH Antivirus Plus 2007	30 Users	24,000
Net Protector 2007	30 Users	32,000
Mcafee Plus 2007	01 User	900
Net Protector Server 2007	05 Users	11,000
Net Protector Server 2012	111 Users	33,300
➢ **Database Support**		
Oracle Personal 8.0	01 User	14,000
Oracle on 8 Relese 8.0.3 for Win NT	05 Users	48,000
SQL Server 2000	30 Users	56,600
Oracle 9i (standard Edition) for server.	10 Users	1,15,000
Power Builder Enterprise 6.0	01 User	79,500
Oracle Developer suite 10g with WDP Programme	100 User	2,75,027
Total Cost		**20,18,730/-**

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S.S.B.T's College of Engineering & Technology,Bambhori,Jalgaon.

Details of Licensed Softwares: - Year (1012-13)

Name of the software	No. of User License	Price
➢ **Multi user Operating Systems**		
SCO Unix 5.0.4 Enterprise.	16 Users	1,13,000
Win NT 4.0	25 Users	38,000
Windows 2000	25 Users	44,000
Novell Netware 5.12	25 Users	1,30,500
Win XP with IBM M/C	25 Users	Free
Red Hat Linux 7.2	Multi-user	15,000
Red Hat Linux 8.0	Multi-user	5,800
Windows 2000	40 Users	20,550
Novell Small Business suit 6	25 Upgrade + 25 Additional	78,473
Novell Linux Desktop 9	5 Users	13,000
MSDN Academic Alliance S/W Product (Ordered)	Multi User	39,900
Windows Starter 7 SNGL OLP NL Academic Legalization Get Genuine	300 Users	6,90,000
➢ **Single user Operating Systems**		
Win 95	01 User	3,000
Win 98	01 User	3,500
MS-DOS 6.2	01 User	1,500
Tick RTOS with Compiler, debugger etc.	01 User	90,875
SUSE Linux Enterprises Server 9	01 User	12,480
➢ **Compilers**		
TC++	01 User	8,500
VC++	01 User	4,000
VB 6.0 Pro.	01 User	20,000
VJ++ 1.0	01 User	2,500
Boroland TC++ Suite	Multi-user	2,850
Visual Studio .Net (Media kit)	20 Users	61,500
i) ASP		
ii) VC++		
iii) VB++ 1.0		
iv) VJ++ 1.0		
v) C#		
FORTRAN 77 on DOS	01 User	5,000
Ansi COBOL on DOS	01 User	15,000
PASCAL on DOS	01 User	15,000
FORTRAN 77 on Unix	16 Users	15,000
Ansi COBOL on Unix	16 Users	40,000
PASCAL on Unix	16 Users	15,000

Name of the software	No. of User License	Price
➢ **Applications Packages**		
Rational suit Enterprise Ver.2002.5.20	10 Users	3,00,000
Ideas	07 Users	18,80,000
Ideas 11 nx Series (Upgraded Version)	07 Users	2,80,000
Build Master	01 User	26,000
Adfast	01 User	12,500
MDT	01 User	50,000
Ansys Introductory Multi physics software version 10.0	05 Users	1,83,750
AutoCAD 2005	10 Users	3,20,000
Soul	Multi User	20,000
SEPL LS Drafter	01 User	7,500
STRUDD	03 Users	36,000
OrCAD Capture (Ordered)	02 Users	50,400
OrCAD PSPICES A/D (Ordered)	01 User	87,500
OrCAD Layout (Ordered)	01 User	88,350
TECS	03 Users	27,000
CM (Construction Manager)	03 Users	16,500
En soft Build Master	01 User	27,000
Super Civil	01 User	1,250
MATLAB 6	05 Users	5,50,000
MATLAB 2007	02 Users	3,16,201
VLSI Software of Xilinx	Multi Users	41,500
PCB Software (Ulti board)	01 User	41,800
Sim 2K	01 User	59,600
MS Office 2000	01 User	9,500
Antivirus		
Antivirus QH V 5.10	01 User	2,700
Antivirus QH Kit	01 User	3,000
Antivirus Dr. Soloman for Win NT	Multi-user	18,500
Antivirus Dr. Soloman Antivirus V 7.9	01 User	1,500
Antivirus Norton 2001 Symantics for Win 95/98	01 User	1,800
Antivirus Norton 5.0	01 User	1,500
Antivirus Macafee	01 User	3,000
Antivirus Norton 2000 7.5.1 (for NT)	Multi-user	8,500
QH Antivirus Plus 2007	30 Users	24,000
Net Protector 2007	30 Users	32,000
Mcafee Plus 2007	01 User	900
Net Protector Server 2007	05 Users	11,000
Net Protector Server 2012	300 Users	60,000

Name of the software	No. of User License	Price
➢ **Database Support**		
Oracle Personal 8.0	01 User	14,000
Oracle on 8 Relese 8.0.3 for Win NT	05 Users	48,000
SQL Server 2000	30 Users	56,600
Oracle 9i (standard Edition) for server.	10 Users	1,15,000
Power Builder Enterprise 6.0	01 User	79,500
Oracle Developer suite 10g with WDP Programme	100 User	2,75,027
Total		**76,88,200/-**

Note: The College has done Microsoft Campus Agreement to use Microsoft Products Legally which includes following software

Sr.No.	Name of Software under Microsoft Campus Agreement
01	MS Office 2010 PRO or MS Office 2007 Pro or MS Office 2003 Pro
02	MS Windows XP Pro/ Windows 7 Pro & VISTA UPG
03	MS Windows Server 2008
04	MS SQL Server 2008
05	MS Windows CAL 2008
06	MS Visual Studio Pro 2010
07	MS Visual C++ , MS Visual Basic , MS Visual c # & MS Visual NET Frame Works .
08	MSDN Academic Alliance License (On line Program)

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List of facilities available

Sports facilities:

a) **List of indoor facilities**

01	Badminton Court	Separate for Boys & Girls
02	Gymnasium	Common for Boys & Girls
03	Table Tennis	Separate for Boys & Girls
04	Chess	Separate for Boys & Girls
05	Carom	Separate for Boys & Girls
06	Billied	For staff

b) **Outdoor**

01	Football	Playground
02	Cricket	Playground
03	Volleyball	Playground
04	Basketball	Basketball Court
05	Kho-Kho	Playground
06	Kabaddi	Playground
07	Handball	Playground
08	Atalatics 200m Track	Playground

Extra Curriculum Activities

1) Cultural activity committee :

1) Shri M.V.RAWLANI	(Mechanical)	: Chairman
2) Ms SAPNA MADAN	(Chemical)	: Member
3) Ms RICHA.MODIYANI	(MBA)	: Member
4) Shri C.K.MUKHARJEE	(Mechanical)	: Member
5) MsT.S.JOSHI	(I.T.)	: Member
6) Shri KALYAN DANI	(Computer)	: Member
7) ShriD.S.PATIL	(Electrical)	: Member
8) Shri J.N.KALE	(Civil)	: Member
9) Shri M.B.PATIL	(App. Sci.)	: Member
10) Shri J.P.PALPALLIWAR	(Biotech)	: Member
11) Shri R.S.KALSI	(E&TC)	: Member

2) Seminar Hall 02 Nos. Seating capacity 166 for each.

3) Audio Video facilities including mike system, LCD, OHP, Computer Camera recording system.

4) Funds available

5) List of activities carried out in each year

a) Sketching
b) Debate
c) Quiz
d) Group Discussion
e) Elocution
f) Traditional Day
g) Celebration Independence Day
h) Celebration Republic Day
i) Ganesh Utsav
j) Arranging Workshop like Personality development
k) Fashion Show
l) Dance Competition
m) Singing Competition
n) Rangoli Competition
o) Annual Gathering
p) Personality Contest
q) Ad Mad Show r) Dum Charad Competition

Soft Skill Development Facilities

The soft skill development facilities is provided at the college level through Training and Placement Cell which is headed by Training and Placement Officer. One faculty member of each department is the member of the cell. They are provided with computer tools such as scanner, Internet etc.

We had signed an MOU with Astrum solution (Pvt.) Ltd., New Delhi for skills & personality development for success in professional & personal life.

The college is the member of the federation of the engineering colleges under North Maharashtra University, Jalgaon and the soft skill facilities are also provided at the federation level. The Training and Placement Cell caters to soft skill development in the following areas :

a) Work ethic
b) Courtesy
c) Teamwork
d) Self-discipline and self-confidence
e) Conformity to prevailing norms pertaining to dress, body language, tone of voice and vocabulary according to the particular culture of the given workplace.
f) Language proficiency and environmental awareness

Revised & final on 12.12.12

APPENDIX - 1

LAND

Enclose with appendix 01, 7/12 extracts or other documents showing ownership of land on which the buildings are constructed.

Particulars of ownership of land of Engineering college only do not club with polytechnic or otherst

Sr.No	Date of Purchase or Acquisition	Gut No.or Survey No	Area in Hacters	Present ownership title
01	**The Collector, Jalgaon vide letter No.3-RR4431, dated 17/10/1984**	**280**	**9.56**	**Shram Sadhana Sadhana Bombay Trust**
02	**The Collector, Jalgaon vide letter No.3-RR4431, dated 17/10/1984**	**290**	**0.44**	**Shram Sadhana Sadhana Bombay Trust**
	Total Area		**10.00**	

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 1) **Civil Engineering**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	Departmental Office	102	4.5 x 6	27	Administrative
2	HOD Cabin	102A	4.5 x 6	27	Administrative
3	Staff Cabin	G16A,13B 104A, 108B 105(A) 105(B) G20 (B) 102 A	2x3x4 2x3x4 4.5 x 4.5 6 x 3 3 x 3 7.5x3	24 24 20 18 09 22	Administrative 180
4	Class Room Class Room Class Room Class Room Tutorial P G Tutorial P G Tutorial UG	203 205 114 302 G13A 104B G10A	12 x 9 15 x9 12x9 12x9 4.5 x 7.5 6 x 5.5 6x5.65	108 135 108 108 34 PG 33 PG 34	Instructional 560
5	Drawing Hall/ Seminar Room	305	15x 9	135	Instructional
	Seminar Hall	G14	18x9	162	
6	Laboratories				**UG PG1484**
	1) Engg. Geology Lab	108	10.5 x 9	95	Instructional
	2) TOM Lab	G9 + G10	21 x 9-6x5.5	155	UG
	3) Engineering Mechanic I	109	9 x 9	81	PG
	4) Engg. Mechanics II	110	9 x 9	81	
	5) Geotechnical Lab	G13	18 x 9+9 x 3-3x3-4.5x7.5	147	
	6) Survey Store	108 (A)	7.5x9	68	
	7) Fluid Mechanics I	G19	12 x 9-3x4	96	
	8) Fluid Mechanics II	G20	9x9+3x3	90	
	9) Comp lab UG & PG	101	12 x 9	108	
	10) Environmental Lab	103+104	12 x 9-3x3-6x5.5	66	PG Shared UG
	11) Transportation Lab	105	9 x9	81	
	12) PG comp. Lab Research Lab	G16	12 x 9-3x4	96	PG Renovation in progress
	13) Dept. Library	102C	3x7.5	23	UG
7	Store	G 20 (A)	3 x 3	09	Administrative
8	Toilet	G11+G12 106+107 206+207	3 x 6 3 x 6 3 x 6	18 18 18	Amenities 54
9	Passage, Passage GF, FF, SF Stair	G8 205 212	1.5 x 5.5 6 x 1.5 6 x 1.5 3x51x3 3x 3x4.5	8.25 09 09 459 40.5	Circulation & Other 525
	Total			2803	

Total Instructional area =2044

Total Administrative area = 180

Total Amenities area= 54

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 2) **Computer Engineering**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maxim m x m	Carpet Area in Sq m.	Remarks
1	Departmental Office	G22	6 x 6	36	Administrative
2	HOD Cabin (Computer)	G22 (B)	6 x 3	18	Administrative
3	Staff Cabin	G28 (B) B2 B2 (B) G22(C) G22 (D) G22 (E) G28 G25 G30A 129 115 A2 115 B2C2 115D1D2 314	3x3 6 x 3 3 x 3 3 x 3 6 x 3 3 x 6 3 x 4.5 3 x 4.5 3 x7.5 6x3 3x3 2x4x3 2X4X3 6x3	9 18 09 09 18 18 13 13 22 18 9 24 24 18	Administrative 303
4	Class Room Tutorial Room **P G** Tutorial Room **P G**	130 131 132 133 115 124 115A1	9 x 9 9 x 9 9 x 9 9 x 9 12 x 9 7.5 x 6 6 x 5.5	81 81 81 81 108 45 33	Instructional 510 PG PG
5	Seminar Hall	317	18 x 9	162	Instructional
6	Laboratories				Instructional
	1) Lab 1/ Data Structure Lab	B2 (A)	15 x 6	90	UG
	2) Lab 2/Embedded System Lab	B1 (A)	9 x 7.5	68	UG
	3) Lab 3/M.E.(CSE) Computer Lab	115 A	12x9- 3x3-6X5.5	66	PG-Renovation
	4) Lab 4/ Digital & Microprocessor Lab	B1 ©	9 x 9	81	UG
	5) Lab 5/Software Engg. Lab	G25 ©	9 x 7.5	68	UG
	6) Lab 6/Programming Lab-I	G25(B)	9 x 9- 3 x 4.5	67	UG
	7)Lab 7/Database Lab	G28 ©	9 x 7.5	67	UG
	8)Lab 8/System Programming Lab	G28(A)	7.5 x 9	67	UG
	9)Lab 9/Project Lab	G29	9 x 9	81	UG
	10) Lab 10/ Linux Lab	115D	18x9-6x3	144	UG
	11) Lab 11/Programming Lab-II	115 C	9 x9-3X3.	71	UG
	12) Lab12 /M.E. (CSE) Research Lab	115 B	9 x9-3X3.	71	PG-Renovation
	13) Departmental Library	B5	9 x 3	27	
7	Toilet	G26,G27 318,19	3 x 6 3x6	18 18	Amenities

	Passage,	B2(C) B1 G28 G25	3 x 3 12 x 3 3 x 3 9 x 1.5 9 x 1.5	09 36 09 13.5 13.5	Circulation & Other 387
	Store Server Room UPS Room Passage GF Passage Basement Stair GF , Basement	B2 (D) G22 (A) B3 GF SF	3 x 3 3 x 3 3 x 3 50x3 21x3 12x3 2x3x4.5	09 09 09 150 66 36 27	Administration Administration Administration
	Total			2339	

Total Instructional area = 1640
Total Administrative area = 303
Total Amenities area=36

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 3) **Biotech**

Building wise / Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	Departmental Office	236	6 x 4.5	27	Administrative
2	HOD Cabin	236(A)	6 x 3	18	Administrative
3	Staff Cabin	237 238A 239 A	3 x 6 3x4 3x4	18 12 12	87
4	Class Room Tutorial room Tutorial room	223 224 225 226 111A	6x9 6x9 6x7.5 4x9 5.5x6	54 54 45 36 33	Instructional 222
5	Seminar Hall with chemical	308	18 x 9	162	Instructional
6	Laboratories				Instructional
	1) Microbiology Lab	238	9 x 9-3x4	69	UG 913
	2) Biochemistry Lab	239	9 x 9-3x4	69	
	3) Immunology lab	245	9 x 7.3	66	
	4) Computer Lab	244	4.8 x 9+ 3x7.5	66	
	5) Bio process Lab	242	4.8 x 9+ 3x7.5	66	
	6) Fermentation	241	9 x 7.3	66	
	7) Lab	234	3 x 7.5 +5 x 9	68	UD renovation
	8) Lab	235 B	7.5 x9	68	UD renovation
	9) Fluid Mech Lab	111	12 x 9- 5.5x6	108	Civil
	10) Heat power lab	M001A	8.8x 7.5	66	Mechanical
	11) **Research lab**	227	9x8	72	
7	Toilet	240	3 x 3	09	Amenities
	Passage SF Stair		66x3 1x3x4.5	198 13.5	Circulation 212
	Total			**1443**	

Total Instructional area = 1135
Total Administrative area = 87
Total Amenities area= 09

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: -4) **Mechanical Engineering**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	**Departmental Office**	M108	7.5 x 7.6	57	Administrative
2	HOD Cabin	M107	7.5 x 3.6	27	Administrative
3	Staff Cabin	M 2,3,5,6 M109 M110,111 M201 M202 M207 M208 M209 M214	4x3.7x3.7 3.4x3.7 2x3x3.7 3.75x3.5 3X3.5 4.5x3.75 5.75x3.5 3.5x1 4.5x3.75 2.5x3.75	56 13 22 13 10.5 17 20 3.5 17 9	Administrative 295
4	MESA Office	M310	7.5x4	30	Administrative
5	Class Room **SE (A)** **TE (A)** **TE (B)** **BE (A)** **BE (B)** **SE (B)** Tutorial Room U G* Tutorial Room U G* Tutorial Room **P G*** Tutorial Room **P G***	M301 M302 M303 M304 M306 M309 M306 A M309 A M102 A M 103 A	7.5x11 7.5x11.3 7.5x11.3 7.5x11.3 9.5x7.5 9.5 x 7.5 9.5 x 3.8 9.5 x 3.8 7.5 x4.5 7.5 x 4.5	82 85 85 85 71 71 36 36 34 P G 34 P G	Instructional 619 NR NR PG PG
6	Drawing Hall	M305	9.7x7.5	73	Instructional
7	Seminar Hall	M104	7.5x18.75	141	214
8	Laboratories				Instructional
	1)Heat Transfer Lab	M001	7.5x10.00	75	UG PG 1298
	2) Heat Power Lab	M004	7.5 x18.75	141	UG
	3) RAC lab 4) Turbo Machine lab	M007 M007A	**7.5x11.25** **7.5x7.5 +** **2.25x7.5**	85 73= **158**	PG Renovation
	5) Computer Lab	M102	7.5x14.5	109	
	6) CAD CAM Lab/ Research Lab	M103	7.5x14.25	107	PG shared by UG
	7) Tribology Lab	M204	9.5x11.3	107	PG
	8) Materials Science Lab	M203	9.5x11.2 7.5x1	114	
	9) Mechanical Measurement & Metrology Lab	M205	9.5x11.3	107	
	10) Mechatronics Lab	M213	9.5x11.3	107	
	11) Theory of Machine	M210	9.5xx11.3	107	
	12) Model & project Lab	M206	9.5x11.3 7.5x1	114	
	12) Dept library	M101	7.5x7.25	54	
9	Toilet	M105,106, 211,212 307,308	6x3.8x3.8	87	Amenities 87

10	Passage, Passage FF,SF& TF Passage FF & TF Passage SF Stair	GF	2.75x20 3x12.75 x3.75 3x42x2.75 3x4x10.5	55 143 346 126	Circulation & Other 670
	Total			3183	

Total Instructional area = 2131
Total Administrative area = 295
Total Amenities area=87

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 5) **Chemical Engineering**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	Departmental Office	139	6 x 4.5	27	Administrative
2	HOD Cabin	139 (A)	6 x 3	18	Administrative
3	Staff Cabin	G42 (A) G42 (B) 134 138A 140 A	3 x 3 3 x 6 3 x 6 3 x 6 3x6	09 18 18 18 18	Administrative 126
4	Class Room Tutorial Room	122 123 124 125	6 x 9 6 x 9 6x7.5 4x9	54 54 45 36	Instructional 306
5	Seminar Hall with Biotech	308	18 x 9	162*	Instructional
6	Laboratories				820
	1) Mass transfer I	G42A	7.5 x 9	68	Instructional
	2) M T II	G42B	7.5 x 9	68	
	3) U. O. I	G44 A	4.8x9+3x7.5	66	
	4) U O II	G 44 B	9x7.3	66	
	5) Instrumentation lab	G 45 A	4.8x9+3x7.5	66	
	6) Process Control	G 45 B	9x7.3	66	
	7) C. R. E. Lab	138	12 x 9-3x6	90	
	8) C. T. Lab	140	12 x 9-3x6	90	
	9) Computer Lab	136	9 x 9	81	
	10) Project Lab	135	9 x 9	81	
	11) **Research Lab**	126	8x9	72	
	Compressor room		2x3	6	
8	Toilet	137 G43	3 x 3 3 x 3	09 09	Amenities 18
9	Passage GF,FF Passage GF,FF Stair GF'FF'		2x54x3 2 x 6x3 3x3x4.5	324 36 40.5	Circulation & Other 406
	Total			1676	

Total Instructional area = **1126**
Total Administrative area =**126**
Total Amenities area=**18**

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 6) **Electrical Engineering**

Building wise / Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	Central server Room	E01	7.5x7.5	56	Administrative
	HOD Cabin	E114	3.65x3.65	13	Administrative
	Departmental Office.	E104	3.8 x5.8	22	134
	Staff Cabins	E003A E005D E006C E115,16 E117	7.5 x 4 3x4 7.5x3 2x3x3.65 3.65x3.65	30 12 22 22 13	
2	Class Room Class Room* Class Room* **Tutorial PG** **Tutorial PG** **Tutorial UG** **Seminar Room Propose**	E110 E111 E112 E102 E103 E 106 A310	7.76x8.65 7.76x8.65 7.65x8.65 9.6x3.8 4.2 x7.85 7.6x7.6 9.10x17	66 66 66 37 33 58 155	Instructional 481
3	Laboratories				Instructional
	1) Measurement Lab	E003	15 x 7.5 - 7.5x4	82	UG+PG 927
	2) Control System	E004	7.5 X11.25	84	UG 728
	3) Electrical Machine Lab I	E005A	15 x 4.5 + 3.6 x 2.1	75	PG 184
	4) Machine lab II / PSS	E005 B	7.5 x 10.5	79	
	5) Power System lab	E005 C	7.5x10.5 - 4x3	67	
	6) Switch Gear Lab SGP	E008	7.5 x9	68	
	7) **P G Lab**	E009	7.5 x9	68	
	8) IDC / Network Analysis	E115 A	7.5 x 9	68	
	9) ADE / PMMC lab	E 115 B	7.5x7.5 + 3.5x3.5	69	
	10) High Voltage Lab	EG1	7.5x8.5 + 3x2	70	Renovation in progress
	11) Computer Lab	E007	8 x 8.25	66	
	12) Research lab **PG**	E113	7.65 x 11.5	87	Un developed
	13) Library	E 101	7.65X5.8	44	
5	Toilets	E114	3.65x3.65	13	Amenities 13
6	Circulation Paved passage	stair GF	2x12 3 x 46 3 x 23	24 138 69	231
	Total			**1786**	

Total Instructional area = 1408
Total Administrative area = 134
Total Amenities area=**13**

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 7) **Electronics & Telecommunication Engineering**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Max. m x m	Carpet Area in Sq m.	Remarks
1	Departmental Office	202	4.5 x 6	27	Administrative
2	HOD Cabin	202A	4.5 x 6	27	Administrative
3	Staff Cabin	202B,C 121(C) 121B,C 213ABC 214 215,16 A 217,18A 220C 201B 311	2x3 x 7.5 6 x 3 2x3 x 3 3 x 2.5x3 6 x 3 2x3 x 3 2x3 x 3 3x4 3x4 6x3	45 18 18 22 18 18 18 12 12 18	Administrative 253 UD UD
4	Class Room Tutorial Room **U G** Tutorial Room **U G** Tutorial Room **P G** Tutorial Room **P G**	229 230 232 233 301 119 A 119 C 220 A 221 A	9 x 9 9 x 9 9 x 9 9 x 9 12 x 9 9 x3.8 9 x 3.8 9X 3.8 9X 3.8	81 81 81 81 108 34 UG 34 UG 34 PG 34 PG	Instructional 568
5	Seminar Hall	209	18x9	162	Instructional
6	Laboratories 1) MMS DSP Lab	119(A)	7.5 x 9	68	Instructional
	2) Computer Lab	119 (B)	7.5 x 9	68	UG PG 967
	3) EDC Lab	121	12x9- 2x3x3	90	**UG**
	4) EM / EI Lab	201	9 x 9	72	**PG**
	5) NAS Lab	213 AB	12 x 9- 9x3	81	
	6) Communication Lab	215	9 x 9	71	
	7) RMT Lab	216	9 x 9	71	
	8)Televisión Lab	217(B)	9 x 9	71	
	9) E D / TM Lab	217(A)	9 x 7.5	68	
	10) P C B Lab	220 (B)	9 x 7.5	68	
	11) B EP Electronics	221	12 x 9 -9X3.8	75	
	12) Comp lab **PG**	209 A	9x9	71	PG Renovation
	13) Research lab **PG**	209 B	9 x 7.5	71	PG Renovation
	14) Library	201(A)	3 x 7.5	22	
7	Toilet	117+118 218+219	3 x 6 3 x 6	18 18	Amenities 36
	Passage Passage GF, FF, SF Passage FF, SF Passage SF Stair Stair	201	3 x 1.5 3x12x3 2x27x3 18x3 3x4.5x4.5 3x3x4.5	4.5 108 162 54 60.75 40.5	Circulation 430
	Total			2416	

Total Instructional area = **1697**

Total Administrative area =253

Total Amenities area=**36**

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 8) **Information Technology**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	HOD Cabin	E210	3.65x5 3.80x1.80	25	Administrative
2	Departmental Office	E209	3.5x7.3	26	Administrative
3	Staff Cabins Staff Cabins **Proposed cabins**	E211-213 E 203 A E 204 A E 205 A E 301,2, E 308,9	3x3x3.65 4x3 7.6 x 3.8 9.1 x 3.5 4x 3.8x3.8	33 12 20 32 **58**	Administrative 206
4	Class Rooms	E 305 E 311 E 312	10.80x7.60 11.40x7.60 11.40x7.60	82 87 87	Instructional 256
5	Seminar Hall	310	18.30x7.60	139	139
6	Laboratories				Instructional
	1)Programming lab / lab3	E 201	9.50 x 7.60	72	723
	2) Digital & micro processor / lab 1	E202	9.50 x 7.60	72	
	3) Computer Network / lab 6	E203	11.4 x 7.60 – 3 x4	75	
	4) Data base & management / lab 7*	E204	7.60 x 9	68	
	5) Lab 8	E205	9.10 x 9.30	84	Furniture Not ready
	6) Operating System / lab 5	E 206	7.30 x9.50	69	
	7) Data Structure / lab2	E 207	7.30 x 9.20	67	
	8) Multimedia / lab 4	E 208	7.30 x 9.20	67	
	9)Lab 9 undeveloped	E303	7.60 x 10.80	82	UD Furniture Not ready
	10)Lab 10 undeveloped	E304	7.60 x 8.80	67	UD Furniture Not ready
7	Toilet		2x7.65x3.8	58	Amenities 58
8	Passage SF Stair	SF SF SF TF	11.5x1.80 30.5x1.8 46x2 7.5x2 2x7.5x3.75 41x1.8 3.65x9 2x9.5x3.8 2x6.2x1.9	21 55 92 15 56 74 33 +11 72 24	Circulation 453
				1835	

Total Instructional area = 1118

Total Administrative area = 206

Total Amenities area= 58

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 9) **MBA**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Area Sq m.	Remarks
1	HOD Cabin	A209	3.00x6.65	20	Administrative
	Department Office/ Lib.	A208	6.00x 6.65	20+20=40	Administrative
2	Staff Cabin	A203 A204A A212	3.0x4.00 3x3.0x3.0 3x4	12 27 12	Administrative 91
3	Class Room Class Room	A202 A213	9.1x7.4 9.1x7.4	67 67	Instructional 456
4	Seminar Hall*	A211	7.9x17.0	134	Instructional
5	Computer Lab	204	7.3x14.0	102	Instructional
	Tutorial room I	A206	4.5x7.4	33	
	Tutorial room II	A207	4.5x7.4	33	
6	Girl's Common Room	A306	7.4x9.1	67	Amenities
	Boy's Common / GD	A309	7.4x9.1	67	Amenities
	Toilets	A203,12A A205,10	2x1.2x1.8 2x2.9x3.3	4 19	157
7	Passage Stair	FF SF	19.5x2.4 19.5x2.4 3x3.2x6.7	47 47 64	Circulation 158
	Total			862	

Total Instructional area = 456
Total Administrative area = 91
Total Amenities area= 157

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 10) **Library**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	Reading Room PG / staff Reading Girls Students Reading Boys	323 A 323 B 323 D	6 x 7.5 12 x 9 18x9	45 108 162	Instructional 927
2	Entrance Lobby	323 F	6 x9	54	
	Counter Clock room	323 E	6 x3	18	Administrative
	Issue Counter	323 H	9 x 3	27	Administrative
3	Liberian, room	323 G	3x9	27	Administrative
4	Stack Room	323 I	27x 9	243	
5	Reference Section	323 J	18 x 9	162	
	E lib	323 L	9 x 9	81	
6	Book Bank	323 M	3 x 9	27	
	Magazine	323 N	6 x 7.5	45	
7	Store	323 O	12 x3	36	Administrative
8	Pantry for library Staff	323 P	3x6	18	Amenities
9	Xerox	323 Q	3x3	9	Amenities
10	Toilets	323c,k	2x3x3	18	Amenities
11	Drinking water	323	3x3	9	Amenities
12	Passage		54x3	162	Circulation
	Total			1251	

Total Instructional area = 927
Total Administrative area = 108
Total Amenities area=54

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 11) **Applied Science**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	HOD Cabin	G41	3 x 6	18	Administrative
	Dept office	G40A,B	3x9	27	
2	Staff Cabin	B14(A) B15 G 34A,B G35 A,B G37A,B G38 G39A,B 320A	3 x 6 3x3 3x7.5 3x7.5 3x9 3 x6 3x9 3x7.5	18 9 22 22 27 18 27 22	Administrative 210
3	Class Room Seminar / Class Room	303 309 312 313 316 320 321 322 325	12 x 9 12 x 9 12 x 9 12 x 9 15 x 9 12 x 9 12 x 9 12 x 9 12 x 9	108 108 108 108 135 108 108 108 108	Instructional 999
4	Drawing Hall	G37	15x9	135	135
5	Laboratories				Instructional
	1) Physics Lab	B14	15 x 9+3 x 3	144	522
	2) Chemistry Lab	G 40	15 x 9	135	
	3) Environment lab	G 34	12 x 9	108	NR
	4) Language & audio visual lab	G 39	15 x 9	135	NR Furniture
6	Toilet	228 306	2x3 x 3 2x3x6	18 18	Amenities
	Passage Stair		54x3 3x4.5	162 13.5	Circulation & other 175
	Total			2077	

Total Instructional area =1656
Total Administrative area = 210
Total Amenities area= 36

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 12) **Computer Centre**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	I/C Cabin	128(A)	3 x 3	09	Administrative
2	Computer Centre	128	15 x 9 3 x 3	135 09	Instructional
3	UPS Room	128(B)	3 x 3	09	Administrative
	Total			162	

Total Instructional area = **144**
Total Administrative area =18

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

13) Workshop

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum M x m	Carpet Area in Sq m.	Remarks
1	Main Work shop	W0	45.5 x 15-2x3.65x7.3	630	
2	Black Smithy	W1	15 x 6.7	101	
3	Foundry Shop	W2	4.65 x 9	42	
5	Fitting shop / Carpentry New Mech. bldg	M05	10.5x18.75-3x4	185	
	Staff Cabin	M05A	3x4	12	
	Staff Cabins	W0A	2x3.65x7.3	53	
	Total				

Total Instructional area = 958
Total Administrative area = 65
Total Amenities area= ---

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

Department: - 14) **Tutorial Rooms U G**

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
1	Tutorial Rooms 12 Nos.	D1 to D12	12x8 x 4	384	Instructional
2	Main Bldg 3 Nos.	B16A, B	2 x 6 x 9	108	
		B13	6 x 7.5	45	
		310, 315	2 x 6 x 9	108	
	Electrical/ I T bldg.	E 310A	4.6x7.6	35	
		18		680	

Total Instructional area = **680**

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

15) Administrative

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum M x m	Carpet Area in Sq m.	Remarks
1	Conference Room	G02	9 x 4.5	40.5	co
2	Anti Chamber	G03(A)	4 x 4.5	18	co
3	Principal	G7	6 x 5.25	31.5	co
4	Dy. Registrar	G4 A	3 x 3	09	co
5	Director's Cabin	G6(A)	6 x 3	18	co
6	E.D.P. Office	G17	3 x 3	09	co
7	O.S	G31	3 x 6	18	co
8	Training & Place. Office	G08	9 x 6	54	
9	Maintenance Office	B11	9x6	54	
10	Main Office	G4 G5	6 x 9+ 6 x 6	90	co
11	A/C Office A.O	G32	3 x 6	18	co
12	Caretaker Room	G15	2 x 3	06	co
13	Waiting + Pantry Room	G3	4.5 x 4.5	20	co
14	Reception cum waiting	G01	3 x 9	27	co
15	Xerox Room	G18	1.2 x 3	3.6	
16	**Security Office**	B12	9 x 6	54	
17	General Store	B6	9 x 9-3x3	72	
18	Garden Maintenance Store	G23	2 x 3	06	co
19	Exam Record Room	211+210	3 x 3+3 x 3	18	co
20	**Exam office**	212 B	9 x 6	54	co
22	Office Store	D16, 17,18	27.88 x 3	84	co
23	Maint. Store Electrical	B09	3x3	9	
24	Maint. Store Plumbing	D15	7.62 x 3.66	28	
25	Rector office Hostel 1	OBHOO	3.66x4.57	17	
26	Warden Office		2.43x2.82	7	
27	U P S Room	G17 (A)	1.2 x 3	3	
28	Electrical Maint Room	B4	3 x 3	09	
29	House keeping	B10	3.2x3.2	10	
30	Reception/waiting	A101	2x3+1.2x6	13	
31	O S Main office	A102	9x6.3	57	
32	Office Record room	A103	6x5.4	32	
33	Account Office cash	A104A	3.65x17	62	
34	Exam Academic office	A104 B	3.65x17	62	
35	Directors Cabin Board Room	A107	9x5.4	49	
36	Principle/ Director meeting	A108	5.1x6.5	33	
37	Principle/ Director	A109	4.0x6.5	26	
38	Conference room	A111	7.3x17.0	124	
39	Pantry Office	A112	3x4.3	13	
40	AO office Other office	A113	6x5.4	32	
41	Dy. Registrar Other office	A115	3x5.4	16	
	Total			**1307**	

16) Amenities

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum M x m	Carpet Area in Sq m.	Remarks
	Girls common room	G35,	12 x 9	108	
	Boys common room	B17	12 x 9	108	
	Canteen Boys Hostel	CNTN	4.27x4.27	18	
	College **Canteen Near Gate**	CNTN2	11.30x5.80 7.50 x 15.50	65 116	
	Student activity center	G24	18x9	162	
	Dinning Hall No 1	DH1		184	
	Dinning Hall No 2	DH2		247	
	Dinning Hall for Girls	DHGH		143	
	T V Room (Girls)	TVGH	7.24 x 7.66	56	
	Medical Room Boys Hostel	MEDICL	3.73 x 4.57	17	
	Medical Room Girls Hostel	MEDI1	3.66 x 4.57	17	
	S T D Room Canteen	CNTN2	3.66x3.05	11	
	Generator Room	GENTOR	5.0x6.0	30	
	Transformer	TRANS	7x8	66	
	Meter room	MTR RM	3x3	9	
	Electric Room	ELE RM	2Nosx3x3	18	
	Generator	GENTOR2	3x6	18	
	Pump House	PUMPS	5 nosx2x2	20	
	Gymnasium TF	GYM	12.25x15.25	187	
	Yoga Gym	YOGA	12.25x15.25	187	
	Bus Stop	BUSSTP	7.5x10.	75	
	Cycle Stand	CYCLST	18.20x35	637	
	Parking 4 wheeler Class I	PARKN1		348	
	ATM	ATM	4.50 x 3.65	27	
	Bank	BANK	7.50 x 15.50	116	
	Stationary Store	B8-9	9 x 9-3x3	72	
	Toilets	A106	3x3.2	10	
	Toilet	A110	3x4.4	13	
	Toilet	AG1,2	2x3x3.2	19	
	Total			**3104**	

Sr. No.	Particulars/Details	Room No.	Size Maximum M x m	Carpet Area in Sq m.	Remarks
	Principal's Quarter	A8,9,10		169	
	Guest house	C1 to 8	8 x 32.2	258	
	VIP Guest house	VIP City	--	220	
				647	

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

17) Open-air theater

Open Air Theater **UC**		76 x 25		1900 Sq m
Central Canteen& Guest House **U C**				2400 sq m

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

18) Residential

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
	Principal's quarter Staff quarter A Staff quarter B Renovated B Staff quarter (sweeper) Staff quarter IV New Staff quarter IV NMU		113+ 56 56.4 x 9 56.4x6 66.4 x 4 24.65x3 32.5x6 B/U	169 507 338 266 74 195 282	
	Guest house	A0, A4	56.4x2	113	
	Guest house Guest house VIP Guest House		32.2x4 32.2 x4	129 129 220	
	Hostel 1			1889 134	
	Hostel 2			2479	
	Girls Hostel 3rd floor	1087	660	1747	
	Girls Hostel / Class I staff Quarters		464x4	1856	
	Total			10528	

*Net residential area=10528 sq.m

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON.

19) **Sports**

Building wise/Department wise space allocation

Sr. No.	Particulars/Details	Room No.	Size Maximum m x m	Carpet Area in Sq m.	Remarks
	Sport Office	113	3x3	09	
	Sport store		2.44x3.43	8	
	Badminton (Girls)		15.24x15.24	233	
	Badminton (Boys)		30.87x24.47	755	
	T T Hall Sport Bldg	YOGA	12.2x15.25	187	
	Gym office		2x1.2x 9.2	22	
	Total	**TT BDN**		**1004**	

20)Play field

	Basket ball	**BSKBAL**	**30x38**		**1140**
	Cricket, Football, Volleyball		160x66		10560
	Kabaddi ground		30x18		540
	Kho- Kho ground		29 x16		464
	Total				12704
	Total				13992

21) Roads and Lawn in Campus

A) Roads

(i) Black top road length: 2.10 km

B) Lawn:

(i) Central high land Lawn: 6000 Sqm.
(ii) Central low land Lawn: 1275 Sqm.
(iii) Main Building Lawn: 486 Sqm.

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON

Department wise **carpet area (Excluding Administrative, Amenities)** Summary

Dept.	C.R	T.R	S.R	D.H	Lab.	Comp. lab.	Library	Other	Total Acad. Area
1)Civil	459 (4)	101 (3)	162	135	960 (10)	204 (2)	--	--	2044
2)Comp.	432 (5)	78 (2)	162	--	941 (12)	--	27	--	1640
3)Mech.	479 (6)	140 (4)	141	73	1030 (10)	216 (2)	54	--	2131
4)Chem.	108 (2)	36 (1)	162	--	739 (10)	81	--	--	1126
5)Biotech	153 (3)	69 (2)	--	--	685 (10)	66	--	--	973
6)Elec.	198 (3)	128 (3)	155	--	817 (11)	66	44	--	1408
7)E&TC	432 (5)	99 (2)	162	--	934 (12)	149 (2)	22.5	--	1798
8) IT	256 (3)	--	139	--	723 (10)	--	--	--	1118
9) MBA	134 (2)	66 (2)	134	--	--	102	20	--	456
10)App Sci.	999 (9)	--	--	135	387 (3)	135	--	--	1656
11) Library	--	--	--	--	--	--	927	--	927
12) Comp. Center	--	--	--	--	--	144	--	--	144
13)Work Shop	--	--	--	--	--	--	--	958	958
14) Tutorial	--	680 (18)	--	--	--	--	--	--	680
19)Sports									--
Total	**3650 (42)**	**1397 (37)**	**1217 (8)**	**343 (3)**	**7216 (88)**	**1163 (12)**	**1094 (6)**	**958**	**17059**

Figures below area show numbers of rooms

SSBT'S COLLEGE OF ENGINEERING & TECH. BAMBHORI, JALGAON

Department wise **carpet area** Summary for Instructional Administrative Amenities & other

	Requirement of area for total strength 0f 2664 Students	2664x6 = 15984	2664x1= 2664	2664x2= 5328	23976
Sr. No.	Department	Instructional	Administrative	Amenities	Total **Carpet Area**
01	Civil	2044	180	54	**2278**
02	Computer	1640	303	36	**1979**
03	Biotech	973	87	9	**1069**
04	Mechanical	2131	295	87	**2513**
05	Chemical	1126	126	18	**1270**
06	Electrical	1408	134	13	**1555**
07	E & TC	1798	253	36	**2131**
08	IT	1118	206	58	**1382**
09	MBA	456	91	157	**488**
10	Library	927	108	54	**1089**
11	App. Science	1656	210	36	**1875**
12	Comp Center	144	18	---	**162**
13	Workshop	958	65	---	**1023**
14	Tutorials	680	---	---	**680**
15	Administrative	---	1307	---	**869**
16	Principal qtr. Guest house	---	---	647	**647**
17	Amenities	---	---	3104	**3038**
18	Sport	---	---	1004	**1004**
19	Play field Basket Ball ground	---	---	1140	**1140**
	TOTAL	**17,059**	**3,383**	**6,453**	**26,895**

Under construction area (Carpet Area)

Sr. No.	Department	Instructional	Administrative	Amenities	Total
01	Open Air Theater	---	---	1900	**1900**
02	Canteen & Guest house	---	---	2400	**2400**

Proposed Construction Built up area

Sr. No.	Department				Total Sq m
01	Building for First year GF	GF 2800	FF 2800		**5,600**
02	Electrical/ E&TC Dept.	SF 3000	TF 3000		**6,000**

Teaching Learning Process

Methodology

For effective teaching learning process good and adequate infrastructure facilities are available. The class rooms and labs / workshop are well lighted with natural light during day time with circulation of fresh air. Conventional methods is adopted where in black board, chalk and faculty are involved in teaching the students in conjunction with modern methods like charts, cut models, OHPS, LCD’s , electronics media like e-books , educational CD’s, VCD. TV’s are adopted by the faculty . Course files for all the subject are available in each department. Each department is having a departmental library and computer lab connected with internet. The central library is computerized with Del Net facilities and has AC reference room in addition to a reading room and staff rooms.

A computer center having 40 terminals is independently available for the use of faculty and students. The computer center is provided with internet facility and is available both during working hours and in additional time also.

Effectiveness

To asses the effectiveness of learning process by the students. Two class test at each month end and an assignment week is conducted where in the students are given an assignment sheets in a period sometime during 5th and 6th week of the term as per notified schedule and the students who gets the maximum marks is given a book on subject as reward with intention of motivating him for better performance in forthcoming university examination. The answer papers are checked in time and are shown to students and are collected back for record duly singed by student concerned.

Internal continuous evaluation system is followed for evaluation of term work as per guidelines issued by the University.

Motivations and rewards

Gold medals are awarded by the Management who are University first position rank holder in branch of Chemical Engg., Production Engg., Computer Engg. and Electronics Engg. in the University convocation. The University toppers are also felicitated at the college level in the afternoon of University convocation day.

Shrama Sadhana Bombay Trust's

COLLEGE OF ENGINEERING & TECHNOLOGY, BAMBHORI, JALGAON

TENTATIVE ACADEMIC CALENDAR (TERM-I) 2012-13

Sr.No.	Activity	Day	Date / From -To
1	Opening of College	Monday	09 July 2012
2	Registration of Students	Tuesday	10 July 2012
3	Commencement of Classes (S.E. To B.E.)	Wednesday	11 July 2012
4	Sketch Competition & Essay Competition (College level)	Saturday	21 July 2012
5	Opening of College &Commencement of Classes for F.E. Students.	Wednesday	01 August 2012 (Tentative)
6	Departmental Activity [All department] Guest Lecture/Group Discussion/Quiz Competition/ Expert Lecture	Saturday	04 August 2012
7	Independence Day Celebration	Wednesday	15 August 2012
8	Commencement of Classes (M.E.-I &II year)	Thursday	16 August 2012
9	Class Test – I (S.E. To B.E)	Tuesday to Saturday	21 Aug. to 25 August 2012
10	Lecture Series "FEAST"(College level)	Thursday to Saturday	30 Aug. to 01 Sept. 2012
11	Teacher's Day & Fresher's Welcome (All Depts.)	Wednesday	05 Sept. 2012
12	Feed back from students	Monday to Friday	03 Sept.to 07 Sept. 2012
13	Group Discussion(College level)	Saturday	08 Sept. 2012
14	Engineer's Day	Saturday	15 Sept. 2012
15	Class Test – I (F.E.) Class Test – II (S.E. to B.E.)	Thursday to Wednesday	20 Sept to 26 Sept. 2012
16	Quiz Competition / Traditional Day (College level)	Saturday	06 Oct. 2012
17	Term-Work Assessment (S.E To B.E.)	Thursday to Saturday	11 Oct. to 13 Oct. 2012
18	Class Test – II (F.E.)	Monday to Saturday	15 Oct. to 20 Oct. 2012
19	Makeup Week (S.E To B.E.)	Monday to Saturday	15 Oct. to 20 Oct. 2012
20	Alumina meet	Saturday	03 Nov. 2012
21	Term Work Assessment F.E.	Monday to Wednesday	05 Nov. to 07 Nov. 2012
22	Makeup Week (F.E.)	Monday to Saturday	19 Nov. to 24 Nov. 2012
23	PR/OR Exam. (S.E To B.E.) (Tentatively)	From Monday	29 Oct. to 10 Nov. 2012
24	University Theory Examination (Tentatively)	From Tuesday	26 Nov. to 24 Dec. 2012
25	Industrial Tour of All Dept. (Tentatively)	--	After 1st Term Exam. and before commencement of 2nd Term

Shrama Sadhana Bombay Trust's
COLLEGE OF ENGINEERING & TECHNOLOGY, BAMBHORI, JALGAON.
TENTATIVE ACADEMIC CALENDAR (TERM-II) 2012-13

Sr. No.	Activity	Day	Date / From -To
1.	Start of II Term (Registration of students)	Monday	14 Jan. 2013
2.	STTP on CAD, CAM, CAE (Mechanical Engg. Dept.)	Tuesday to Saturday	15 Jan. to 19 Jan.2013
3.	STTP on "Cloud Computing" (By Computer Engg. Dept.)	Monday to Friday	21 Jan. to 25 Jan.2013
4.	Republic Day Celebration	Saturday	26 Jan.2013
5.	Art of living (By Applied Science Dept.)	Tuesday to Sunday	29 Jan. to 03 Feb.2013
6.	Entrepreneurship Awareness Camp. (IEDC)	Wednesday to Friday	06 Feb. to 08 Feb. 2013
7.	Workshop on UTM Total Station (By Civil Dept.) for faculty, students)	Saturday	09 Feb.2013
8.	One day workshop on Disaster Management (By Applied Science Dept.)	Saturday	09 Feb. 2013
9.	Class Test-I (SE to BE)	Monday to Saturday	11 Feb. to 16 Feb.2013
10.	Alumni Meet	Sunday	17 Feb.2013
11.	Annual Sports	Monday to Wednesday	18 Feb. to 20 Feb.2013
12.	Annual Gathering (Vasantutsav)	Thursday to Saturday	21 Feb. to 23 Feb.2013
13.	Feedback from Students	Monday to Thursday	25 Feb. to 28 Feb.2013
14.	Science Exhibition (University Level) Applied Science Dept.	Thursday	28 Feb.2013
15.	MEC FEST (Mech., E&TC & Computer Dept.)	Friday	01 Mar.2013
16.	Student Activity- B-Storm (MBA Dept.)	Friday	01 Mar.2013
17.	National Level Student Paper Presentation "Milestone2K13"	Saturday	02 Mar.2013
18.	Use of Computer in day to day life : Women's Training Programme	Friday	08 Mar.2013
19.	Class Test- (ISE) for FE	Monday to Saturday	11 Mar. to 16 Mar.2013
20.	Workshop on Fermentation Technology (Biotech Dept.)	Friday to Saturday	15 Mar. to 16 Mar.2013
21.	Class Test-II (SE to BE)	Monday to Saturday	18 Mar. to 23 Mar.2013
22.	International Conference on "Advances in Energy Technology" (By Chemical & Civil Depts.)	Friday	29 Mar. 2013
23.	Class Test (ISE) for FE	Monday to Saturday	01 Apr. to 06 Apr.2013
24.	12^{th} Students programme	Friday to Saturday	05 Apr. to 06 Apr.2013
25.	Project Exhibition	Saturday	06 Apr. 2013
26.	Farewell to B.E. Students (All department)	Saturday	13 Apr. 2013
27.	T.W. Assessment	Monday to Wednesday	15 Apr. to 17 Apr.2013
28.	Workshop on Sci-Lab for Faculty & BE Students (Electrical Dept.)	Tuesday to Saturday	16 Apr. to 20 Apr.2013
29.	End of Term	Saturday	20 Apr.2013
30.	Parents Meet	Sunday	21 Apr.2013
31.	Industrial Meet	Saturday	27 Apr. 2013
32.	PR/Oral Exam., FE to BE	Monday onwards	22 Apr. to 3 May. 2013
33.	Theory Exam., FE to BE & ME	Monday onwards	06 May. to 4 Jun. 2013
34.	Project Oral (BE)	Thursday to Sunday	06 Jun. to 09 Jun.2013
35.	PR/Oral Exam., ME	Thursday to Thursday	06 Jun. to 13 Jun.2013
36.	Commencement of Next Year	Monday	08 July. 2013

(Dr. K.S.Wani)
Principal

Copy to:
1) Chairman, G.B. & L.M.C. 2) Managing Trustee Sh. Raosaheb R.D.Shekhawat
3) All H.O.Ds 4) DOA 5) Director, T &P 6) DOR&D 7) D.R 8) A.R. 9) B.K.P. 10) Store
11) Library12) Chairman, Cultural Activities 13) Physical Director 14) Admission Office
15) Principal Office

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Syllabus of First Year Engineering
(Common to all branches)
Faculty of Engineering and Technology

W.E.F 2012 - 2013

FE Semester – I

Course Code	Name of the Course	Group	Teaching Scheme				Theory		Practical		Total	Credits
			Theory Hrs / week	Tut. Hrs / week	PR. Hrs / week	Total	ISE	ESE	ICA	ESE		
FE 121	Engineering Physics – I	A	3	---	---	3	20	80	---	---	100	3
FE 122	Engineering Chemistry – I	A	3	---	---	3	20	80	---	---	100	3
FE 123	Engineering Mathematics - I	A	3	1	---	4	20	80	---	---	100	4
FE 124	Elements of Civil Engineering & Engineering Mechanics	B	3	1	---	4	20	80	---	---	100	4
FE 125	Computer Programming	B	3	---	---	3	20	80	---	---	100	3
FE 126	Engineering Science Lab - I	A	---	---	2*	2*	---	---	25	---	25	1
FE 127	Computer Programming Lab	B	---	---	2	2	---	---	25	25 **(PR)**	50	1
FE 128	Elements of Civil Engineering & Engineering Mechanics Lab	B	---	---	2	2	---	---	25	25 **(OR)**	50	1
FE 129	Workshop Practice – I	B	---	---	2	2	---	---	25	---	25	1
FE 130	Soft Skills – I	C	1	---	2	3	---	---	50	---	50	2
	Total		**16**	**2**	**10**	**28**	**100**	**400**	**150**	**50**	**700**	**23**

ISE: Internal Sessional Examination, **ESE:** End Semester Examination, **ICA :** Internal Continuous Assessment

Note: For Engineering Science Lab, practical of Engineering Physics and Engineering Chemistry shall be conducted in alternate week.

FE Semester-II

Course Code	Name of the Course	Group	Teaching Scheme				Theory		Practical		Total	Credits
			Theory Hrs / week	Tut. Hrs / week	PR. Hrs / week	Total	ISE	ESE	ICA	ESE		
FE 221	Engineering Physics – II	A	3	---	---	3	20	80	---	---	100	3
FE 222	Engineering Chemistry - II	A	3	---	---	3	20	80	---	---	100	3
FE 223	Engineering Mathematics - II	A	3	1	---	4	20	80	---	---	100	4
FE 224	Elements of Electrical & Electronics Engineering	B	3	---	---	3	20	80	---	---	100	3
FE 225	Engineering Drawing & Elements of Mechanical Engineering	B	3	---	---	3	20	80	---	---	100	3
FE 226	Engineering Science - II Lab	A	---	---	2*	2*	---	---	25	---	25	1
FE 227	Engineering Drawing & Elements of Mechanical Engineering Lab	B	---	---	4	4	---	---	25	25 **(OR)**	50	2
FE 228	Elements of Electrical & Electronics Engineering Lab	B	---	---	2	2	---	---	25	25 **(PR)**	50	1
FE 229	Workshop Practice - II	B	---	---	2	2	---	---	50	---	50	1
FE 230	Soft Skills-II	C	1	---	2	3	---	---	25	---	25	2
	Total		**16**	**1**	**12**	**29**	**100**	**400**	**150**	**50**	**700**	**23**

ISE: Internal Sessional Examination, **ESE:** End Semester Examination, **ICA:** Internal Continuous Assessment

Note: For Engineering Science Lab, practical of Engineering Physics and Engineering Chemistry shall be conducted in alternate week.

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Syllabus of First Year Engineering

(Common to all branches)

Faculty of Engineering and Technology

SEMESTER-I

W.E.F 2012 - 2013

Engineering Physics - I

COURSE OUTLINE

Engineering Physics - I	**EP- I**	**FE 121**
Course Title	Short Title	Course Code

Course Description:

This course is aimed at introducing the fundamentals of basic sciences (Engineering Physics-I) to undergraduate students. The background expected includes a prior knowledge of physics from HSC (science) and familiarity with various laws, principles and theories. The goals of the course are to understand the basic principles of science (Engineering Physics -I) and their applications in different areas.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	15	40	03

Prerequisite Course(s): 11^{th}, 12^{th} Physics.

General Objective:

The objective of this course is to provide learner with basic concepts and knowledge of sciences (various principles, theories, laws etc.) and to analyze it from experiments. The learner can apply the same in various branches of Engineering and Technology.

Learning Outcomes:

After successful completion of this course the student will be able to:

a) Understand the concept of different Energy Sources, their production, advantages, disadvantages, applications etc
b) Understand the basic properties, mechanism, terminology etc of Laser and their types, Principles, construction and re-construction of Holography. Principle, structure, and propagation mechanism of Fiber optics communication and their Industrial application.
c) Understand the basic of crystal structure, its parameter.
d) Understand the production of X-rays, properties and applications in various fields.
e) Describe the classification of solid, its properties , formation of semiconductor diode, its application and concept of Hall effect and Hall coefficient.
f) Understand to know about the basic concepts of Interference, Diffraction Polarization, their production and various applications

COURSE CONTENT

Engineering Physics - I **Semester-I**

Teaching Scheme	**Examination Scheme**	
Lectures -3 Hrs/week	**End Semester Exams (ESE)**	**: 80 Marks.**
	Duration of ESE	**: 3 Hours.**
	Internal Sessional Exam (ISE)	**: 20 Marks.**

Unit –I- Environmental Science **No of Lecture: 8 Hours, Marks: 16**

A) Energy Sources (non conventional): Introduction to non-conventional energy sources, Solar cell (Principle- Construction- Working & Characteristics), Wind energy- Wind Mill, Biogas & Bio Mass (Brief Explanation about way of harnessing or utilization, advantages), Advantages of non-conventional energy.

B) Energy Sources (conventional): Introduction to Nuclear Fission, Fusion, Chain reaction Multiplication Factor, Nuclear Reactor (with Diagram and Working), Numericals.

Unit –II- Laser & Fiber Optics **No of Lecture: 8 Hours, Marks: 16**

A) Laser: Introduction, Laser beam characteristics -Coherence, Directionality, Intensity, Mono chromaticity. Mechanism of Laser- Stimulated absorption, Spontaneous emission, Stimulated emission, Laser Terminology- Active Medium, Population, Population Inversion, Pumping, and Metastable State. Types of Laser-Gas Laser (He-Ne Laser), Nd-Yag Laser, Applications of Laser, Holography – Introduction, Principle of Holography, Recording of 3 D Image using Hologram, Reconstruction of 3 D images, Comparison with ordinary photography.

B) Fiber Optics: Structure of optical fiber. Principle of optical fiber. Propagation Mechanism in optical fiber- Angle of acceptance, Numerical aperture, Critical angle. Optical fiber communication system (Only Diagram), Advantages of optical fiber, Applications of optical fiber.

Unit-III- Crystallography & X-ray **No of Lecture: 8 Hours, Marks: 16**

A) Crystallography : – Introduction , Space Lattice – Translation Vectors, The Basis and crystal structure, Unit cell & Lattice parameters, Bravais Lattices, The cubic crystal- The Simple Cube (SC), Body Centered Cube (BCC), Important Parameters of cubic lattice – Number of atom per unit cell, Coordination Number, Atomic Radius , Packing density OR

Packing Factor, Calculation of Lattice Constant. Miller indices – Rules for finding Miller Indices, Important features of Miller Indices, Miller Indices for cube crystal, Numericals.

B) X-Rays: Production of X –rays (Coolidge tube), Continuous and characteristic x – rays, Bragg's law, Properties & Applications of X-ray, Numericals.

Unit- IV -Physics of Semiconductor **No of Lecture: 8 Hours, Marks: 16**

Classification of solid on the basis of band theory, Fermi-level and position of Fermi level in intrinsic [With derivation i.e $E_f =(Ec + Ev) /2$] and extrinsic semiconductors, Conductivity in semiconductors, Formation of P-N junction, Diode under forward and reverse bias, Hall Effect, Determination Hall Coefficient.

Unit-V- Optics **No of Lecture: 8 Hours, Marks: 16**

Interference- Interference, Michelson's Interferometer, Applications of Michelson's interferometer- wavelength determination, Refractive index of thin film, thickness of transparent material.

Diffraction- Diffraction, Theory of plane transmission diffraction grating, Determination of wavelength by grating, Rayleigh's criteria of resolution, resolving power of grating.

Polarization-Polarization, Polarization by reflection, Brewster's law, law of Malus, Dichroism, Polaroid's, Engineering application of polarization

Reference Books:

1. R K Gaur, S L Gupta, "Engineering Physics", Dhanpath Rai Publications.
2. P S Aithal, H J Ravindra, "Engineering Physics", Acme Learning.
3. G Vijaya kumari , "Engineering Physics" , Vikas Publications.
4. M R Srinivasan, "Physics for Engineers", New Age International Publishers.
5. C S Solanki, "Solar Photovoltaic", PHI Learning Private Limited.
6. S O Pillai, "Solid state Physics", New Age International Publishers.
7. Ajay Ghatak, "Optics", TMH.
8. Hugh D Young, Roger A Freedman, "University Physics (With Modern Physics)", Pearson.
9. Hintendra K Malik, A K Singh, "Engineering Physics", Mc Graw Hill.
10. K Rajgopal, "Engineering Physics", PHI Learning Private Limited.
11. M N Avadhanulu, P G Kshrisagar, "Text book of Engineering Physics", S. Chand.
12. Uma Mukharji, "Engineering Physics" , Narosa Publishing House
13. S Deswal, A Deswal, "Basic Course of Environmental Pollution", Dhanpath Rai Publications.
14. N Subrahmanyam, Brijal, M N Avadhanulu, "Optics", S. Chand.
15. Sanjay Jain, "Engineering Physics", Universities Press (India) Pvt Ltd.

Engineering Chemistry – I

COURSE OUTLINE

Engineering Chemistry-I	**EC-I**	**FE 122**
Course Title	Short Title	Course Code

Course Description:

This course is aimed at introducing the fundamentals of basic sciences (Engineering Chemistry –I) to undergraduate students. The background expected includes a prior knowledge of chemistry from HSC (science) and familiarity with basic fundamental theories. The goals of the course are to understand the basic principles of Engineering Chemistry –I and their applications in different branches of engineering.

Lecture	**Hours / Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	15	40	03

Prerequisite Course(s): 11^{th}, 12^{th} Chemistry,

General Objectives:

To apply the knowledge of science in engineering and technology and also understand the basic concepts of chemistry and to analyze it from experiments.

Learning Outcomes:

After successful completion of this course the student will be able to:

a) Design and conduct experiments, analyze and interpret data.
b) Design a component, system or process to meet desired needs within realistic constraints.
c) An ability to function on multidisciplinary terms.
d) Identify, formulate and solve problems.
e) Understand the impact of engineering solutions in global, economic, environmental and societal context.
f) Ability to appreciate contemporary issues and engages in life-long learning.
g) Use the latest techniques, skills and modern tools necessary for engineering practices.

h) Understanding of the necessity to quantitatively balance the built environment with the natural world.
i) Understanding the basic parameters of water, different water softening processes and effect of hard water in industries.
j) Understanding the preparation, basic properties and applications of various polymers as an engineering material.
k) Understand the preparation, basic properties and applications of Portland cement.
l) Understand the synthesis, various properties and applications of ceramics as an engineering material.
m) Understand the classification, preparation, properties and applications of different alloys.

COURSE CONTENT

Engineering Chemistry-I **Semester-I**

Teaching Scheme **Examination Scheme**

Lectures -3 Hrs/week	**End Semester Exams (ESE)**	**: 80 Marks.**
	Duration of (ESE)	**: 3 Hours.**
	Internal Sessional Exam (ISE)	**: 20 Marks.**

Unit – I Water **No. of Lect. – 08, Marks: 16**

a) Introduction: Definition of water, impurities of water
b) Types of hardness – Units of hardness, causes of hardness of water
c) Analysis of water - Chloride contents by Mohr's method, Alkalinity along with numerical.
d) Water Softening Process:(i) Lime soda process by Hot continuous process (Numerical based on it) (ii) Zeolite process, (iii) Ion exchange method, (iv) Reverse Osmosis method
e) Effect of hard water in steam generation, priming, foaming, caustic embrittlement.

Unit – II Polymer **No. of Lect. – 08, Marks: 16**

a) Introduction , Definition, functionality
b) Classification: on the basis of chemical composition, synthesis, intramolecular forces.
c) Types of polymerization – addition &condensation polymerization with mechanism and examples.
d) Plastic – Types of plastic – Thermoplastic & thermosetting plastic.
e) Compounding of plastic & their functions.

f) Explanation & different types with their properties & applications(i) PVC (ii) Teflon (iii) Polyurethane (iv) Polycarbonate (v) Polystyrene
g) Rubber - Types of rubber- natural & synthetic
h) Vulcanization of rubber: drawbacks of natural rubber
i) Synthetic Rubber - Synthesis, structure, properties & applications of- (i) Styrene butadiene rubber (SBR) (ii) Neoprene rubber (iii) Nitrile rubber (iv) Butyl rubber

Unit – III Cement **No. of Lect. – 08, Marks: 16**

a) Definition, Classification and properties - Natural, Puzzolona & Port land
b) Chemical constituent of Portland cement.
c) Manufacture of Portland cement by wet process.
d) Manufacture of Portland cement by dry process (using flow sheet diagram)
e) Setting & Hardening of Portland cement with chemical reaction.
f) Heat of hydration of cement.

Unit – IV Ceramics **No. of Lect. – 08, Marks: 16**

a) Introduction, Definition Classification of ceramics such as functional & structural classification.
b) Basic raw materials for ceramic preparation – clays, feldspars and flint or sand
c) Manufacture of ceramic by flow sheet diagram
d) Drying of ceramic wares – mechanism of drying, drying rate & shrinkage, methods of drying such as drying shades, cross – circulating drying, hot floor drying.
e) Firing of ceramic wares - Effect of heat on ceramic ware, Effect of heat on shrinkage & porosity.
f) Properties of ceramic material –
   1. Mechanical Properties such as Tensile strength, compressive strength, torsional Strength, plastic deformation.
   2. Thermal properties such as thermal conductivity, thermal shock resistance.
   3. Electrical properties such as insulator, ceramic conductor, ceramic Semiconductors.
g) Application of ceramics.

Unit – V Alloys **No. of Lect. – 08, Marks: 16**

a) Introduction,
b) Necessity (Purpose) of making alloys
c) Classification of alloys
d) Preparation of alloys – Fusion method, Electro deposition method

e) Composition , properties & application of following -(i)Brass (ii) Bronze (iii) Duralumine (iv) Nichrome (v) Steel – Mild, Medium & High.

Reference Books:

1. B K Sharma, Krishna, “Engineering Chemistry”, Prakashan Media (P) Ltd.
2. Suba Ramesh, “Engineering Chemistry”, Wiley India Pvt. Ltd..
3. Jain & Jain, “Engineering Chemistry”, Dhanpat Rai Publishing Co.
4. S S Dara, “A Text Book of Engineering Chemistry”, S Chand & Co. Ltd.
5. R Gopalan, “A Text book of Engineering Chemistry”, Vikas Publishing House Pvt. Ltd. Third Edition
6. B S Chauhan, “Engineering Chemistry”, University Science Press, Third Edition.
7. Shashi Chawla, “A Text book of Engineering Chemistry”, DhanpatRai Publishing Co.
8. V R Gowariker, “Polymer Science”. New Age International.
9. Abhijit Mallick, “Engineering chemistry”, Viva books.
10. Sunita Ratan, “Engineering chemistry”, S K Kataria & Sons.
11. Das R K, “Industrial Chemistry”, Asia Pub. House, New York, 1966

Engineering Mathematics - I

COURSE OUTLINE

Engineering Mathematics -I	**EM-I**	**FE 123**
Course Title	Short Title	Course Code

Course Description:

This course is aimed at introducing the fundamentals of basic Mathematics to undergraduate students. The background expected includes a prior knowledge of Mathematics from 12th science and familiarity with various laws, principles and theories. The goals of the course are to understand the basic principle of Mathematics and its application in different area.

Lecture	**Hours / Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	15	40	03
Tutorial	01	15	13	01

Prerequisite Course(s): 11^{th}, 12^{th} Physics.

General Objective:

The basic necessity for the foundation of Engineering and Technology being Mathematics, the main aim is to teach mathematical methodologies and models, develop mathematical skill and enhance thinking and decision making power of student.

Learning Outcomes:

After completion of this course learner will be able to:

a) Apply knowledge of mathematics in engineering and technology.
b) Identify, formulate and solve engineering problems.
c) Design Mathematical models for engineering problems and solve them.

COURSE CONTENT

Engineering Mathematics-I **Semester-I**

Teaching Scheme **Examination Scheme**

Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE)**	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

Unit-I: Matrix Algebra **No. of Lect. - 08, Marks-16**

a) Definition of Elementary Transformations, Normal Form, Canonical Form & Rank of Matrix.
b) System of Linear Equations. (by using rank of matrix) for both Homogeneous & non-Homogeneous system.
c) Eigen values & Eigen vectors.
d) Orthogonal Matrix.
e) Introduction to Cayley-Hamilton's Theorem. (without proof)
f) Applications of Matrices (Translation, Scaling, Rotation).

Unit-II: Calculus of factions of single variable **No. of Lect. - 08, Marks-16**

a) Introduction to Successive Differentiation with standard formulae.
b) Leibnitz's theorem (without proof).
c) Taylor's & Maclaurin's theorems (without proof).
d) Expansion of Functions by using Taylor's theorem, Maclaurin's theorem & Leibnitz's theorem.
e) Applications of Taylor's theorem.

Unit-III: Integral Calculus (Some Special Functions) **No. of Lect. - 08, Marks-16**

a) Gamma Function.
b) Beta Function.
c) Differentiation under Integral Sign. (No Verification of Rule).
d) Error Function.

Unit-IV: Differential equation & its applications (1st order & 1st degree)
No. of Lect. - 08, Marks-16

a) Exact differential equation.

b) Non-exact differential equation. (reducible to exact differential equation by using integrating factor).
c) Linear differential equation.
d) Reducible to linear differential equation.
e) Applications of differential equation to simple electrical circuits & conduction of heat

Unit-V: Complex Number **No. Of Lect. - 08, marks-16**

a) Introduction to Circular functions, Hyperbolic functions & Inverse hyperbolic functions & their relations (without proof).
b) Hyperbolic functions.
c) Logarithm of a complex number.
d) Separation into real & imaginary parts.

Reference Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd.
2. C R Wylie, "Advanced Engineering Mathematics", TMH New Edition.
3. B S Grewal, "Higher Engineering Mathematics", Khanna Publication.
4. H K Das, "Advanced Engineering Mathematics", S. Chand & Company.
5. B V Ramana , "Engineering mathematics", (New Edition) TMH.
6. N P Bali, "A Text Book of Engineering Mathematics", Laxmi Publication.
7. Babu Ram, "Engineering Mathematics", Pearson Education.

Elements of Civil Engineering & Engineering Mechanics

COURSE OUTLINE

Elements of Civil Engineering & Engineering Mechanics	ECE&EM	FE 124
Course Title	Short Title	Course Code

Course Description:
This course provides the elementary level knowledge of civil Engineering and Engineering mechanics which includes-

a) Study of Forces and force systems.
b) Resultant and equilibrium of coplanar force systems.
c) Kinematics and kinetics of bodies which are in motion.
d) Scope of civil engineering and basic areas of civil engineering.
e) Types of civil engineering structures and important parts of buildings.
f) Principles of Planning and Building Byelaws.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	13	39	03
Tutorial	01	13	13	01

Prerequisite Course(s): Fundamental knowledge of Physics and mathematics of 11th and 12th std.

General Objective:

The general objective of course is to know the concepts of statics and dynamics. This includes application of math and physics principles to identify formulate and solve engineering problems. Also it aims to introduce the students the scope and basic areas of civil engineering.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

(Engineering Mechanics):

a) Understand the basic physics concepts, such as force, weight, particle, and rigid body and SI system of units.
b) Compute the rectangular components of a force.
c) Identify and/or list the different types of force systems.
d) Define and calculate the resultant of coplanar force systems.
e) Define and calculate the moment of forces about any given point.

f) Draw free body diagrams of coplanar force systems.
g) Understand condition of equilibrium for coplanar forces
h) Solve for the forces and reactions in statically determinate coplanar force systems
i) Calculate the centroid of composite plane and curved figures.
j) Compute the tensile and compressive values of forces in truss members.
k) Define friction, friction force, static friction, kinetic friction,normal force, coefficient of static friction, angle of friction, and angle of repose.
l) Calculate the frictional force between two bodies in contact.
m) Find position, displacement, speed, velocity, acceleration, distance, and time of moving particle along the straight line and curved path.
n) Solve particle motion involving equation in 2D using rectangular and tangential/normal Coordinate systems.
o) Understand Newton's second law and D'Alembert's principle.
p) Understand principle of linear impulse and momentum.
q) Understand the principle of work and energy for particles.

(Element of Civil Engineering)

r) Understand of the role of the civil engineer
s) Know basic areas of civil engineering
t) Understand important civil engineering structures
u) Know principle of planning and building byelaws.
v) Understand use of the compass for angular measurement and calculation of included angles in a traverse

COURSE CONTENT

Elements of Civil Engineering & Engineering Mechanics **Semester-I**

Teaching Scheme	**Examination Scheme**
Lecture: 3 hours / week	**End Semester Examination (ESE) : 80 Marks**
Tutorial: 1 hour / week	**Paper Duration (ESE) : 03 Hours**
	Internal Sessional Exam (ISE) : 20 Marks

Unit I **No. of Lect. - 08, Marks-16**

A) Resultant of coplanar forces : Introduction, basic concepts, principle of mechanics, force systems, composition and resolution of forces, resultant of concurrent force system in plane, moment of forces, couples, Varignon's theorem, equivalent force couple systems, resultant of non-concurrent force system in plane.

B) Equilibrium of coplanar force system : Introduction, body constraints, types of supports and loads, free body diagram, conditions of equilibrium, equilibrium of forces in a plane , Lami's theorem, reactions of determinate beams, (simple and compound beams).

Unit II **No. of Lect. - 08, Marks-16**

A) **Centre of Gravity: -** Introduction, centre of gravity/centroid of composite plane figures and curves.

B) **Analysis of Structure: -** Plane trusses, method of joints and method of sections, cables subjected to point loads.

c) **Friction: -** Introduction, laws of friction, simple contact friction, ladder friction, application of friction on horizontal and inclined planes.

Unit III **No. of Lect. - 09, Marks-16**

A) **Kinematics of rectilinear motion of particle: -** Introduction, basic concepts, types of rectilinear motions, motion under gravity.

B) **Kinematics of curvilinear motion of particle: -** Introduction, basic concepts, motion along curved path, normal and tangential components of motion, rectangular and path coordinate systems, projectile motion.

Unit IV **No. of Lect. - 07, Marks-16**

A) Kinetics of rectilinear motion of particle: - D'Alembert's Principle, Newton's second law of motion, introduction to work and energy, impulse momentum principle. (No numerical on work and energy and impulse momentum principle).

B) Elements of Civil Engineering: Surveying: Compass: - Principles of surveying. Introduction to compass, bearing, Whole Circle Bearing and Reduced Bearing systems, local attraction, its detection and correction.

Note for unit 4: Out of three questions on unit 4; one question, consisting of 04 marks on Engineering Mechanics (EM), i.e. part A and 04 marks on Elements of Civil Engineering (ECE), i.e. part B is compulsory. Out of remaining two questions, one complete question should be on EM and one complete question should be on ECE.

Unit V **No. of Lect. - 07, Marks-16**

A) Basic Civil Engineering: - Introduction to various branches of civil engineering, introduction to various civil engineering structures such as buildings, highways, railways, bridges, dams, canals, elevated and ground storage reservoirs etc.

B) Building Construction: - Introduction to principles of planning, building rules and bye-laws, load bearing, framed and composite structures, introduction to various parts of buildings.

Reference Books:

1. Bhavikatti S S & K G Rajashekarappa, “Engineering Mechanics”, New Age International (P) Ltd., Publishers.
2. Unadkat Sanju, “Engineering Mechanics”, Tech-Max Publications, Pune.
3. Kanitkar T P and Kulkarni , “Surveying and Levelling, Part I”, Pune Vidyarthi Graha Prakashan, 24th Edition
4. Bindra and Arora, “Building Construction”, Dhanpatrai and Sons, Delhi.
5. N Kumara Swamy and A Ksmeswara Rao, “Building Planning and Drawing” ,Charotar Publishing House Pvt. Ltd.
6. Satish Gopi, “Basic Civil Engineering”, Pearson Education, Delhi, 2008.
7. F P Beer and E R Johnson, “Mechanics for Engineers – Statics”, McGraw-Hill Publication, 5th Edition
8. F P Beer and E R Johnson, “Mechanics for Engineers – Dynamics”, McGraw-Hill Publication, 8th Edition.
9. S P Timoshenko and D H Young, “Engineering Mechanics”, McGraw- Hill Publications, 4th Edition
10. R C Hibbeler “Engineering Mechanics statics and dynamics”, Pearson Education, 11th Edition.
11. S R Bendale, “Engineering Mechanics”, John Wiley & Sons, Delhi, 1st Edition
12. Jaget Babu, “Engineering Mechanics”, Pearson Education, Delhi, 1st Edition.
13. Sushilkumar, “Building Construction”, Standard Publishers, New Delhi, 2010.
14. M G Shah, Kale C.M. and Patki S.Y., “Building Drawing”, Tata McGraw Hill Co. Ltd., New Delhi.

Computer Programming

Course Outline

Computer Programming	**CP**	**FE 125**
Course Title	Short Title	Course Code

Course Description:

The objective of this course is to introduce the students to the fundamentals of computers, the concepts of the C and C++ programming language and enable them to apply these concepts for solving real world problems.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	15	45	03

Prerequisite Course(s): Fundamental knowledge of Computers.

General Objective:

This course covers introduction to Computers, Algorithms and flowcharts, C and C++ programming concepts including variables, control structures, arrays and structures.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

a) Understand the principles of designing structured programs.
b) Write and debug programs using an IDE.
c) Know use of the appropriate statements available in the C and C++ language.
d) Implement small to medium programs of varying complexity, using the most commonly used features of the language.
e) Employ good programming style, standards and practices, during program development.
f) Adapt programming experience and language knowledge to other programming language Contexts.
g) Explain the principles of structured program design.
h) Describe what is meant by a well designed program.
i) Describe when and how to use the standard C and C++ statement.

COURSE CONTENT

Computer Programming **Semester-I**

Teaching Scheme	**Examination Scheme**	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**: 80 Marks**
	Paper Duration (ESE)	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

Unit- I: Program Development Concepts and Introduction to C

No of Lect. – 8, Marks: 16

a. Algorithms, flowcharts.

b. Types of programming languages.

c. Programming language tools.

d. History of C programming.

e. Data types in C.

f. Writing simple programs.

Unit- II: Control Structures and Basic Input/output

No of Lect. – 8, Marks: 16

a. C operators and expressions.

b. Introduction to decision control statements.

c. Conditional branching statements.

d. Iterative statements.

e. Nested loops.

f. Break, continue and goto statements.

g. Basic Input/output statements.

Unit- III: Arrays and Strings **No of Lect. – 8, Marks: 16**

a Declaration and initialization of arrays

b Accessing and storing values in arrays

c Operations performed on arrays

d One and Two- dimensional arrays

e Introduction to strings.

f Declaration and initialization of string.

g String operations with and without C library functions.

Unit- IV: Functions and Structures **No of Lect. – 8, Marks: 16**

a Introduction to functions.

b Function declaration and definition.

c Function call and parameter passing.

d Introduction to structures.

e Initializing and accessing members of a structure.

Unit- V: Introduction to C++ **No of Lect. – 8, Marks: 16**

a Limitations of procedure oriented programming.

b Object-oriented programming paradigm.

c Basic concepts of object-oriented programming.

d Classes and objects

e Defining member functions and scope resolution operator.

f Simple C++ program with class and object.

Reference Books:

1. E Balagurusamy, "Programming in ANSIC C", Tata McGraw Hill, 4/E, 2007.
2. E Balagurusamy "Object Oriented Programming with C++", Tata McGraw Hill, 4/E, 2008.
3. Yashavant Kanetkar, "Let Us C", BPB Publications ,10/E, 2010.
4. Reema Thareja, "Computer Fundamentals and Programming in C", OXFORD University Press, 2012.
5. Stephen G Kochan "Programming in C", Pearson Education , 3/E, 2004.
6. Ashok N Kamthane, "Computer Programming", Pearson Education , 2/E,2008.
7. Vikas Gupta, "Computer Concepts and C Programming", Dreamtech Press, 2009.
8. K R Venugopal and S R Prasad, "Mastering C", Tata McGraw Hill, 1/E, 2011.
9. Behrouz A Forouzan, Richard F Gilberg, "COMPUTER SCIENCE – A Structured Programming approach using C", Thomson, 3/E Indian Edition, 2007.
10. Kernighan, Ritchie, "The C Programming Language", Prentice Hall of India , 2/E, 1988.
11. Pradeep K Sinha and Priti Sinha, "Computer Fundamentals", BPB Publications , 4/E, 2007.
12. Robert Lafore, "Object Oriented Programming in Turbo C++", Galgotia Publication, 2003.

(Engineering Science Lab-I)

LAB COURSE OUTLINE

(Engineering Science Lab-I)

Engineering Science Lab-I	**ES-I LAB**	**FE 126**
Course Title	Short Title	Course Code

Laboratory (Alternate week)	Hours/ Week	No. of Weeks	Total Hours	Semester Credits
	02	15	26	1

Engineering Physics – I

Course Description:

In this laboratory, course emphasis is on the understanding of basic principles, characteristic – properties for semiconductor diode, different instruments used in a field of optics, electronics, communication and metallurgy etc. The learner here can use this knowledge and apply in various branches of engineering as required.

Prerequisite Course(s): Course of Physics at HSC level.

General Objective:

The objective of the laboratory is to impart the fundamental knowledge of physics to the students and develop their ability to apply the specific procedures to analyze the experimental results.

In this lab, students will be familiar with the use of different equipments, basic principles, properties etc which they can apply in various disciplines of engineering during their studies and in future.

Learning Outcomes: After successful completion of this lab student will be able to:

a) Use the latest techniques, skills, and modern tools necessary for engineering practices.

b) Design a component, system or process to meet desired needs with in realistic constraints.

c) Understand classification of solid on the basis of band gap

d) Can analyze characteristic properties and determine the resistivity of semiconductor.

e) Analyze wavelength of Laser, working of Laser, various properties and applications.

f) Describe the use of fiber optics in communication.

g) Can study Hall effect & determine Hall coefficient.

h) Describe working of solar cell, its advantages, disadvantages and uses.

i) Describe the working of Michelson's Interferometer & find unknown wavelength of monochromatic light..

j) Can understand the phenomenon of diffraction & diffraction grating and determine wavelength of light using diffraction grating.

k) Can determine the polarizing angle & refractive index of glass by using Brewster's law.

l) Can study the law of Malus.

m) Can study the crystal structure.

LAB COURSE CONTENT

Practical -2 Hrs/Alternate weeks (Alternate with Engineering Chemistry- I)

(Note: Minimum FIVE Experiments from the following)

1. Semiconductor diode characteristics.

a) To determine forward and reversed characteristics of given semiconductor diode.
b) Analyze the knee voltage of given diode.
c) Compare analytical and the practical values.

2) Band gap in semiconductor material.

a) To determine forbidden energy gap of given semiconductor.
b) Compare analytical and the practical values.

3) To determine the resistivity of the given semiconductor by using four probe method.

a) To determine the resistivity of given semiconductor.
b) To study its variation with temperature.

4) To determine the wavelength of laser source

a) To determine wavelength of He-Ne Laser using diffraction grating.
b) Study the properties of Laser.

c) Compare analytical and the practical values.

5) Fiber Optics Communications.

a)Study of fiber optics communication

b) Describe the advantages of optical fiber over metallic cables.

6) Hall effect & determination of Hall coefficient.

a) A study of Hall Effect in semiconductors.

b) To determine Hall coefficient of semiconductor.

c) To determine the sign of majority charge carrier.

7) Solar cell Characteristics

a) To study the characteristics of solar cell

b) To find fill factor.

c) To determine its efficiency.

d) Measure intensity of source using Lux meter.

8) Spectrometer Grating

a) To understand diffraction phenomenon and diffraction grating.

b) To determine wavelength of light using diffraction grating

c) Compare analytical and the practical values.

9) Michelson's Interferometer

a) To determine unknown wavelength of monochromatic light.

b) Describe the operation of Michelson's Interferometer.

c) Compare analytical and the practical values.

10) Determination of polarizing angle for glass and to determine refractive index of glass using Brewster's law.

a) To determine polarizing angle and refractive index using Brewster's law.

11) Experimental verification of law of Malus

a) To study law of Malus (i.e.- Intensity of polarized light is proportional to $\cos^2\theta$)

12) Crystal structure

a) To Study the given crystal structure.

Reference Books:

1. M N Avadhanulu, A A Dani, P M Pokley, "Experimets in Engineering Physics", S.Chand.
2. S P Singh, "Advanced Practical Physics", Pragati Prakashan.

Engineering Chemistry-I

LAB COURSE OUTLINE

Course Description: In this laboratory course emphasis is on the understanding of basic principles, characteristic properties of water, polymers, and alloys as engineering materials. The learner here can use this knowledge and apply in various branches of engineering as required.

Prerequisite Lab Course(S): 12^{th} Chemistry, Different laws, basic principles and theories.

General Objectives:

This course is intended to provide engineering students with a background in important concepts and principles of chemistry and emphasis on those areas considered most relevant in an engineering context, and practical applications in engineering and technology.

Learning Outcomes:

Upon successful completion of lab Course, student will be able to:

a) Analyze the total hardness of water sample by EDTA method.

b) Analyze the strength of dissolved oxygen from water sample by

Winkler's Method.

c) Analyze the alkalinity of water sample by volumetric method.

d) Analyze the chloride content of water sample by Mohr's method.

e) Estimate the percentage of phenol iodometrically.

f) Determine the yield percentage of Polystyrene by bulk polymerization.

g) Determine the yield percentage of Phenol Formaldehyde Resin (Bakelite).

h) Analyze the percentage of copper in given Brass Sample.

i) Analyze the percentage of Zinc in given Brass Sample.

j) Analyze the percentage of Calcium in given Cement sample.

LAB COURSE CONTENT

Practical : 2 hour/ week (Alternate with Engineering Physics-I)

(Note: Minimum FIVE Experiments from the following)

1. Estimation of total hardness of given sample of water by EDTA Method.

a. Standardization of EDTA by using standard hard water.

b. To find the exact normality of EDTA solution.

c. Estimation of total hardness of given water sample.

2. Determination of Dissolved oxygen present in given water sample (Winkler's Method).

a. Standardization of Sodium Thiosulphate solution against std. $K_2Cr_2O_7$ solution using starch indicator.

b. Calculate exact normality of Sodium Thiosulphate solution.

c. Estimation of dissolved oxygen from given water sample.

d. Calculate the strength of dissolved oxygen from given water sample.

3. Determination of alkalinity of water sample.

a. To find the presence of OH^-, CO_3^{2-} and HCO_3^- ions in given sample of water by titrating against N/10 HCL using phenolphthalein indicator.

b. Using Methyl orange indicator in the same solution, to find out the methyl orange end point.

c. Calculate the amount of OH^-, CO_3^{2-} and HCO_3^- ions in given sample by end point results.

4. Estimation of Chloride content in a given water sample by Mohr's Method.

a. Standardization of $AgNO_3$ solution by using Standard NaCl solution.

b. To find the exact normality of $AgNO_3$ solution.

c. Estimation of Chloride ions in given sample of water.

d. Calculate the strength of Chloride ions in sample water.

5. Estimation of phenol by Iodometrically.

a. Dilution of Phenol solution.

b. Back titration of the above solution against standard 0.1 N Sodium Thiosulphate solutions.

c. Blank titration from brominating stock solution against 0.1 N Sodium Thiosulphate solutions.

d. Calculate the percentage of phenol.

6. Preparation of Polystyrene by bulk polymerization.

a. Add nitrogen to styrene in oil bath.

b. Cool the mixture and break it to give Polystyrene.

c. Dissolve the polystyrene in benzene, filter the precipitate and dry it.

d. Calculate the yield percentage.

7. Preparation of Phenol Formaldehyde Resin (Bakelite).

a. Dissolution of Glacial acetic acid, formaldehyde and phenol.

b. Acidifying the above solution.

c. Washing the residue obtained with distilled water and dry it.

d. Calculate of the yield of Phenol formaldehyde resin.

8. Estimation Copper in Brass Iodometrically.

a. Prepare given brass sample by acidifying, neutralizing and dilution in volumetric flask.

b. Determine the amount of Copper in diluted brass sample solution by volumetric titration.

c. Calculate the percentage of copper in given Brass Sample.

9. Estimation of Zinc from Brass Volumetrically.

a. Standardization of $K_4 [Fe (CN)_6]$ by using Uranyl nitrate indicator.

b. Dilution of the brass sample.

c. By removing Sn, Pb, Cu, Fe from the solution.

d. Titrating the remaining solution against $K_4 [Fe (CN)_6]$ and calculate the percentage of Zinc in Brass sample.

10. Determination of % of Ca in Cement.

a. Dilution of the cement sample in NH_4Cl Solution.

b. Distilled off and filter the solution with Whatmann paper No. 1.

c. To the above filtrate add NH_4NO_3 solution, keep the filtrate and washing for the estimation of Lime.

d. Estimation of Lime- Rectify the solution then add methyl red indicator along with ammonium oxalate solution.

e. Calculate the amount of Calcium using oven and estimate the percentage of lime from the sample.

f. Also find the percentage of calcium by volumetric analysis using $KMNO_4$ solution.

Reference Books:

1. Shashi Chawla, “Essentials of Experimental Engineering Chemistry”, DhanpatRai Publishing Co.Pvt. Ltd.
2. Dr Sudha Rani, “Laboratory Manual on Engineering Chemistry”, Dhanpat Rai Publishing Co.Pvt. Ltd.

Guide lines for ICA :

ICA (Internal Continuous Assessment) marks of 25 are for practicals in Engineering Physics - I & Engineering Chemistry – I.

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Computer Programming Lab

LAB COURSE OUTLINE

Computer Programming Lab	**CP LAB**	**FE 127**
Course Title	Short Title	Course Code

Course Description:

This laboratory provides students with a comprehensive study of the C and C++ programming language. Classroom lectures stress the strengths of C and C++, which provide students with the means of writing efficient, maintainable, and portable code.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	15	30	1

ESE Pattern: Practical (PR)

Prerequisite Course(s): Fundamental knowledge of Computers.

General Objective:

The objective of this laboratory is to introduce the students to the fundamentals of computers, the concepts of the C and C++ programming language and enable them to apply these concepts for solving real world problems.

Learning Outcomes:

Upon successful completion of the lab student will be able to

a) Program for basic arithmetic operations and expressions

b) Program for finding roots of a quadratic equation, square root of a number

c) Find area and volume of geometric objects

d) Find greatest and smallest of 2or 3 numbers

e) Generate odd / even numbers

f) Find factorial of a number

g) Check / generate prime numbers

h) Check for Armstrong numbers

i) Check a number for palindrome

j) Find GCD of two numbers

k) Generate sine /cosine series/value

l) Solve a linear equation

m) Print a number in words

n) Find Greatest / smallest/ sum /average of 'n' numbers

o) Convert Integer to binary / hex and octal

p) Find Greatest / smallest/ sum /average of 'n' numbers(Using arrays)

q) Apply Linear / binary search

r) Generate Permutation and Combination

s) Perform String processing / operations

t) Sort numbers and Strings

u) Perform Matrix operations

v) Record processing using structure

LAB COURSE CONTENT

(Note: Minimum SIX Experiments from group A and FOUR from group B.)

Group A

1. **Program for basic arithmetic operations and expressions.**

   a. Performing simple arithmetic operations like

   b. Addition,

   c. Subtraction,

   d. Multiplication,

   e. Division.

2. **Program for finding roots of a quadratic equation, square root of a number**

   Finding roots of any quadratic equation and square root of any given number.

3. **Find area and volume of geometric objects**

   Calculate area and volume of geometric objects (circle, square, triangle etc.)

4. **Finding greatest and smallest of 2 or 3 numbers**

   To find smallest and largest numbers from given 2 or 3 numbers.

5. **Generating odd / even numbers**

   To generate odd and even numbers.

6. **Finding factorial of a number**

   Calculate the factorial of any given number.

7. **Checking / generating prime numbers**

   Generate the prime numbers.

8. **Checking for Armstrong numbers**

   Generate the Armstrong numbers.

9. **Checking a number for palindrome**

   Check the given number for palindrome.

10. **Finding GCD of two numbers**

    Calculate GCD of any two numbers.

11. **Generating sine /cosine series/value**

    Generate the sine/cosine series.

12. **Solving a linear equation**

    To solve the linear equation.

13. **Printing a number in words**

    Print any given number in words.

14. **Greatest / smallest/ sum /average of 'n' numbers**

    Find the greatest/smallest/sum/average of any given n numbers.

15. **Integer to binary / hex and octal conversion**

    To integer to binary, hex and octal.

Group B

1. **Greatest / smallest/ sum /average of 'n' numbers**

   To find the greatest/smallest/sum/average of given n numbers using arrays.

2. **Linear / binary search**

   To search a number from given n numbers using linear and binary search.

3. **Permutation and Combination generation**

   Calculate the permutation and combination.

4. **String processing / operations**

Performing string operations using arrays.

5. **Sorting of numbers and Strings**

   Sorting any string and numbers ascending and descending order using arrays.

6. **Matrix operations**

   Performing matrix operation (addition, subtraction, multiplication etc.) using arrays.

7. **Record processing using structure**

   Processing student record using structures.

Reference Books:

1. E Balagurusamy, "Programming in ANSIC C", Tata McGraw Hill, 4/E, 2007.
2. E Balagurusamy "Object Oriented Programming with C++", Tata McGraw Hill, 4/E, 2008.
3. Yashavant Kanetkar, "Let Us C" , BPB Publications ,10/E, 2010.
4. Reema Thareja, "Computer Fundamentals and Programming in C", OXFORD University Press, 2012.
5. Stephen G Kochan "Programming in C",Pearson Education , 3/E, 2004.
6. Ashok N Kamthane, "Computer Programming", Pearson Education , 2/E,2008.
7. Vikas Gupta, "Computer Concepts and C Programming", Dreamtech Press, 2009.
8. K R Venugopal and S R Prasad ,"Mastering C", Tata McGraw Hill, 1/E, 2011.
9. Behrouz A Forouzan, Richard F Gilberg, "COMPUTER SCIENCE – A Structured Programming approach using C", Thomson, 3/E Indian Edition, 2007.
10. Kernighan, Ritchie, "The C Programming Language", Prentice Hall of India , 2/E, 1988.
11. Pradeep K Sinha and Priti Sinha, "Computer Fundamentals", BPB Publications , 4/E, 2007.
12. Robert Lafore, "Object Oriented Programming in Turbo C++", Galgotia Publication, 2003.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

a. ESE will be based on the practical assignments submitted by the students in the form of journal.

b. In the ESE, the students may be asked to perform the practical assignment with minor modification.

c. Evaluation will be based on the paper work of flowchart and algorithm, understanding of the logic and the syntax, quality of program code, execution of the program code, type of input and output for the program code.

Elements of Civil Engineering & Engineering Mechanics Lab

LAB COURSE OUTLINE

Elements of Civil Engineering & Engineering Mechanics Lab	ECE & EM LAB	FE 128
Course Title	Short Title	Course Code

Course Description:

These laboratories cover experiments related to basic principles of Statics, Dynamics and Compass Surveying.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	2	13	26	1

ESE Pattern: Oral (OR)

General Objective:

In these laboratories students will be introduced to the applications of different theorems of mechanics to solve problems in statics and dynamics. Also students will get familiar with surveying with Compass. These include:

a) Concept of vectors.
b) Triangle law of forces.
c) Lami's theorem.
d) Conditions of equilibrium.
e) Laws of friction.
f) Laws of simple machines.
g) Angular measurement with Compass.

Objective to develop following Intellectual skills:

a) To understand basic laws of engineering mechanics & apply the same to solve problems.
b) To learn use of prismatic compass for angular measurements.
c) To identify principles and working of different apparatus in laboratories.

Objective to develop following Motor skills:

a) Ability to draw diagrams and graphs.
b) Ability to apply forces and measure the corresponding effects.
c) Ability to perform the experiments and record the observations.
d) Ability to apply the basic principles in various field conditions.

Learning Outcomes:

Upon successful completion of these experiments the student will be able to

a) Apply concept of vectors to solve problems in engineering.
b) Study and verify Lami's theorem and apply it to solve problems in engineering.
c) Understand and apply triangle law of forces for solving problems.
d) Understand the conditions of equilibrium of forces.
e) Describe efficiency, load, effort, velocity ratio, frictional effort and verify law of machines.
f) Describe frictional forces, limiting friction, coefficient of friction and verify law of friction.
g) Apply graphical method to solve problems.
h) Measure bearings of lines with prismatic compass and calculate included angles.

LAB COURSE CONTENT

Group A

1 Study of vectors.

a. To calculate resultant of coplanar and non coplanar (space) forces.
b. To calculate unknown force (reaction).

2 Verification of law of polygon of forces.

a. To verify law of polygon of forces.
b. To calculate analytically and experimentally resultant of concurrent force system.
c. To compare analytical values with measured ones.

3 Verification of Lami's theorem.

a. To Verify Lami's theorem.
b. To observe the ratios of $P/\sin\alpha$, $Q/\sin\beta$, $R/\sin\gamma$ and compare the same.

4 Forces in jib crane

a. To study law of triangle of forces analytically and graphically.
b. To apply conditions of equilibrium.
c. To calculate forces in members of jib crane.
d. To compare the theoretical results with experimental values.

5 Reactions of beam.

a. To verify conditions of equilibrium of a system of coplanar parallel forces using reaction of beam apparatus.
b. To understand active and reactive forces.

6 Simple friction on horizontal and inclined planes.

a. To describe frictional force, limiting friction, coefficient of friction, angle of repose.
b. To know the concept that the Force ⍰ Reaction.

c. To find coefficient of friction for bodies in equilibrium on inclined planes.

7 Study of simple machines and verification of law of machines

a. To describe efficiency, load, effort, velocity ratio, frictional effort and verify law of machines.

b. To establish the law of machine from graph.

8 Graphical work (Statics) – (minimum three problems on graphical solution of Static's problems).

To understand graphical method to solve the problems in statics.

a. To solve the problem on coplanar concurrent forces, parallel forces and reactions of beam by graphical method.

b. To describe Bow's notation, space diagram, vector diagram, polar diagram, funicular diagram and to draw the same.

9 Graphical work (Dynamics) – (minimum two problems on graphical solution of Dynamic's problems).

a. To draw the motion curve and understand the significance of the same.

b. To calculate displacement and distance travelled from V-T diagram.

Note: The laboratory journal should consist of six experiments/assignments from group A. Assignment no. 8 and 9 are compulsory. Any four out of remaining seven experiments/assignments are to be conducted.

Group B

1 Observations of bearings by using Compass and calculations of included angles.

a. Describe whole circle and quadrantal bearing system.

b. Calculate included angles from observed bearings in a closed traverse.

2 Assignment based on fifth unit. Any one of the following.

a. Write notes on the following: Various branches of civil engineering such as Structural Engineering, Water Resources Engineering, Geotechnical Engineering, Transportation Engineering, Environmental Engineering, Building Science and Construction Management.

b. Write notes on the following Civil Engineering structures such as buildings, highways, railways, bridges, dams, canals, elevated & ground storage reservoirs.

c. i) Explain principles of planning.

ii) Differentiate between load bearing and framed structures with neat sketches.

Note: The laboratory journal should consist of above two experiments/assignments from group B.

Reference Books:

1. Bhavikatti S S & K G Rajashekarappa, “Engineering Mechanics”, New Age International (P) Ltd., Publishers.
2. Unadkat Sanju, “Engineering Mechanics”, Tech-Max Publications, Pune.
3. Kanitkar T P and Kulkarni , “Surveying and Levelling, Part I”, Pune Vidyarthi Graha Prakashan, 24th Edition
4. Bindra and Arora, “Building Construction”, Dhanpatrai and Sons, Delhi.
5. N Kumara Swamy and A Ksmeswara Rao, “Building Planning and Drawing” ,Charotar Publishing House Pvt. Ltd.
6. Satish Gopi, “Basic Civil Engineering”, Pearson Education, Delhi, 2008.
7. F P Beer and E R Johnson, “Mechanics for Engineers – Statics”, McGraw-Hill Publication, 5th Edition
8. F P Beer and E R Johnson, “Mechanics for Engineers – Dynamics”, McGraw-Hill Publication, 8th Edition.
9. S P Timoshenko and D H Young, “Engineering Mechanics”, McGraw- Hill Publications, 4th Edition
10. R C Hibbeler “Engineering Mechanics statics and dynamics”, Pearson Education, 11th Edition.
11. S R Bendale, “Engineering Mechanics”, John Wiley & Sons, Delhi, 1st Edition
12. Jaget Babu, “Engineering Mechanics”, Pearson Education, Delhi, 1st Edition.
13. Sushilkumar, “Building Construction”, Standard Publishers, New Delhi, 2010.
14. M G Shah, Kale C.M. and Patki S.Y., “Building Drawing”, Tata McGraw Hill Co. Ltd., New Delhi.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignments submitted by the student in the form of journal. In ESE the student may asked to answer questions based on experiments/assignments. Evaluation will be based on performance in oral examination.

Workshop Practice- I

LAB COURSE OUTLINE

Workshop Practice I	**WP-I**	**FE 129**
Course Title	Short Title	Course Code

Course Description:

Workshop Practice I covers the basic knowledge and practices on measuring instrument, fitting shop, welding shop, Tin smithy, Black smithy, foundry shop and computer hardware workshop in order to improve the practical skill of students in different workshops.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	11	22	1

Prerequisite Course(s): 11^{th}, 12^{th} Physics, Mathematics, Engineering Drawing, Engineering Materials.

General Objective:

In workshop practice, students will get familiar with use of different workshop practices like fitting, welding, tin smithy, black smithy, foundry and computer hardware workshop. Students will also get familiar with different tools, machines, equipments, job holding devices, job drawing, job material, job manufacturing operations and processes in different workshops.

Objective to develop following Intellectual skills:

a. Identification and selection of manufacturing processes/operations according to job requirement in different workshops.
b. Identification, selection and understanding of tools, equipments, machines and job material according to job drawing for different workshops.
c. Understanding working principle and construction of process planning sheet.
d. Identification, understanding of the working principle of computer hardware components.

Objective to develop following Motor skills:

a. Ability to handle measuring instruments.
b. Ability to read the job drawing.

c. Ability to understand the basic working principle of fitting operations, tools and equipments in fitting shop.
d. Ability to understand the basic working principle of welding operations, tools and equipments in welding shop.
e. Ability to understand the basic working principle of sheet metal operations, tools and equipments in tin smithy shop.
f. Ability to understand the basic working principle of black smithy operations, tools and equipments in black smithy shop.
g. Ability to understand the basic working principle of moudling and casting operations, tools and equipments in foundry shop.
h. Ability to understand working principle of computer hardware and its application.

Learning Outcomes:

Upon successful completion of these practical's the student will be able to hand

a) Measuring Instruments and fitting shop
b) Welding Shop
c) Tin smithy shop
d) Black smithy shop
e) Foundry shop
f) Computer Hardware Workshop

LAB COURSE CONTENT

1 Measuring Instruments

a. Demonstration of handling measuring instruments like steel rule, measuring tape, try- square, vernier caliper, micrometer, vernier height gauges, bevel protector etc.

b. **Fitting shop**

One job on finishing two sides and make right angles of square job by filling operation, one drilling and taping operations.

2 Welding Shop

a. One Job on T-joint: one side of T-joint welded by Gas welding and another by Electrical Arc Welding
b. Demonstration of Brazing.

3 Tin Smithy

One job including soldering, Riveting etc. For example- letter box, Waste paper basket, tray, Funnel etc.

4 Black Smithy

One job on black smithy including Bending and Flattening etc. For example: S-shape, hook shape, U shape job.

5 Foundry Shop

Demonstration of preparation of molding, casting of any simple pattern.

6 Computer Hardware Workshops

a. Introduction to Personal Computers, PC Main Parts: CPU, Input and Output devices.
b. Introduction of Floppy & CD drives, HDD, CD, DVD, USB Flash Drives, and Memory cards.
c. Introduction of Motherboard, I/O connectors. Installation of cards, devices and connecting cables, Identification of cables of computers (connecting media)

Reference Books

1. Hajara Chaudhary and Bose S K, "Element of Workshop Technology Volume I and II", Asia Publishing House.
2. P N Rao, "Production Technology Volume I and II", Tata McGraw Hill Publication.
3. R K Jain, "Production Technology", Khanna Publications.
4. P C Sharma, "Production Technology", Khanna Publication.
5. Chapman W A J, "Workshop Technology", ELBS Publication.
6. HMT, "Production Technology", Tata McGraw Hill Publication.
7. Kannaiah K L, Narayana, "Workshop Manual", Scitech Publications, Chennai, 2nd Edition.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Soft Skills - I

LAB COURSE OUTLINE

Soft Skills-I	**SS I**	**FE 130**
Course Title	Short Title	Course Code

Course Description:

Through this course we have tried to bridge the gap of industry and institution by bringing in an awareness and practical approach to soft skills such as communication skills, presentation skills and written language. This course stresses on ability to communicate, public speech, e-presentations and structure of English language.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	1	15	15	2
Laboratory	2	15	30	

Prerequisite Course(s): Fundamental knowledge of English of 11th and 12th.

General Objectives:

We have tried to achieve the following objectives through this course:

a) To make the student industry ready in terms of his/her ability to communicate effectively

b) To augment the ability of the student to create, compose and render presentations with or without the help of media

c) To understand the importance of public speech and the role language plays in that

d) To enhance the ability of written communication by giving a primer on English

Learning Outcomes:

Upon successful completion of this course the student will be able to:

a) Understand the importance of communicating effectively

b) Communicate effectively by removing barriers

c) Address an audience effectively and deliver speeches without inhibition

d) Create and deliver effective e-presentations

e) Understand the meaning and utility of Active Listening in communication

f) Use the vocabulary more effectively

g) Expand and enrich grammatical structure and vocabulary in English

h) Comprehend thoughts through body language and use it as a tool to understand non-verbal signals for better communication

LAB COURSE CONTENT

1 Communicate With Confidence **No of Lect. – 9, Marks: 10**

a Communication Skills and Barriers to Communication

b Listening Skills

c Assertion Skills

2 Speaking to be Understood **No of Lect. – 9, Marks: 10**

a Basic Corpus for Formatted Feeding

b A Matter of Pronunciation

c Pattern Drills and Dialogues

3 Public Speech **No of Lect. – 9, Marks: 10**

a Influencing Others

b Speaking in Public

c Learning to Read Through Body and Voice

4 Effective Presentations **No of Lect. – 9, Marks: 10**

a Formulas and Advanced Techniques of Presentations

b E-Presentations

c The Fear Factor

5 Eloquent Writing - I **No of Lect. – 9, Marks: 10**

a Comprehension of Passages

b Understanding of English Language

c Vocabulary Enhancement Practice

Reference Books:

1. Allan and Barbara Pease, "A Definitive Book on Body Language", Publication Bantam Books.
2. Robert Bolton, "People Skills: How to Assert Yourself, Listen to Others and Resolve Conflicts", Publication Simon and Schuster.
3. R K Iyer, "Spoken English", IU Publications.
4. Sethi and Dhamija , "A Course in Phonetics and Spoken English", Prentice Hall of India.
5. Matthew McKay , "The Communication Skills", Publisher: New Harbinger Publications Inc.
6. Frank Paolo , " How to Make a Great Presentation in 2 Hours", Pustak Mahal.
7. Kaplan's GRE, Kaplan Publications.
8. Barron's GRE, Galgotia Publications.

Guide lines for ICA :

ICA shall be based on continuous evaluation of student performance throughout semester and assignment submitted by the student in the form of journal.

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

First Year Engineering

(Common to all branches)

Faculty of Engineering and Technology

SEMESTER-II

W.E.F 2012 – 2013

Engineering Physics - II

COURSE OUTLINE

Engineering Physics – II	**EP- II**	**FE221**
Course Title	short Title	course code

Course Description:
This course is aimed at introducing the fundamentals of basic sciences (Engineering Physics-II) to undergraduate students. The background expected includes a prior knowledge of physics from HSC (science) and familiarity with various laws, principles and theories. The goals of the course are, to understand the basic principles of science (Engineering Physics -II) and their applications in different areas.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	15	40	03

Prerequisite Course(s): HSC Physics, Different Laws, Principles and Theories.

General Objective:

The objective of this course is to provide learner with basic concepts and knowledge of sciences (various principles theories laws etc.) and to analyze it from experiments. The learner can apply the same in various branches of Engineering and Technology.

Learning Outcomes:

After successful completion of this course the student will be able to:

a) Understand the impact of Engineering Solutions in global, economic, environmental and societal contexts.
b) Design and conduct experiments, analyze and interpret data.
c) Use the latest techniques, skills, and modern tools necessary for engineering practices.
d) Design a component, system or process to meet desired needs with in realistic constraints.
e) Identify, formulate and solve problems.

f) Describe the basics of acoustics and its use in designing/ planning of Hall, Building, and Theaters etc. Various factors affecting acoustics of building and its remedy.
g) Understand the concept of ultrasonic waves , its production and applications.

h) Describe the different properties, classification and applications of magnetic materials and super conductors.
i) Understand and describe the concepts of Modern Physics and Spectroscopy and their applications in various fields.
j) Understand the state of micro particles, its physical parameters, Uncertainty Principle, Schrodinger's wave equation and their applications
k) Understand the basic concepts of nano science, nano particles properties and classification of nano materials, their advantages and applications.

COURSE CONTENT

Engineering Physics - II	**Semester-II**	
Teaching Scheme	**Examination Scheme**	
Lectures -3 Hrs/week	**End Semester Exam (ESE)**	**: 80 Marks**
	Duration of (ESE)	**: 3 Hours.**
	Internal Sessional Exam (ISE)	**: 20 Marks.**

Unit –I- Acoustics & Ultrasonic's **No of Lectures: 8 Hours, Marks: 16**

A) Acoustics- Elementary acoustics, Echo, Reverberation, Reverberation time, Sabine's formula(without derivation). Coefficient of absorption, Intensity Level, Loudness, decibel, Acoustic Intensity, Limits of Audibility, Acoustical planning of building, Factors affecting the architectural acoustics of building, Limits of audibility, Numericals

B) Ultrasonic's -Ultrasonic waves, Production of ultrasonic waves -by 1) Piezoelectric generator its merit & Demerit 2) Magnetostriction oscillator- Its merits & demerits Properties of ultrasonic. Engineering applications of ultrasonic, Numericals

Unit –II- Magnetic Materials and Superconductivity
No of Lectures: 8 Hours, Marks: 16

A) Magnetic Materials – Origin of Magnetism, Classification of magnetic materials into Para magnetism, Diamagnetism & Ferromagnetism, Hysteresis loop, Hard and Soft magnetic materials. Ferrites – production, properties & applications, Numericals

B) Superconductivity- Superconductor, Type-I & Type –II superconductor, Properties of superconductor, effect of impurity, magnetic field, pressure, stress etc on super conductor, Meissner's effect, Applications of superconductor. Numericals

Unit-III Modern Physics & Spectroscopy **No of Lectures: 8 Hours, Marks: 16**

A) Modern Physics: Motion of Charged particle in electric field, magnetic field, and Combined field, Electron microscope (SEM) , Positive rays, Block diagram, principle, and working of Cathode ray oscilloscope, Bainbridge Mass Spectrograph(Principle ,Construction and Working) , Numericals

B) Spectroscopy- Zeeman Effect (normal and anomalous) experimental arrangement for Normal Zeeman Effect, Nuclear Magnetic Resonance, Magnetic Resonance Imaging, Numericals

Unit- IV Quantum Physics No of Lectures: 8 Hours, Marks: 16

Wave nature of matter, wave particle duality, De- Broglie's Wave, Wavelength of matter wave, concept of group velocity, phase velocity & wave packet, Heisenberg's uncertainty principle with illustration, Physical significance of wave function, Schrodinger's time independent and time dependent wave equation,, Application of Schrodinger's time independent wave equation to the problem of particle in rigid box.

Unit-V Nano science & Technology No of Lectures: 8 Hours, Marks: 16

Introduction of Nano particles, Properties of Nano particles (Optical, electrical, magnetic, structural, Mechanical), Brief description of different methods of synthesis (Physical, Chemical, Biological, Mechanical), Classification of Nano materials, Fabrication Process- Top-down approach, Bottom up Approach. Applications of nanotechnology
Advantages & Limitations of Nano-materials

Reference Books:

1. R K Gaur, S L Gupta, "Engineering Physics", Dhanpat Rai.
2. M R Srinivasan, "Physics for engineers", New Age International Publishers.
3. M N Avadhanulu, P G Kshrisagar, "Text book of Engineering Physics", S.Chand.
4. Brijlalal, Subramanyam, "Atomic and Nuclear Physics", S. Chand.
5. S K Kulkarni, "Nanotechnology, principles & Practices", Capital Publication Co.
6. Rajgopal, "Engineering Physics", PHI Learning Private Limited.
7. G S Raghuvanshi, "Engineering Physics", PHI Learning Private Limited.
8. G Vijayakumari, "Engineering Physics", Vikas Publishing House.
9. Hugh D Young, Roger A Freedman, "University Physics(With Modern Physics)", Pearson.
10. Uma Mukharji, "Engineering Physics", Narosa Publishing House.
11. S O Pillai, "Solid state Physics", New Age International Publishers.
12. Beiser , "Concept of modern physics", Tata macgraw-hill.
13. R B Singh, "Introduction to modern physics", New age Publication.

Engineering Chemistry - II

COURSE OUTLINE

Engineering Chemistry-II	**EC-II**	**FE222**
Course Title	Short Title	Course Code

Course Description:

This course is aimed at introducing the fundamentals of basic sciences to undergraduate students. The background expected includes a prior knowledge of chemistry from HSC (science) and familiarity with basic fundamental theories. The goals of the course are to understand the basic principles of Engineering Chemistry –II and their applications in different branches of engineering.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	15	40	03

Prerequisite Course(S): 12^{th} Chemistry, Different laws, basic principles and theories.

General Objectives:

To apply the knowledge of science in engineering and technology and also understand the basic concepts of chemistry and to analyze it from experiments.

Learning Outcomes:

After successful completion of this course the student will be able to:

a) Design and conduct experiments, analyze and interpret data.
b) Design a component, system or process to meet desired needs within realistic constraints.
c) An ability to function on multidisciplinary terms.
d) Identify, formulate and solve problems.
e) Understand the impact of engineering solutions in global, economic, environmental and societal context.
f) Ability to appreciate contemporary issues and engages in life-long learning.
g) Use the latest techniques, skills and modern tools necessary for engineering practices.
h) Understanding of the necessity to quantitatively balance the built environment with the natural world.
i) Understand the Classification of various fuels, their analysis by Bomb and Boy's Gas calorimeter.

j) Understand the mechanism, physical and chemical properties of lubricants and its applications.
k) Understand the preparation, basic properties and applications of Refractories.
l) Understand the types of corrosion and its mechanism. It will also help us to develop the corrosion control methods.
m) Understand the Water, Air Noise and Radioactive Pollution along with its control measures.

COURSE CONTENT

Engineering Chemistry-II **Semester-II**

Teaching Scheme **Examination Scheme**

Lectures -3 Hrs/week

End Semester Exams (ESE) : 80 Marks
Duration of (ESE) : 03 Hours
Internal Sessional Exam (ISE) : 20 Marks

Unit – I Fuels and Combustion **No. of Lect. – 08, Marks: 16**

a) Introduction – Definition, classification of Fuel, Calorific value & its units,
b) Characteristics of good fuel
c) Solid Fuel: Analysis of Coal-(i) Proximate analysis – Determination & its significance(ii) Ultimate analysis – Determination & its Significance
d) Determination of Calorific Value by Bomb calorimeter (Numerical based on it). Liquid Fuel: Refining & fractional distillation of LPG, petroleum, gasoline, diesel, kerosene. Power Alcohol: - Preparation, properties & Uses, Biodiesel – preparation, properties & uses. Gaseous Fuel: Preparation, properties & uses of (i) Water gas, (ii) Natural gas.
e) Determination of Calorific Value of gaseous Fuel/Volatile liquid by Boy's Gas Calorimeter (Numerical based on it).
f) Combustion: Chemical reactions, calculation on air requirement for combustion (Numerical based on it).

Unit – II Lubricant **No. of Lect. – 08, Marks: 16**

a) Introduction: Classification, characteristics.
b) Mechanism of lubrication – Fluid Film, boundary & extreme-pressure lubrication
c) Properties of lubricant –
   A. Physical properties with Experimental determination
      i. Viscosity & Viscosity Index by Red wood viscometer.
      ii. Flash & fire point by Pensky - Marten's apparatus
      iii. Cloud & pour points

iv. Oiliness

B. Chemical properties with determination

i. Saponification value

ii. Acid value

iii. Emulsification

d) General Criteria for selection of lubricants for delicate machine, IC engine, gears, cutting tools, transformer & refrigeration system.

Unit – III Refractories **No. of Lect. – 08, Marks: 16**

a) Introduction,
b) Types of Refractories, Characteristics of Refractories
c) Preparation, Properties & application of acidic, basic & neutral Refractories
   (i) Acidic - Alumina, Silica, Fireclay.
   (ii) Basic - Magnesite, Dolomite.
   (iii) Neutral - Carbon, graphite.

Unit – IV Corrosion and Its control **No. of Lect. – 08, Marks: 16**

a) Introduction – definition, causes, consequences of corrosion
b) Dry & Wet Corrosion - explanation with mechanism.
c) Types of corrosion – Pitting, waterline, soil, inter granular, Stress corrosion.
d) Corrosion Control - Design & material selection, anodic & cathodic protection, hot dipping, galvanizing , tinning, electroplating , powder coating& surface coating.

Unit – V Environmental Pollution and Its control **No. of Lect. – 08, Marks: 16**

a) Introduction
b) Water Pollution: Methods to determine the extent of water pollution –BOD, COD, DO.
c) Causes, Effects and Control measures of water pollution,
d) Air Pollution: Acid Rain, Green house effects, Depletion of Ozone
e) Causes, Effect and Control measures of air pollution.
f) Noise Pollution :Causes, effects & Control of noise pollution
g) Radioactive pollution: Causes, effects & Control of Radioactive pollution.

Reference Books:

1. B K Sharma, "Engineering Chemistry", Krishna Prakashan Media (P) Ltd.
2. Suba Ramesh "Engineering Chemistry", Wiley India Pvt. Ltd.
3. Jain & Jain, "Engineering Chemistry ", Dhanpat Rai Publishing Co.
4. S S Dara, "A Text Book of Engineering Chemistry", S. Chand & Co. Ltd.

5. R. Gopalan, “A Text book of Engineering Chemistry (Third Edition)”, Vikas Publishing House Pvt. Ltd.
6. B S Chauhan, “Engineering Chemistry”, University Science Press. Third Edition.
7. Shashi Chawla, “A Text book of Engineering Chemistry”, DhanpatRai Publishing Co.
8. Abhijit Mallick, “Engineering chemistry”, Viva books.
9. Sunita Ratan, “Engineering chemistry”, SK Kataria & Sons.
10. R K Das, “Industrial Chemistry”, Asia Publishing House
11. S Deswal, A Deswal, “Basic Course in Environmental Pollution”, Dhanpath Rai Publications.

Engineering Mathematics - II

COURSE OUTLINE

Engineering Mathematics -II	EM-II	FE223
Course Title	Short Title	Course Code

Course Description:

This course is aimed at introducing the fundamentals of basic Mathematics to undergraduate students. The background expected includes a prior knowledge of Mathematics from 12th science and familiarity with various laws, principles and theories. The goals of the course are to understand the basic principle of Mathematics and its application in different area.

	Hours / Week	No. of Weeks	Total Hours	Semester Credits
Lecture	03	15	40	03
Tutorial	01	15	13	01

Prerequisite Course(s): 12th Mathematics, different laws, principles and theorems.

General Objective:

The basic necessity for the foundation of Engineering and Technology being Mathematics, the main aim is to teach mathematical methodologies and models, develop mathematical skill and enhance thinking and decision making power of student.

Learning Outcomes:

After completion of this course learner will be able to:

a. Apply knowledge of mathematics in engineering and technology.
b. Identify, formulate and solve engineering problems.
c. Design Mathematical models for engineering problems and solve them.
d. Use partial derivative to find total derivative of implicit functions.
e. Use partial derivative to find Jacobians
f. Find error and approximate values of problems related to engineering field.
g. Draw the rough sketch of Cartesian and polar curves.

h. Evaluate multiple integrals using spherical polar and cylindrical polar coordinates.

i. Solve ordinary differential equations using numerical methods.

COURSE CONTENT

Engineering Mathematics-II **Semester-II**

Teaching Scheme	Examination Scheme	
Lecture: 3 hours / week	End Semester Examination (ESE)	: 80 Marks
Tutorial: 1 hour / week	Paper Duration (ESE)	: 03 Hours
	Internal Sessional Exam (ISE)	: 20 Marks

Unit-I: Calculus of function of several variables **No. of Lect.-08, Marks- 16**

a) Definition of Partial Derivative, Rules & Theorems of Partial Derivatives.
b) Euler's Theorem on homogeneous function.
c) Change of Independent Variable, Differentiation of Composite Function (1^{st} order only).
d) Total Differentiation.
e) Differentiation of Implicit Function.

Unit-II: Application to Calculus of functions of several variables
No. of Lect.-08, Marks- 16

a) Jacobian and its applications. (Definition of Jacobian, chain Rule of Jacobian, Jacobian of implicit function, Functional dependence & independence).
b) Errors & approximations.(Problems related to engineering field)
c) Lagrange's method of undetermined multipliers for single constraint.

Unit-III: Curve Tracing and Fourier series **No. of Lect.-08, Marks- 16**

a) Curve Tracing
Cartesian & polar curves.
b) Fourier series
Full range Fourier series on $c \le x \le c + 2l$.
Half range Fourier series on $0 \le x \le l$.

Unit-IV: Multiple Integrals and its Applications **No. of Lect.-08, Marks- 16**

a) Introduction to three co-ordinate system.
b) Double integration.

(Cartesian form, polar form & change of order of integration).

c) Triple integration.
d) Application of multiple integrals to area & volume.

Unit-V: Numerical solution of ordinary Differential equation (first order and first degree)

No. of Lect.-08, Marks- 16

a) Numerical solution by Taylor's series method.
b) Runge -Kutta method (fourth order).
c) Picard's method.
d) Modified Euler's method.

Reference Books:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", Wiley Eastern Ltd, 7th Edition.
2. C R Wylie, L C Barrett, "Advanced Engineering Mathematics", TMH 6th Edition.
3. B S Grewal, "Higher Engineering Mathematics", Khanna Publication.
4. H K Das, "Advanced Engineering Mathematics", S. Chand & Company.
5. B V Ramana , "Engineering Mathematics", TMH,2nd Edition.
6. N P Bali, "A Text Book of Engineering Mathematics", Laxmi Publication, New Delhi.
7. Babu Ram, "Engineering Mathematics", Pearson Education.
8. S S Shastri , "Numerical Methods", Printice Hall of India.
9. Kandasamy , "Numerical Methods", S. Chand & Company.

Elements of Electrical & Electronics Engineering

COURSE OUTLINE

Elements of Electrical & Electronics Engineering	EEEE	FE224
Course Title	Short Title	Course Code

Course Description:
This course provides an introduction to electrical and electronics engineering covering: basic electric circuit quantities and circuit analysis techniques; semiconductor devices such as diodes, transistors and operational amplifiers and their application; logic gates and their applications, introduction to Microprocessor and Micro-controller; and study of different transducers.

Lecture	Hours / Week	No. of Weeks	Total Hours	Semester Credits
	03	15	45	03

Prerequisite Course(s): knowledge of Physics at HSC level.

General Objective:

The objective of the course is to provide students with a firm grasp of the essential principles of electric circuit analysis and basic electronics. This course will help student to understand the concepts and terminology that are used in electrical and electronics engineering. It is not an in-depth electrical/electronic course but, rather a course aimed at acquiring an understanding of basic principles that are used in electrical/electronic engineering.

Learning Outcomes:

Upon successful completion of this course the student will be able to:

a) Cary out circuit reduction using series parallel, star delta and/or source transformation method.
b) Analyze DC circuits by using Loop analysis and Nodal analysis method and DC circuit Theorems.
c) Explain various terms related to AC quantities such as R.M.S. value, Average value, Form factor, Crest factor. Phase and phase difference.
d) Draw and Explain phasor diagrams of sinusoidal AC quantities and explain the terms impedance, reactance, admittance, conductance and susceptance. Active, reactive and apparent power.
e) Understand generation of 1-ϕ & 3-ϕ EMF.

f) Understand working principle of PN junction diode, Zener diode and their applications.
g) Describe different configuration of Bipolar Junction Transistor.
h) Understand CE amplifier and working of transistor as a switch.
i) Describe and Understand difference between unregulated and regulated power supplies, DC power supply and its various building blocks.
j) Understand operating principle of various transducers and their applications.
k) Understand operational amplifier and its applications.
l) Describe use of the Basic gate and Universal gate.
m) Understand block diagram of 8085 and 8051.
n) Describe types of Earthing, Fuses and lamps.

COURSE CONTENT

Elements of Electrical & Electronics Engineering **Semester-II**

Teaching Scheme	**Examination Scheme**	
Lecture: 3 hours / week	**End Semester Examination (ESE)**	**:80 Marks**
	Paper Duration (ESE)	**: 03 Hours**
	Internal Sessional Exam (ISE)	**: 20 Marks**

Unit-I: DC Circuits **No of Lect. – 9, Marks: 16**

a) Review of series and parallel circuits.
b) Kirchhoff's current and voltage law and their applications.
c) Loop analysis and Nodal analysis.
d) Ideal/practical voltage/current sources and Source conversion.
e) Superposition, Thevenin's, Norton's and Maximum power transfer theorem.
f) Star to Delta and Delta to star conversion.

Unit-II: AC Circuits **No of Lect. – 9, Marks: 16**

a) Generation of single phase AC and terms related to sinusoidal waveforms.
b) Definitions and derivation of RMS value, Average value, Form factor, Crest factor.
c) Phasor representation of AC quantities, voltage-current phasor diagram, addition of AC quantities, complex notation (rectangular and polar form) for AC quantities.
d) AC through pure resistance, pure inductance, pure capacitance, RL, RC, RLC series/parallel circuits- concept of impedance, reactance, admittance, conductance, susceptance and their voltage / current phasor diagram.
e) Concept of active, reactive, apparent power and power f\actor.
f) 3-ϕ EMF generation and equation of 3-ϕ EMFs.

g) Relation between line/phase voltages, currents in Star /Delta connected system with phasor diagrams and relation for three phase power.

Unit-III: Semiconductor Devices **No of Lect. – 9, Marks: 16**

a) Introduction to PN junction diode.
b) Application as a rectifier: Half wave, Full wave and Bridge rectifier.
c) Introduction to Zener diode, its working and Characteristics.
d) Transistor configurations: CB , CE & CC.
e) Transistor specifications: - alpha, beta and gamma and their relation.
f) Working of transistor as a switch and CE amplifier.
g) Transistor biasing – Voltage Divider Bias.

Unit-IV: D C Power Supplies, Transducers & Op-Amp. **No of Lect. – 8, Marks: 16**

a) DC Regulated power supplies Block diagram.
b) Zener shunt regulator and Transistor series regulator.
c) Definition and operating principle of RTD, Thermistor, LVDT, Potentiometer, strain gauge transducers.
d) Virtual ground concept of Op-Amp, applications - Inverting, non-inverting amplifier & as a comparator.

Unit-V: Digital Electronics, Automation, Earthing, Fuses and Lamps
No of Lect. – 9, Marks: 16

a) Definition of: Generation of Integrated Circuits- SSI, MSI, LSI and VLSI.
b) Logic gates - AND, OR, NOT, NAND, NOR, X-OR, X- NOR their truth table.
c) De-Morgan's theorem. Adder & Subtractor circuit.
d) Microprocessor-8085 and Microcontroller-8051 block diagram.
e) Safety precautions, types of Earthing and Fuses.
f) Operating principle of lamps.

Reference Books:

1. B L Theraja and A K Theraja, "A Text book of Electrical Technology- Vol-I", S Chand, 1st Edition, 2001
2. S Salivahanan, N Sureshkumar and A Vallavaraj, "Electronics Devices and Circuits", TMH, 2nd Edition, 2009
3. R S Sedha, "Applied Electronics", S Chand, 1st Edition, 2005
4. H S Kalsi, " Electronic Instrumentaion", TMH, 2nd Edition, 2007
5. R A Gaikwad, "Op-Amps and Linear Integrated Circuits", PHI, 4th edition, 2001
6. R P Jain, "Modern Digital Electronics", TMH, 4th Edition, 2010
7. R S Gaonkar, "Microprocessor Architecture, Programming and Application with the 8085", Penram International, 4th Edition, 2000

8. S K Bhattacharya, "Basic Electrical and Electronics Engineering", Pearson Education, 1st Edition, 2012
9. J B Gupta, " A Course in electrical Power ", S K kataria and Sons, 12th Edition, 2002

Engineering Drawing & Elements of Mechanical Engineering

Course Outline

Engineering Drawing & Elements of Mechanical Engineering	**ED & EME**	**FE225**
Course Title	Short Title	Course Code

Course Description:

This course provides the elementary level knowledge of Engineering Drawing and Elements of Mechanical Engineering. Course includes introduction to Engineering Drawing, Orthographic Projection, Isometric view and Isometric Projection. The course also introduces students to concept of Energy and energy conservation, Energy management & Audit, Conventional Energy Sources, Working Principle of Work producing devices, work absorbing devices and various mechanical devices.

Lecture	**Hours / Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	15	45	03

Prerequisite Course(s): Fundamental knowledge of Physics of 11^{th} and 12^{th}.

General Objective:

This course covers introduction to Engineering Drawing, Orthographic Projection, Isometric view and Isometric Projection. The course also introduces students to concept of Energy and energy conservation, Energy management & Audit, Conventional Energy Sources, Working Principle of Work producing devices, work absorbing devices and various mechanical devices.

Learning Outcomes: Upon successful completion of this course the student will be able to:

a) Use various drawing instruments to layout and draw a sheet.
b) Explain various types of lines used, Lettering, Numbering and Dimensioning and Scales.
c) Draw and explain Planes of projection, quadrants and first angle & third angle method of projection.
d) Illustrate Principles of Orthographic projection by Projection of straight line and plane in 1^{st} and 3^{rd} quadrant.
e) To draw front view, Top View and side View of Simple objects.
f) Orthographic projection with different sections and Conversion of simple views into orthographic views.
g) Illustrate Principles of Isometric projection and Isometric view.
h) Conversion of given orthographic view into isometric view.
i) Describe Energy, Different forms of energy and mass conservation laws.
j) Understand non Renewable energy sources and Renewable energy sources.
k) Explain energy management strategy and energy audit.

l) Illustrate with principle various conventional energy producing devices and energy absorbing devices.
m) Illustrate with principle various power transmission elements, drives, direction and flow control valves.
n) Explain types of Actuators, Simple Hydraulic & Pneumatic power unit with its applications, merits and demerits.

COURSE CONTENT

Engineering Drawing & Elements of Mechanical Engineering Semester-II

Teaching Scheme	**Examination Scheme**
Lecture: 3 hours / week	**End Semester Examination (ESE) : 80 Marks**
	Paper Duration (ESE) : 03 Hours
	Internal Sessional Exam (ISE) : 20 Marks

Unit-1 Introduction to Engineering Drawing **No of Lect. – 9, Marks: 16**

a Significance and scope of Engineering Drawing, use of Drawing instruments, Sheet layout.
b Types of lines used, Lettering, Numbering and Dimensioning - aligned and unidirectional systems, Scales.
c Planes of projection, Horizontal Plane, Vertical Plane, four quadrants and first angle & third angle method of projection.
d Principles of Orthographic projection.
e Projection of a point in different quadrants.
f Projection of straight line and plane in 1st quadrant strictly INCLINED TO ONE PLANE only.

Unit-2 Orthographic Projection **No of Lect. – 9, Marks: 16**

a Introduction to Orthographic Projection.
b To draw front view, Top View and side View of Simple objects in different positions using both 1st angle method and 3rd angle method.
c Orthographic projection with different sections (Full section, half section, revolved section, offset section, etc) and Conversion of simple views into orthographic views.

Unit-3 Isometric projection **No of Lect. – 9, Marks: 16**

a Introduction, Isometric axes, lines and planes
b True scale and isometric scale.
c Isometric projection and Isometric view.
d Conversion of given orthographic view into isometric view.

Unit-4 Energy **No of Lect. – 9, Marks: 16**

a Energy, energy and mass conservation laws, Different forms of energy, Heat Transfer, Work Transfer and it form.
b Energy management strategy, energy audit: types and methodology,

energy audit reporting format. Energy producing devices.

c Conventional energy Sources – Heat Engines such as I. C. Engine (2S and 4S Engines, Diesel and Petrol engines),

d Steam Power Plant, hydroelectric power plant, water turbine

e Nuclear power plant, gas turbine power plant.

Unit-5 Energy absorbing devices and Mechanical devices

No of Lect. – 9, Marks: 16

a **Energy absorbing devices** – reciprocating air compressor and pump, centrifugal pump, rotary pump, blower, air motors, household refrigerator and window air conditioner.

b **Mechanical devices:**

Elements: power transmission shafts, axles, keys, couplings, bearings

c **Drives**: types of drives, belt drive, rope drive, chain drive, gear drive and friction clutches.

d **Valves**: Various types of Pressure, Direction & Flow control valves & their applications, On-off valves, flow control valves, non return valve, pressure regulating valve, throttle valve, butterfly valve, and solenoid operated valve.

e Various types of Actuators, Simple Hydraulic power unit and Pneumatic power unit.

f Applications, advantages and disadvantages of Hydraulic and Pneumatic systems.

Reference Books:

1. Bhatt N D, Panchal V M, "Engineering Drawing – Plane and Solid Geometry", Charotar Publishing House.
2. Rajan T S, "Basic Mechanical Engineering", New Age International, New Delhi.
3. T Jeyapoovan, "Engineering Drawing and Graphics Using Autocad", Vikas Publication Noida, New Delhi.
4. Kannaiah K L, Narayana, "Engineering Graphics", Scitech Pub, Chennai, 2nd Edition
5. H G Phakatkar, "Engineering Graphics", Nirali Publication, Pune.
6. Nag P K, "Engineering Thermodynamics", McGraw Hill.
7. Thomas Beven, "Theory of Machines", Pearson.
8. Rattan S S, "Theory of Machines", McGraw Hill.
9. Khan B H, "Non Conventional Energy Resources", Tata McGraw Hill, New Delhi.
10. Rai G D, "Non Conventional Sources of Energy", Khanna Publication, New Delhi.
11. David G Alciatore, Michael Histand, "Introduction to Mechatronics and Measurement Systems", McGraw-Hill, 2003
12. H L Stewart, "Hydraulics and Pneumatics Power for Production", Industrial Press Inc. N.Y. USA, 2001

(Engineering Science Lab-II)

LAB COURSE OUTLINE

(Engineering Science Lab-II)

Engineering Science Lab-II	**ES-II LAB**	**FE 226**
Course Title	Short Title	Course Code

Laboratory (Alternate week)	Hours/ Week	No. of Weeks	Total Hours	Semester Credits
	02	15	26	1

Engineering Physics – I

Course Description:

In this laboratory, course emphasis is on the understanding of basic principles, working of ultrasonic interferometer, ultrasonic detector, sound level meter, motion of charged particle (e/m), hysteresis curve, properties of magnetic material, production of magnetic field, working of CRO synthesis and characterization of metal nano particles etc. The learner here can use this knowledge and apply in various branches of engineering as required.

Prerequisite Course(s): Course of Physics at HSC level.

General Objective:

The objective of the laboratory is to impart the fundamental knowledge of physics to the students and develop their ability to apply the specific procedures to analyze the experimental results.

In this lab, students will be familiar with the use of different equipments, basic principles, properties etc which they can apply in various disciplines of engineering during their studies and in future.

Learning Outcomes: After successful completion of this lab; student will be able to:

a) Use the latest techniques, skills, and modern tools necessary for engineering practices.

b) Design a component, system or process to meet desired needs with in realistic constraints

c) Describe the use of sound level meter

d) Describe ultrasonic wave and analyze its velocity

e) Analyze e/m of an electron and describe motion of electron in electric field.

f) Can understand and draw Hysteresis curve (B-H curve)
g) Describe and analyze the magnetic materials and their properties.
h) Describe working CRO and its uses.
i) Can understand the synthesize & characterization of Nano composites and describe its properties.

LAB COURSE CONTENT

(Engineering Science Lab-II)

Practical -2 Hrs/Alternate weeks (Alternate with Engg. Chemistry- II)

(Note: Minimum FIVE Experiments from the following)

1. Sound Level Meter

a) To measure sound pressure in decibel
b) To study the use of sound level meter

2. Ultrasonic Interferometer.

a) Determine velocity of ultrasonic wave in water
b) Study the properties of ultrasonic waves and its application
c) Compare analytical and practical values.

3 Ultrasonic Detectors

a) Determine distance, wavelength and velocity of ultrasonic wave.
b) Study the production of ultrasonic wave.
c) Compare analytical and practical values.

4. e/m by Thomson's method.

a) To determine specific charge of electron by using Thomson's method.
b) To study motion of electron in electric field.
c) Compare analytical and practical values.

5) To Study B-H curve

a) To study and draw hysteresis curve using solenoid method.
b) Find remanance and coercive force.

6) Determination of Magnetic Susceptibility.

a) To determine magnetic susceptibility of given solution.
b) To study the properties of magnetic materials.
c) To study working of electromagnet to produce magnetic field.

7) Uses of CRO

a) To study working of CRO.
b) Use of CRO to find frequency and amplitude.

c) Compare analytical and practical values.

8) Synthesis and Characterization of Nano Composites

Synthesis and characterization of metal nanoparticle like ZnO, CdP, Fe, Ag or Core shell by electrochemical reduction process/ultrasonic cavitation/microwave/sol-gel technique at room temperature. Size of metal nanoparticles can be calculated from XRD and Shearer's formula. Shape and exact size of metal nanoparticles can be confirmed using Transmission Electron Microscope (TEM).

Reference Books:

1. R K Gaur, S L Gupta, Dhanpat Rai, "Engineering Physics".
2. M R Srinivasan, "Physics for engineers", New Age International Publishers.
3. M N Avadhanulu, P G Kshrisagar,"Text book of Engineering Physics", S.Chand.
4. Brijlalal, Subramanyam, "Atomic and Nuclear Physics", S. Chand.
5. S K Kulkarni, "Nanotechnology, principles & Practices", Capital Publication Co.
6. Rajgopal, "Engineering Physics", PHI Learning Private Limited.
7. G S Raghuvanshi, "Engineering Physics", PHI Learning Private Limited.
8. G Vijayakumari, "Engineering Physics", Vikas Publishing House.
9. Hugh D Young, Roger A Freedman, "University Physics(With Modern Physics)", Pearson.
10. Uma Mukharji, "Engineering Physics", Narosa Publishing House.
11. S O Pillai, "Solid state Physics", Wiley Eastern.
12. Beiser , "Concept of modern physics", Tata macgraw-hill.
13. R B Singh, "Introduction to modern physics", New age Publication.
14. Satyapraksah, "Quantum Mechanics", Pragati Prakashan

Engineering Chemistry-II

LAB COURSE OUTLINE

Course Description:

In this laboratory, course emphasis is on the understanding of basic principles, working of pH-meter, Bomb calorimeter, Ostwald's Viscometer, various properties of lubricating oils, proximate analysis of fuels etc. The learner here can use this knowledge and apply in various branches of engineering as required.

Prerequisite Lab Course(S): 12th Chemistry, Different laws, basic principles and theories.

General Objectives:

This course is intended to provide engineering students with a background in important concepts and principles of chemistry and emphasis on those areas considered most relevant in an engineering context, and practical applications in engineering and technology.

Learning Outcomes:

Upon successful completion of lab Course, student will be able to:

a) Analyze the partition Coefficient of Iodine between water & CCl_4.
b) Analyze the saponification value of given oil sample.
c) Analyze the viscosity of given liquid by Ostwald's Viscometer.
d) Analyze the Calorific value of fuel sample by using Bomb calorimeter.
e) Identify the Moisture content, Volatile matter, Ash content and Fixed carbon in coal sample by proximate analysis.
f) Identify the acidic and basic solution by using pH-meter.
g) Analyze the acid value of Vegetable Oil sample.
h) Analyze the strength of $NaHCO_3$ and NA_2CO_3 in alkali mixture.
i) Analyze the Aniline point of lubricating oil.
j) Analyze the Iodine value of an Oil sample by Wij's method.

LAB COURSE CONTENT

(Engineering Science Lab-II)

Practical: 2 hour/ week (Alternate with Engineering Physics-II)

***ICA (Internal Continuous Assessment) marks of 25 are for practical's in Engineering Physics - II &Engineering Chemistry – II.**

(Note: Minimum FIVE Experiments from the following)

1. Determination of partition Coefficient of Iodine between water & CCl_4.
   a. Preparation of different composition of saturated Iodine solution in CCl_4.
   b. Separation of Aqueous and CCl_4 layer from each bottle.
   c. Titration of Aqueous layer against N/100 Sodium Thiosulphate solution.
   d. Titration of CCl_4 layer against N/20 Sodium Thiosulphate solution.
   e. Calculation of Iodine in both the layers.

2. Determination of saponification value of oil.
   a. Preparation of std. KOH solution.
   b. Standardisation of Std. KOH solution against 0.5N HCL solution using Phenolphthalein indicator.
   c. Add KOH solution in 2 gm of Oil sample and reflux for 2 hours.
   d. Titrate the above solution against 0.5N HCL solution using Phenolphthalein

indicator.

e. Using two titrate values calculate the saponification number.

3. Determination of Viscosity by Ostwald's Viscometer.
   a. Find out the density of given liquid by using specific gravity bottle.
   b. Measure the flow time required for liquid and water by using Ostwald's Viscometer.
   c. Calculate the relative viscosity from the above observed values.

4. Determination of Calorific value of fuel sample by using Bomb calorimeter.
   a. Burn the known mass of solid fuel in Bomb pot.
   b. Observe the temperature difference of water in bomb pot.
   c. Calculate the actual and corrected calorific value of solid fuel sample from above observations.

5. Determination of Moisture, Volatile matter & Ash in a given sample of Coal (Proximate analysis).
   a. Determine and calculate the moisture content from the given coal sample.
   b. Determine and calculate the Volatile matter from the given coal sample.
   c. Determine and calculate the Ash content from the given coal sample.
   d. Determine and calculate the Fixed Carbon from the given coal sample.

6. Use of pH meter.
   a. Calibrate the pH-meter using buffer solution at room temperature.
   b. Measure the pH-values of given solutions.
   c. From the measured pH-values of solution, conclude which are acidic or basic solutions.

7. Acid Value of vegetable Oil sample.
   a. Add neutral alcoholic solution in given Oil sample and heat in water bath for 30 minutes.
   b. Titrate above solution against 0.1N KOH solution using phenolphthalein indicator.
   c. Calculate the acid value of given Vegetable Oil sample from above observations.

8. Determination of $NaHCO_3$ & Na_2CO_3 in given alkali mixture.
   a. Titration of alkali mixture solution against 0.1N HCl using methyl orange indicator.
   b. Titration of alkali mixture solution against 0.1N HCl using phenolphthalein indicator.
   c. Calculate the strength of $NaHCO_3$ and NA_2CO_3 from the above observed titrate values.

9. Determination of Aniline point of lubricating oil.
    a. Mixed Aniline and lubricating oil sample in Aniline point apparatus.
    b. Maintain the apparatus at constant temperature using water bath.
    c. Observe the temperature at which cloudiness and hazy appearance in the solution.
    d. Report the observed values as Aniline point.

10. Determination of Iodine value of an Oil sample (Wij's method).
    a. Back Titration: Dissolve the given oil sample in CCl_4 solution then add Wij's solution.
    b. Titrate the above solution against std. 0.1N Sodium Thiosulphate solution.
    c. Blank Titration: In Wij's solution add KI solution and titrate it against 0.1N sodium Thiosulphate solution.
    d. Calculate the Iodine value of an oil sample from above observed titrate values.

Reference Books:

1. B K Sharma, "Engineering Chemistry", Krishna Prakashan Media (P) Ltd.
2. Subaramesh, "Engineering Chemistry, Wiley India Pvt. Ltd.
3. Jain & Jain, "Engineering Chemistry ", Dhanpat Rai Publishing Co.
4. S S Dara, "A Text Book of Engineering Chemistry", S. Chand & Co. Ltd.
5. R. Gopalan, "A Text book of Engineering Chemistry (Third Edition)", Vikas Publishing House Pvt. Ltd.
6. B S Chauhan, "Engineering Chemistry", University Science Press. Third Edition.
7. Shashi Chawla, "A Text book of Engineering Chemistry", DhanpatRai Publishing Co.
8. Abhijit Mallick, "Engineering chemistry", Viva books.
9. Sunita Ratan, "Engineering chemistry", SK Kataria & Sons.
10. R K Das, "Industrial Chemistry", Asia Publishing House.
11. S Deswal, A Deswal, "Basic Course in Environmental Pollution", Dhanpat Rai Publishing Co.

Guide lines for ICA :

ICA (Internal Continuous Assessment) marks of 25 are for practicals in Engineering Physics -II & Engineering Chemistry – II.

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Engineering Drawing & Elements of Mechanical Engineering Lab

LAB COURSE OUTLINE

Engineering Drawing & Elements of Mechanical Engineering	ED & EME LAB	FE227
Course Title	Short Title	Course Code

Course Description:

This lab includes drawing sheets related to Engineering Drawing and labs related to elementary level knowledge of Elements of Mechanical Engineering.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	4	15	60	2

ESE Pattern: Oral (OR)

Prerequisite Course(s): 11th Physics, 12th Physics

General Objective:

In this lab, students will imbibe essentials of Engineering Drawing through progressive practice of Orthographic Projection, Isometric view and Isometric Projection. Students will also get familiar with principle and working of boilers, boiler mountings & accessories and mechanical devices used to transmit power.

Objective to develop following Intellectual skills:

a) Identify elements of given Engineering Drawing.
b) Interpretation of given engineering drawing.
c) Understand Orthographic projection.
d) Understand Isometric projection and Isometric view.
e) Understand principle and working of Boiler, its mountings & accessories.
f) Understand principle and working of power transmission devices.
g) Understand principles of energy audit of domestic devices.

Objective to develop following Motor skills:

a) Ability to layout a drawing sheet and apply basic drawing concepts to it.
b) Ability to draw Orthographic projection of given object.
c) Ability to draw Orthographic projection with section view.
d) Ability to draw Isometric projection and Isometric view of given object.
e) Ability to perform energy audit of domestic devices.

Learning Outcomes:

Upon successful completion of these practical the student will be able to

a) Read the given engineering drawing sheet.
b) Interpret different views of given engineering object.
c) Construct an orthographic projection i.e. front view, top view, side views of an object.
d) Prepare an orthographic projection with section of an object.
e) Construct an isometric projection of an object.
f) Prepare an isometric view of an object.
g) Convert orthographic projections of given object into isometric drawing.
h) Illustrate principle and working of fire tube and water tube boiler.
i) Illustrate principle and working of boiler mountings and accessories.
j) Explain principle and working of power transmission devices.
k) Illustrate energy audit of simple domestic appliances.

LAB COURSE CONTENT

Engineering Drawing Lab

1 Sheet No. 01 - Lines, Lettering and methods of dimensioning.

A. Illustration of lettering, numbering, types of lines.
B. Sketch of symbols for 1^{st} and 3^{rd} angle method of projection.
C. Illustration with a simple drawing with at least 2 views to show uses of line types and methods of dimensioning.

2 Sheet No. 02 – Projection of lines and planes.

A. Illustration of projection of straight line in 1st quadrant strictly INCLINED TO ONE PLANE only. [Minimum 02 solved examples]
B. Illustration of projection of plane in 1st quadrant strictly INCLINED TO ONE PLANE only. [Minimum 02 solved examples]

3 Sheet No. 03 – Orthographic Projection.

A. Illustration of simple orthographic projection using both 1st angle and 3^{rd} angle method. [Minimum 02 solved examples]
B. Illustration of sectional orthographic projection using both 1st angle and 3^{rd} angle method. [Minimum 02 solved examples]

4 Sheet No. 04 – Isometric Projection

A. Illustration of Isometric projection with natural scale.
   [Minimum 02 solved examples]
B. Illustration of Isometric projection with isometric scale.
   [Minimum 02 solved examples]

5 Sheet No. 05 – freehand sketches of Machine elements.

A. Free hand sketches of machine elements including screw threads, screwed fasteners, nuts, bolts, riveted and welded joints, Keys, shaft, couplings. (With constructional details.)
B. Introduction to limits, fits and tolerance.

Elements of Mechanical Engineering Lab

6 Demonstration and Study of Cochran and Lancashire boiler.

a. Study the principle, construction and working of Cochran boiler.
b. Demonstrate construction and working of Cochran boiler using chart/model/multimedia.
c. Study the principle, construction and working of Lancashire boiler.
d. Demonstrate construction and working of Cochran boiler using chart/model/multimedia.
e. Discuss relative merits and demerits.

7 Demonstration and Study of Babcock and Wilcox boiler.

a. Study the principle, construction and working of Babcock and Wilcox boiler.
b. Demonstrate construction and working of Babcock and Wilcox boiler using chart/model/multimedia.
c. Discuss relative merits and demerits with fire tube boilers.

8 Demonstration and Study of boiler mountings.

a. Study the principle, construction and working of various boiler mountings.
b. Demonstrate various boiler mountings using chart/model/multimedia.

9 Demonstration and Study of boiler accessories.

a. Study the principle, construction and working of various boiler accessories.
b. Demonstrate various boiler mountings using chart/model/multimedia.

10 Demonstration and Study of power transmission - Single plate clutch, oldham coupling, Hook's Joint.

a. Study the principle, construction and working of Single plate clutch, Oldham coupling, Hook's Joint.
b. Demonstrate various Single plate clutches, Oldham coupling, and Hook's Joint using chart/model/multimedia.

11 Measurement of energy consumption of domestic appliances.

a. Lab demonstration of measurement of energy consumed in kWh for simple household appliances.
b. Students will conduct such experiment at home and submit a case study.

12 Measurement of thermal efficiency of domestic cooking devices.

a. Lab Demonstration of measurement of energy consumed and thermal efficiency of simple household appliances using simple measurement techniques.
b. Students will conduct such experiment at home and submit a case study.

Note: FIVE drawing sheets from ED Lab and FIVE practical from EME Lab shall be conducted during 15 weeks available during semester.

Reference Books:

1. Bhatt N D, Panchal V M, "Engineering Drawing – Plane and Solid Geometry", Charotar Publishing House.
2. Rajan T S, "Basic Mechanical Engineering", New Age International Pvt. Ltd, New Delhi.
3. T Jeyapoovan, "Engineering Drawing and Graphics Using Autocad", Vikas Publication Noida, New Delhi.
4. Kannaiah K L, Narayana, "Engineering Graphics", Scitech Publications, Chennai, 2nd Edition
5. H G Phakatkar, "Engineering Graphics", Nirali Publication, Pune.
6. Nag P K, "Engineering Thermodynamics", McGraw Hill.
7. Thomas Beven, "Theory of Machines", Pearson.
8. Rattan S S, "Theory of Machines", McGraw Hill.
9. Khan B H, "Non Conventional Energy Resources", Tata McGraw Hill, New Delhi.
10. Rai G D, "Non Conventional Sources of Energy", Khanna Publication, New Delhi.
11. David G Alciatore, Michael Histand, "Introduction to Mechatronics and Measurement Systems", McGraw-Hill, 2003
12. H L Stewart, "Hydraulics and Pneumatics Power for Production", Industrial Press

Inc. N.Y. USA, 2001

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignments submitted by the student in the form of journal. Evaluation will be based on paper work.

Elements of Electrical & Electronics Engineering Lab

LAB COURSE OUTLINE

Elements of Electrical & Electronics Engineering Lab	EEEE LAB	FE228
Course Title	Short Title	Course Code

Course Description:

In this laboratory course emphasis is on the understanding of the characteristics of basic circuits that use resistors, capacitors, diodes, bipolar junction transistors, Op-Amp, logic gates, transducers etc. The students can use this knowledge to analyze more complex circuits such as complex electrical networks, rectifiers, amplifiers, digital circuits, circuits using transducer etc.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	15	30	1

ESE Pattern: Practical (PR)

Prerequisite Course(s): Course on physics at HSC level.

General Objective:

The objective of this lab is to impart the fundamental knowledge of electrical and electronics engineering to the students and to develop the students ability to apply the specific procedures to analyze the electrical and electronics engineering Systems.

In this lab, students will be familiar with use of different theorems to analyze electrical networks. Students will also become familiar with various basic analog and digital electronic circuits.

Learning Outcomes:

Upon successful completion of the lab student will be able to

a) Analyze DC networks by using Kirchhoff's Voltage Law and Current Law.
b) Analyze RLC series circuit.
c) Apply superposition theorem to a D.C. network.
d) Apply Thevenin's Theorem to a D.C. network and develop Thevenin's equivalent circuit.
e) Describe operation and construction of different types of lamps.
f) Describe the need and types of earthing.
g) Identify Electronics Components.
h) Analyze half, full and bridge wave rectifier.

i) Analyze transistor, Op-Amp and Digital Circuits.
j) Describe operating principle of LVDT and its application for displacement measurement.

LAB COURSE CONTENT

(Note: Minimum FOUR Experiments from each group.)

Group A

1. Verification of Kirchhoff's laws.

a. Measure Voltage and current in a dc circuit for each element.
b. Find the analytical solution for the circuit to calculate the voltages and currents for each element.
c. Compare analytical and the practical values.
d. Verification of Kirchhoff's voltage law and current law.

2. Study of RLC series circuit.

a. Measure voltages and current of series RLC circuit. (V_R, V_L, V_C, I)
b. Calculate/measure the values for resistance, inductive reactance, and capacitive reactance of the circuit. .
c. Calculate the impedance, inductance, capacitance and power factor of circuit.
d. Draw the phasor diagram for the circuit quantities.

3. Verification of Superposition Theorem.

a. Apply superposition theorem to find analytical values of the branch currents for the given D.C. network.
b. Measure the branch current of the network with both the sources acting simultaneously and also with each source alone at a time.
c. Compare the analytical and measured values of the currents.

4. Verification of Thevenin's Theorem.

a. Find the analytical solution for the load current for the given DC circuit using Thevenin's theorem.
b. Measure the open circuit voltage, equivalent resistance and load current in network.
c. Develop Thevenin's equivalent circuit from measured values.
d. Compare the analytical and practical values.

5. Study of lamps.

a. Describe operation and construction of filament lamp.
b. Describe operation and construction of Mercury vapor lamp.
c. Describe operation and construction of fluorescent tube.
d. Describe operation and construction of Sodium vapor lamp.
e. Describe operation and construction of CFL lamp.

6. Study of Earthing.

a. Describe the Need of Earthing.
b. Describe the Earthing types.
c. Describe types of Fuse and safety precaution working with electricity.

Group B

7. Study and testing of electronics components and their terminals.

a. Identify the values of resistance, inductance, capacitor (mica, electrolyte etc) and identify terminals of diode and transistor.
b. Testing of resistance, inductance, capacitor (mica, electrolyte etc), diode, and transistor using multi meter.

8. Displacement measurement using LVDT.

a. Describe working principle of displacement transducer.
b. Describe how displacement is converted into voltage.
c. Find out the output voltage.

9. Study of half wave, full wave and bridge rectifier.

a. Compare the input and output voltage waveforms for half wave, full wave and bridge rectifier.
b. Measure output DC voltage for half wave, full, and bridge rectifier.

10. Implementation of inverting and non inverting amplifier using Op-Amp.

a. Describe use of Op-Amp as amplifier.
b. Calculate theoretical output voltage of inverting and non-inverting amplifier and find out gain of Op-Amp.
c. Compare measured values and Theoretical values.

11. Input output characteristics curve for CE configuration of transistor.

a. Describe use of Transistor as amplifier.
b. Draw Input Output Characteristics curves for CE configuration of transistor.
c. Describe which configuration is commonly used and why?
d. Compare CC, CB, & CE configuration.

12. Implementation of simple Boolean expression using logic gates.

a. Simplification of any Boolean expression.
b. Implementation of any Boolean expression using basic gate.
c. Implementation of any Boolean expression using universal gate.

Reference Books:

1. B L Theraja and A K Theraja, "A Text book of Electrical Technology- Vol-I", S Chand, 1st Edition, 2001
2. S Salivahanan, N Sureshkumar and A Vallavaraj, "Electronics Devices and Circuits", TMH, 2nd Edition, 2009
3. R S Sedha, "Applied Electronics", S Chand, 1st Edition, 2005
4. H S Kalsi, " Electronic Instrumentaion", TMH, 2nd Edition, 2007
5. R A Gaikwad, "Op-Amps and Linear Integrated Circuits", PHI, 4th edition, 2001
6. R P Jain, "Modern Digital Electronics", TMH, 4th Edition, 2010
7. R S Gaonkar, "Microprocessor Architecture, Programming and Application with
   the 8085", Penram International, 4th Edition, 2000
8. S K Bhattacharya, "Basic Electrical and Electronics Engineering", Pearson Education, 1st Edition, 2012
9. J B Gupta, " A Course in electrical Power ", S K kataria and Sons, 12th Edition, 2002

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of Group A and Group B. Evaluation will be based on paper work and performance in the practical.

Workshop Practice- II

LAB COURSE OUTLINE

Workshop Practice II	**WP-II**	**FE229**
Course Title	Short Title	Course Code

Course Description:

Workshop Practice II covers the basic knowledge and practices on Carpentry shop, Plumbing shop, Machine shop, and Electronics and Electrical workshop in order to improve the practical skill of students in different workshops.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Laboratory	2	11	22	1

Prerequisite Course(s): 11^{th}, 12^{th} Physics, Mathematics, Engineering Drawing, Engineering Materials.

General Objective:

In workshop practice, students will get familiar with use of different workshop practices like carpentry shop, plumbing shop, machine shop, electronics and electrical workshop. Students will also get familiar with different tools, machines, equipments, job holding devices, job drawing, job material, job manufacturing operations and processes in different workshops.

Objective to develop following Intellectual skills:

a. Identification and selection of manufacturing processes/operations according to job requirement in different workshops.
b. Identification, selection and understanding of tools, equipments, machines and job material according to job drawing for different workshops.
c. Understanding working principle and construction of process planning sheet.
d. Identification, repairing, maintenance and understanding of the working principle of electronic and electrical components/devices.

Objective to develop following Motor skills:

a. Ability to handle measuring instruments.
b. Ability to read the job drawing.
c. Ability to understand the basic working principle of carpentry operations, tools and equipments in carpentry shop.

d. Ability to understand the basic working principle of Plumbing operations, tools and equipments in Plumbing shop.
e. Ability to understand the basic working principle of lathe machine operations, tools and equipments in Machine shop.
f. Ability to understand the basic working principle of Electronics components used in electronics workshop.
g. Ability to understand the repair and maintenance of domestic appliances in electrical workshop.

Learning Outcomes:

Upon successful completion of these practical's the student will be able to hand

a) Carpentry shop
b) Plumbing shop
c) Machine shop
d) Electronics workshop
e) Electrical workshop

LAB COURSE CONTENT

A. Carpentry shop

1. Introduction to carpentry operations, equipment and tools.
2. One job involves lap joint, bridle joint.

B. Plumbing shop

1. Introduction to the tools and equipments like pipe vice, pipe bending machine, pipe dies, cutting dies, pipe wrench etc. used for plumbing operations on G.I. pipe.
2. One Job having both side threading and like bending operations.

C. Machine shop

1. One job on lathe machine involving operations like Facing, plain turning, step turning, taper turning, chamfering and drilling.

D. Electronics workshop

Types of PCB, PCB making, soldering, testing of electronic component like diode, transistor, R.L.C. etc and desoldering of a simple electronic circuit; probe making; Use of multimeter (each function)

E. Electrical workshop

1. Introduction and Difference between 1 Φ AC, DC; Transformers;
2. Repair and maintenance of domestic appliances like electric fan, tube light etc;
3. MCB, ELCB; Different types of wiring, Demonstration on preparation of extension boards, tube light wiring etc; demonstration of earthing and neutral.

Reference Books:

1. Hajara Chaudhary and Bose S K, “Element of Workshop Technology Volume I and II”, Asia Publishing House.
2. P N Rao, “Production Technology Volume I and II”, Tata McGraw Hill Publication.
3. R K Jain, “Production Technology”, Khanna Publications.
4. P C Sharma, “Production Technology”, Khanna Publication.
5. Chapman W A J., “Workshop Technology”, ELBS Publication.
6. HMT, “Production Technology”, Tata McGraw Hill Publication.
7. Kannaiah K L, Narayana, “Workshop Manual”, Scitech Publications, Chennai, 2nd Edition

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Soft Skills - II

LAB COURSE OUTLINE

Soft Skills-II	**SS II**	**FE230**
Course Title	Short Title	Course Code

Course Description:

This course is a continuation of SSAD1 in the first semester. We continue to empower the language capabilities of the students. Strengthening of grammatical structure of English and advanced level vocabulary are introduced and consolidated in this course. Students are introduced to basics of business writing and etiquette. They are also made to undergo group discussions and learn the art of debating. Personal Interviews and their subtle nuances are taught to the students. Laws of leadership and team-workmanship are enforced.

	Hours per Week	**No. of Weeks**	**Total Hours**	**Semester Credits**
Lecture	1	15	15	2
Laboratory	2	15	30	

Prerequisite Course(s): Fundamental knowledge of English of 11^{th} and 12^{th}.

General Objectives:

We have tried to achieve the following objectives through this course:

a) To make the students effective team workers with a capacity to lead in any circumstances
b) To augment the ability of the student to render logically good arguments in support of their opinion during debates
c) To understand and become adept in corporate communication of writing letters and memos etc.
d) To enhance the ability of written communication by continuing to advanced level in English
e) To be successful in an HR or Personal Interview and to be a better communicator in technical interviews

Learning Outcomes:

Upon successful completion of this course the student will be able to:

a. Detect errors in simple and complex sentences of English.
b. Expand their vocabulary in English.
c. Debate and discuss cordially but fervently on any given issue.
d. Write corporate letters and take further other corporate communication.
e. Augment his/her performance in personal as well as technical interviews.
f. Increase the ability to calmly handle the pressure in Interviews and discussions.
g. Understand the basic laws of team-workmanship viz. its importance and excellence.
h. Augment the ability to lead a team under any circumstances and create an example for others.

LAB COURSE CONTENT

Unit-1	**Eloquent Writing – II**		**No of Lect. – 9, Marks: 10**
	a	Comprehension of Passages	
	b	Understanding of English Language	
	c	Vocabulary Enhancement Practice	
Unit-2	**Corporate Communication**		**No of Lect. – 9, Marks: 10**
	a	Corporate Letter	
	b	Resume and Curriculum Vitae Writing	
	c	Writing Report	
Unit-3	**Discussions and Debates**		**No of Lect. – 9, Marks: 10**
	a	Basics of a Group Discussion	
	b	Group Discussion Models	
	c	Debates – Value and Process	
Unit-4	**Successful Interviews**		**No of Lect. – 9, Marks: 10**
	a	Pre-Interview Strategies	
	b	Strategies During the Interview	
	c	Strategies After the Interview	
Unit-5	**Leadership and Team-Building**		**No of Lect – 9, Marks: 10**
	a	Laws of Successful Leadership	
	b	Becoming a Motivator	
	c	Principles of Team-workmanship	

Reference Books:

1. Allan and Barbara Pease, "A Definitive Book on Body Language", Publication Bantam Books.

2. Robert Bolton, "People Skills: How to Assert Yourself, Listen to Others and Resolve Conflicts", Publication Simon and Schuster.

3. R K Iyer, “Spoken English”, IU Publications.
4. Sethi and Dhamija, “A Course in Phonetics and Spoken English”, Prentice Hall of India.
5. Matthew McKay, “The Communication Skills”, Publisher: New Harbinger Publications Inc.
6. Frank Paolo, “How to Make a Great Presentation in 2 Hours”, Pustak Mahal.
7. Kaplan’s GRE, Kaplan Publications.
8. Barron’s GRE, Galgotia Publications.

Guide lines for ICA:

ICA shall be based on continuous evaluation of student performance throughout semester and practical assignment submitted by the student in the form of journal.

Faculty of Engineering & Technology

।।अंतरी पेटवू ज्ञानज्योत।।

NORTH MAHARASHTRA UNIVERSITY, JALGAON.

Syllabus For

SECOND YEAR ENGINEERING

BIOTECHNOLOGY

(W.E.F.2007-2008)

NORTH MAHARASHTRA UNIVERSITY, JALGAON

STRUCTURE OF TEACHING & EVALUATION

S.E. (BIOTECHNOLOGY) W.E.F.2007-2008

First Term

Sr. No.	Subject	Teaching Scheme Hours/ Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Concepts in Biotechnology	04	--	03	100	--	--	--
2	Microbiology	04	04	03	100	50	50	--
3	Fluid Flow and Solid Handling	04	02	03	100	25	--	25
4	Process Calculations	04	02	03	100	25	--	--
5	Engineering Mathematics-III	04	--	03	100	--	--	--
6	Computer Applications	--	02	--	--	25	50	--
		20	10		500	125	100	25
	Grand Total	**30**			**750**			

Second Term

Sr. No	Subject	Teaching Scheme Hours/ Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Biochemistry	04	02	03	100	25	50	-
2	Chemistry	04	02	03	100	25	--	-
3	Immunology	04	02	03	100	25	50	-
4	Biostatistics	04	02	03	100	25	--	-
5	Process Heat Transfer	04	02	03	100	25	--	25
		20	10		500	125	100	25
	Grand Total	**30**			**750**			

NORTH MAHARASHTRA UNIVERSITY, JALGAON

STRUCTURE OF TEACHING & EVALUATION

T.E. (BIOTECHNOLOGY) W.E.F.2008-2009

First Term

Sr. No.	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Bio Process Principles	04	--	03	100	25	--	--
2	Chemical Reaction Engineering	04	04	03	100	25	--	50
3	Mass Transfer-I	04	04	03	100	25	50	--
4	Molecular Biology and Genetic Engineering	04	04	03	100	25	--	25
5	Enzyme Engineering	04	--	03	100	25	--	--
		20	12		500	125	50	75
	Grand Total	32			750			

Second Term

Sr. No.	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Instrumentation and Process Control	04	02	03	100	25	--	25
2	Biological Thermodynamics	04	02	03	100	25	--	--
3	Mass Transfer-II	04	04	03	100	25	50	--
4	Biotechnology of Waste Treatment	04	04	03	100	25	--	25
5	Fermentation Biotechnology- I	04	--	03	100	25	--	--
6	Practical Training/Mini Project/Special Study	--	--	--	--	25	--	--
		20	12		500	150	50	50
	Grand Total	32			750			

NORTH MAHARASHTRA UNIVERSITY, JALGAON

STRUCTURE OF TEACHING & EVALUATION

B.E. (BIOTECHNOLOGY) W.E.F.2009-2010

First Term

Sr. No.	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Bioprocess Engineering -- I	04	--	03	100	25	--	--
2	Bioprocess Modeling and Simulation	04	04	03	100	25	25	--
3	Bioseparation Processes	04	--	03	100	25	--	--
4	Elective –I	04	--	03	100	--	--	--
5	Fermentation Biotechnology-II	04	04	03	100	25	--	50
6	Project –I	--	02	--	--	25	--	25
7	Seminar	--	02	--	--	25	--	--
		20	12		500	150	25	75
	Grand Total	32			750			

Second Term

Sr. No.	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Bioprocess Engineering -II	04	04	03	100	25	--	25
2	Bioprocess Engineering and Economics	04	02	03	100	25	--	25
3	Bioinformatics	04	04	03	100	25	25	--
4	Elective –II	04	--	03	100	25	--	--
5	Project –II	--	04	--	--	100	--	50
6	Industrial Visit / Case Study	--	--	--	--	25	--	--
		16	14		400	225	25	100
	Grand Total	30			750			

Subjects:

Elective-I
1)Advanced Biomaterials
2)Plant Tissue Culture & Plant Biotechnology
3)Protein Engineering
4)Food Biotechnology

Elective-II
1)Metabolic Engineering
2)Biosafety & Bioethics
3)Biomedical Fluid Dynamics
4)Applied Genetic Engineering

S.E. BIOTECH. TERM I

1. CONCEPTS IN BIOTECHNOLOGY

Teaching Scheme: **Examination Scheme:**
Lectures: 4 Hrs./ Week **Paper: 100 Marks**
(3Hrs)

UNIT- I
Introduction to Biotechnology:
Definitions, Historical perspectives, Scope and importance, Commercial potential, An interdisciplinary challenge, A Quantitative approach, Classical vs. Modern concepts, Manufacturing quality control, Product safety, Good manufacturing practices, Good laboratory practices, Marketing,Biotechnology in India and Global trends.
Concept of pH, Buffer, Process flow diagrams, Material and energy balances, fluid flow and mixing, Heat transfer, Mass transfer, Unit operations,Homogeneous reactions, Heterogeneous reactions, Reactor engineering.
Protein Structure and Engineering:
Introduction to the world of Proteins, 3-D Shape of Proteins, Structure Function relationship in Proteins, Purification of Proteins, Characterization of Proteins, Protein based products, Designing Proteins, Proteomics. **(10 Hrs, 20 Marks)**

UNIT- II
Recombinant DNA Technology:
Introduction, Tools of rDNA Technology, Making Recombinant DNA, DNA Library, Introduction of Recombinant DNA into host cells, Identification of Recombinants, Polymerase Chain Reaction (PCR), DNA Probes, Hybridization Techniques, DNA Sequencing, Site-directed mutagenesis.
Genomics and Bioinformatics:
Introduction, Genome Sequencing Projects, Gene prediction and Counting, Genome similarity, SNPs and comparative genomics, Functional Genomics, History of Bioinformatics, Sequences and Nomenclature, Information Sources, Analysis using Bioinformatics tools. **(10 Hrs, 20 Marks)**

UNIT- III
Microbial Culture and Applications:
Introduction, Microbial Culture Techniques, Measurement and Kinetics of Microbial Growth, Scale up of Microbial Process, Isolation of Microbial Products, Strain Isolation and Improvement, Applications of Microbial Culture Technology, Bioethics in Microbial Technology. **(10 Hrs, 20 Marks)**

UNIT-IV
Plant Cell Culture and Application:

Introduction, Cell and Tissue Culture Techniques, Applications of Cell and Tissue Culture, Gene Transfer Methods in Plants, Transgenic Plants with Beneficial Traits, Diagnostics in Agriculture and Molecular Breeding, Bioethics in Plant Genetic Engineering.

(10 Hrs, 20 Marks)

UNIT- V

Animal Cell Culture and Applications:

Introduction, Animal Cell Culture Techniques, Characterisation of Cell Lines, Scale-up of Animal Culture Process, Applications of Animal Cell Culture, Stem Cell Technology, Bioethics in Animal Genetic Engineering.

Biotechnology and Society:

Public perception, Role of sciences, Engineering, Arts, Commerce, Patenting - Criterion for patents, Discovery vs Invention,Product and process patent, Reading a patent, National and International Patent Laws, Varietal protection, Patenting of biological systems, Ethical issues in agriculture and health care.

(10 Hrs, 20 Marks)

REFERENCES

1. P. K Gupta, Introduction to Biotechnology. Rastogi Publications
2. Smith, Biotechnology. Cambridge Press.
3. Ed. Young M.M., Comprehensive Biotechnology (Vol. I,II.III and IV), Pergamon Press, London.
4. Hammand J., Mc Gravery P. and Yusibov V. (Eds.). Plant Biotechnology. Springer Verlag, 2000

2. MICROBIOLOGY

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs./ Week	Paper: 100 Marks (3 Hrs)
Practicals : 4 Hrs./ Week	Practical: 50 Marks
	Term Work : 50 Marks

UNIT-I

Microbiology and its scope, microscopy. classification, morphology and physiology of bacteria, yeast, molds, algae and viruses. **(10 Hrs, 20 Marks)**

UNIT-II

Microbial growth kinetics, growth curve, diauxic growth factors influencing growth, continuous and synchronous culture, microbial nutrition and reproduction.

(10 Hrs, 20 Marks)

UNIT-III

Pure culture techniques – microbial culture media, isolation, identification and maintenance of cultures, characteristics of pure culture, enumeration techniques.

(10 Hrs, 20 Marks)

UNIT-IV

Physical and chemical methods of control of microorganisms, immune response, antigen-antibody interaction. Microbial defense mechanisms under adverse conditions.

(10 Hrs, 20 Marks)

UNIT-V

Microbial ecology, incidences of microorganisms in soil, water, air, food and sewage, food spoilage organisms, food borne infections and poisoning organisms.

(10 Hrs, 20 Marks)

REFERENCES:

1. M.J. Pelczar, Jr. E.C.S. Chan and N.R. Krieg, Microbiology 5th Ed. , TMH Book Company.
2. Kathleen Talaro and Arthur Talaro. Foundation in Microbiology. W.C.B. Wm. C. Brown Publishers (1994).
3. Stainer R.Y., Ingraharn J.L., Whoolis M.L. and Painter P.R. General Microbiology. The Mc Millan Press Ltd.
4. Robert F. Byod (1984). General Microbiology. Times Mirror / Mosby College Publication.

TERM WORK / PRACTICALS

Term Work Shall be based on any 10 experiments mentioned below.

1-2. Microscopy : Use & care of microscope, examination of prepared slides and wet mounts of bacteria, yeast, molds. Microbial Identification & examination of food samples. Other biomaterials of bacteria, yeast and molds.

3. Micrometry: Measurement of microbial cells.

4. Staining techniques: Simple staining, Gram staining, Endospore staining, Capsule staining.

5-7. Enumeration techniques: Microscopic count using haemocytometer, Viable cell count (By pour plate method) Turbidity measurement as direct expression of growth.

8-9. Culture techniques: Culture media preparation, Cultivation of microorganisms.

10. Isolation of microorganisms by streak plate method.

11. Isolation by serial dilution method, maintenance & preservation.

12. Influence of antimicrobial agent on growth effect of UV radiation & heat on microbial growth.

13. Microbiological examination of water: Coliform & Salmonella counts.

14. Microbiological assay of a growth factor.

REFERENCES:

1. H.W. Seeley Jr. and Paul J.Van Demark, “Microbes in action”. A laboratory manual of Microbiology.D.B. Taraporevala Sons & Co. Pvt. Ltd.

2. Ed. J.R. Norris and D.W. Ribbons, “Methods in Microbiology”, Vol. 3 A, Academic Press, London & New York.
3. Ronald M. Adas, Alfred E. Brown, Kenneth W. Dobra and Llnas Miller (1986). Basic Experimental Microbiology. Prentice Hall.
4. Aneja K.R.(2nd Edn., 1996). Experiments in Microbiology, Plant pathology, Tissue Culture and Mushroom Cultivation. Wishwa Prakashan, New Age International (P) Ltd.
5. S. Harisha. An Introduction to Practical Biotechnology. Laxmi Publications (P) Ltd. New Delhi.

3. FLUID FLOW AND SOLID HANDLING

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practicals :2 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Oral: 25 Marks
Term Work : 25 Marks

Unit-I

Solids and Their Handling

Properties of solids ,screening, industrial screening equipment. Determination of particle size, screen analysis, size reduction of solids,stages of reduction , operating variables, intermediate and fine size reduction, power requirement and mechanism.

Power driven machines: Crushers, grinders, and conveyors.

Problems based on above (10 Hrs**,** 20 Marks)

Unit –II

Filtration: Theory, continuous and batch equipments. Flow of solids through fluids, Equipments for classification of solids. Sedimentation.

Problems based on above. (10 Hrs**,** 20 Marks)

Unit – III

Fluid flow: Properties of fluids, Flow through pipeline.

Fluid statics : Euler’s equation, Hydrostatic Law and Pressure Measurement

Transport of fluids,energy relationships, pipe fittings, minor losses in pipe flow.

Problems based on above. (10 Hrs**,** 20 Marks)

Unit IV

Flow measurements: Orifice meter. Nozzle and Venturi meters, Rotameter and Pitot tube.

Other flow measuring devices such as Ultrasonic flow meters, Anemometers, Electromagnetic flow meters, Flow meters using thermistors.

(10 Hrs**,** 20 Marks)

UNIT-V:

Pumping of fluids:

Pumping equipments for liquid, the reciprocating pump, positive displacemement pump, rotary pumps, centrifugal pumps, design & operating characteristics, NPSH calculations, airlift pumps, pumping equipments for gases:

Pumping equipment for gases:

Reciprocating piston compressors, rotary blowers & compressors, centrifugal blowers & compressors including turbo compressors, vacuum-producing equipment.

Power required for compression of gases, clearance volume, multistage compressor efficiency, the power requirement for pumping through pipeline for liquids & gases.

Inroduction to fluidization. **(10 Hrs, 20 Marks)**

REFERENCES

1. W.L. McCabe & J.C. Smith, Unit Operations in Chemical Engineering, McGraw Hill / Kogakusha Ltd.
2. P.Chattopadhaya. Unit Operations of Chemical Engineering-Volm.I, Khanna Publication New Delhi,
3. R.K. Bansal. Fluid Mechanics, Khanna Publications, New Delhi
4. V.P.Gupta, Alam Singh and Manish Gupta, Fluid Mechanics and hydrostatics, CBS Publishers, New Delhi.
5. R.S.Hiremath & A.P.Kulkarni Unit operation of Chemical Engineering (Mechanical Operations Vol-I) : Everest Publication, Pune
6. J. M. and Coulson and R.F. Richardson; Chemical Engg. Vol. I and II : Butter worth and Heinemann.

TERM WORK / PRACTICALS

Term Work Shall be based on any 08 experiments mentioned below.

1. To study the separation of solid by sedimentation
2. Sieve Shaker: To ascertain the fineness number and to study the differential & cumulative screen analysis of the sand
3. Ball Mill :To verify the laws of crushing & grinding
4. Jaw Crusher : To verify the laws of crushing & grinding
5. Plate & Frame Filter Press: To determine the rate of filtration ,specific cake resistance and filter medium resistance
6. Rotary Vacuum Filter: To find out the rate of filtration
7. Fluidization : To observe the and study the behavior of the bed during fluidisation and to calculate minimum fluidization velocity
8. To determine the coefficient of Venturimeter
9. To determine the coefficient of Orificemeter
10. To determine the coefficient of Nozzlemeter
11. To Verify Bernoulli equation.
12. Reynolds Experiment

4. PROCESS CALCULATIONS

Teaching Scheme:
Lectures: 4 Hrs./ Week
Term Work :2 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Term Work : 25 Marks

UNIT-I :

Units and Dimensions:

Basic and derived units, dimensional analysis, dimensional and empirical equations. Different ways of expressing units of quantities and physical constants.

Properties of Gases , Liquids and Solids:

Ideal and real gas laws, critical properties, properties of mixtures & solutions & plane equilibria, Kay's rule.

(10 Hrs**,** 20 Marks)

UNIT-II :

Basic Concept:

Humidity and saturation, Psychometric chart, solubility diagrams.

Thermo Physics:

Concept and calculations of involving energy, heat, work & enthalpy of reversible & irreversible process.

(10 Hrs**,** 20 Marks)

UNIT-III :

Material Balances:

Concept of limiting &excess reactants, Tie element, Recycle, Purging, Bypass etc. in batch, stagewise and continuous operations in systems with and without chemical reactions in unit operations.

(10 Hrs**,** 20 Marks)

UNIT-IV :

Thermo Chemistry:

Heat of formation, combustion, solution, dilution etc. and its effects of pressure and temperature on them. Temp. of reaction, Energy balance for system with and without chemical reaction. Process efficiency.

(10 Hrs**,** 20 Marks)

UNIT-V :

Unsteady material and energy balances in Bioprocesses, Energy balances for nuclear, electro chemical and photo chemical processes

Combustion: Introduction, fuels, calorific value of fuels, air requirements.

(10 Hrs**,** 20 Marks)

REFERENCES

1. Bhat B.I. and Vora S.M ; Stoichiometry ; Tata McGraw Hill Publication ; New Delhi

2. Durga Prasad Rao & DVS Murthy ,Process Calculations for Chemical Engineers. McMillan India, New Delhi .
3. K A Gavahane ; Introduction to Stoichiometry ; Nirali Prakashan.
4. Hougen O.A, Watson K.M, & Ragatz R.A.Chemical Process Principles Part-I Asia Publishing House, Mumbai.
5. Himmelbleau D.M. Basic principles and calculations in Chemical Engineering. Prentice Hall Publication.
6. Shekhar Pandharipande and Samir Mushrif, Process Calculations. Pune Vidyarthi Griha Prakashan, Pune
7. Doran Paulin M. Bioprocess Engineering Principles. Academic Press, An Imprint of Elsevier.

TERM WORK

Term Work Shall be based on any 08 assignments on the following.

1. Properties of solids/liquids/gases.
2. Humidity & Saturation.
3. Thermo physics.
4. Thermo chemistry.
5. Material balances.
6. Energy balances.
7. Nuclear, photo chemical and electro chemical processes.
8. Combustion.
9. Steady state and Unsteady state Material and Energy Balances in Bioprocesses

5. ENGINEERING MATHEMATICS –III

Teaching Scheme: Examination Scheme:
Lectures: 4 Hrs./ Week Paper: 100 Marks (3 Hrs)

UNIT-I:
Liner Differential Equation:
Liner differential equation of order "n" with constant co-efficient , Method of variations, Homogeneous liner differential equation , Legendre's LDE, Application to chemical engineering. Problems involving batch reactor. **(10 Hrs, 20 Marks)**

UNIT-II:
Simultaneous Linear Differential Equations of form :

1) f1(D)x + f2(D)y = (t)
(D)x + (D)y = (t)
Where, D=d/dt.

2) dx/P = dy/Q = dz/R.

Partial Differential Equations:

Solutions of (i) One dimensional heat flow equation.
(ii) Two dimensional heat equation (Laplace Equation)
(iii) Laplace Equation in Polar form.Differential equation of first order & higher degree. **(10 Hrs, 20 Marks)**

UNIT-III:
Laplace Transform :
Definition of Laplace Transform, Inverse Laplace transform, Properties and theorems, Laplace transforms of standard functions, Unit step functions, Ramp functions, Impulse functions, Error functions , Jump functions, Laplace Inverse Transform.
Applications to the solutions of liquid systems, consisting of single tank & two tanks in series (Interacting & non-Interacting), Second order systems (Damped vibrator).
(10 Hrs**,** 20 Marks)

UNIT-IV:
Vector Integration :
(i) Line Integral, Surface Integral, Volume Integral.
(ii) Greens Lemma, Stoke's Theorem, Gausse's Divergence Theorem.
Finite Fourier Cosine & Sine transforms, Complex Fourier transforms , Infinite Fourier sine and Cosine transforms, Applications of Fourier transforms to boundary value problems such as one dimensional and two dimensional heat flow problems
(10 Hrs**,** 20 Marks)

UNIT-V:
Numerical Solution of Ordinary Differential Equations :
Taylor's series method, Runga-Kutta method, Piccard's method, Eulers method andLeast square method
Numerical Integration :
Trapezoidal rule, Simpson's $1/3^{rd}$ rule, Simpson's $3/8^{th}$ rule and Weddle's rule.
(10 Hrs**,** 20 Marks)

REFERENCES

1. P .N. Wartikar and J.N. Wartikar, Engineering Mathematics III : Pune Vidyarthi Griha Prakashan, Pune
2. Dr. B.S.Grewal, Higher Engineering Mathematics : Khanna Publications ,New Delhi
3. Wylie and Barrott, Advanced Engineering Mathematics : Tata McGraw Hill Publications.
4. Erwin Kreegszig, Advanced Engineering Mathematics : New age International ,New Delhi
5. Dr.Gokhale and A.N. Singh , Engineering Mathematics III : Nirali Publications.
6. Coughnour Donald R , Process System analysis & control : McGraw Hill, 1991.

6. COMPUTER APPLICATIONS

Teaching Scheme:	Examination Scheme
Practicals : 2 Hrs./ Week	Practical: 50 Marks
	Term Work: 25 Marks

TERM WORK / PRACTICALS

Term work & practical should be based on following

1. Introduction to computer, O.S, M.S Office, Programming languages
2. History, C editor – C language
3. a+b, a-b ,a*b , a/b , a % b using keyboard
4. Using conditional operator find out largest number
5. If – else – program using if – else
6. For or while or Do while / nesting of for to print table of 1 to 10
7. Addition using function
8. Array - program using array

REFERENCES

1. Kanetkar Yashawant P. Let us C, BPB Publication, New Delhi.
2. Kanetkar Yashawant P. Let us C Solutions, BPB Publication, New Delhi.
3. Byron Gottfried, Schaum's Outlines Programming with C, Tata McGraw Hill Publication.
4. Fielding A. Computing for Biologists.
5. Wool E.J. Microcomputers in Biochemical Education.

S.E. BIOTECH. TERM II

1. BIOCHEMISTRY

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practicals : 2 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Practical: 50 Marks
Term Work : 25 Marks

UNIT I

Structure and function of biomolecules; carbohydrates, proteins, lipids and nucleic acids. Biochemical separation methods. Vitamins, enzymes and coenzymes.

(10 Hrs**,** 20 Marks)

UNIT-II

Biological membranes and transport across them. Bioenergetics. Major anabolic and catabolic pathways of carbohydrate metabolism and their regulation; glycolysis, TCA cycle, pentose phosphate pathway, galactose metabolism, electron transport and oxidative phosphorylation, gluconeogenesis.

(10 Hrs**,** 20 Marks)

UNIT-III

Lipid metabolism; transport and oxidation of fatty acids in animal tissues, glycerol metabolism, biosynthesis of fatty acids and triacylglycerol.

Protein metabolism; out lines of amino acid metabolism and their significance.

(10 Hrs**,** 20 Marks)

UNIT-IV

Nucleic acid metabolism; mechanism and biosynthesis of DNA and RNA, reverse transcription. Protein biosynthesis, inhibitors of protein synthesis, transport of proteins and signal peptides.

(10 Hrs**,** 20 Marks)

UNIT-V

Typical metabolic pathways of microbes; Entner-Duodoroff pathway, glyoxilate cycle, phosphoketolate pathway.

Biochemical aspects of Hormone Action.

(10 Hrs**,** 20 Marks)

REFERENCES:

1. Lehninger A.L., Neston D.L., “Principles of Biochemistry”, N.M. Cox, CBS Publishers & Distributors.
2. Lubert Stryer “Biochemistry”, W.H. Freemen & Co. , New York.
3. Weil J.H. “General Biochemistry”, New Age International (Pvt. Ltd.).
4. Murray R.K. and others (Eds). Harper’s Biochemistry, 25^{th} Edn. Appleton and Lange Stanford.

TERM WORK / PRACTICALS

Term Work Shall be based on any 10 experiments mentioned below.

1 Estimation of carbohydrates.
2. Estimation of proteins.
3. Estimation of nucleic acids:
4. Isoelectric precipitation.
5. Separation of amino acids by paper chromatography.
6. Separation of sugars by paper chromatography.
7. Extraction of Lipids.
8. Thin layer Chromatography.
9. Gel Electrophoresis.
10-11. Assay of enzyme activity and enzyme kinetics.
12. Identification and estimation of an intermediate of EMP pathway.
13. Cell fractionation.
14. Vitamin Assay.

REFERENCES

1. Plummer David T. “An Introduction to Practical Biochemistry”, Tata McGraw-Hill Pubblishing Co. Ltd., New Delhi.
2. Jayraman J. A Laboratory Manual in Biochemistry. New Age International Publishers.
3. Sadasivan S. and Manikam K. Methods in Agricultural Biochemistry. Wiley Eastern Ltd., New Delhi.
4. S. Harisha. An Introduction to Practical Biotechnology. Laxmi Publications (P) Ltd. New Delhi.

2. CHEMISTRY

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs./ Week	Paper: 100 Marks (3 Hrs)
Term Work : 2 Hrs./ Week	Term Work : 25 Marks

UNIT- I:

Reaction Mechanism:

Covalent Bond, Homolytic & Heterolytic Fission of Covalent Bond,Electrophiles & Nucleophiles.

Study of reactions with reference to the mechanism involved:

Aldol condensation, Cannizzaro& cross Cannizzaro reactions, Claisen ester condensation, Reimer Tiemann reaction, Grignard reagents & reactions.

SN^1 & SN^2 reactions.

Electrophilic substitution in aromatic rings: Nitration, Sulphonation, Halogenations, Fridel Crafts alkylation& acylations.

Elimination reactions:E_2 , E_1 mechanism.

(10 Hrs**,** 20 Marks)

UNIT-II:

Stereochemistry:

Basic concept of stereochemistry, Structural Isomerism, Different methods of representation of three dimensional molecule on paper, Conformational isomerism: Conformations of Ethane & n-Butane & their relative stability.

Geometrical isomerism: Cis-Trans isomerism shown by alkenes.

Optical isomerism: Measurement of Optical activity by Polarimeter , Specific rotation, Enantiomerism , Necessary conditions of optical activity, Optical isomerism of Lactic acid & Tartaric acid., Distereoisomerism. Baeyer's angle strain concept , Conformations of Cyclohexanes: Equatorial & axial bonds in cyclohexane.

(10 Hrs**,** 20 Marks)

UNIT-III:

Chemical kinetics:

Objective of chemical kinetics, rate of reaction, velocity constant of a reaction, elementary reaction steps & rate expressions, order & molecularity of reaction, factors influencing the reaction rates, integrated rate expressions for 1^{st}, 2^{nd} , 3^{rd} , & zero order reaction (with example), methods for determining order of reactions, experimental investigation of reaction kinetics.

Arrhenius equation, relationship between chemical kinetics & thermodynamics, problem based on above topics.

Fast reactions , Set up for study of Fast reactions

(10 Hrs**,** 20 Marks)

UNIT-IV:

Classical chemical thermodynamics:

Objective & scope, definition of thermodynamic systems.

Heat work reversibility, maximum work, isothermal & adiabatic process, I^{st} law of thermodynamics, II^{nd} law of thermodynamics, entropy, entropy changes, enthalpy & free energy, Gibbs Helmholtz equation, Third law of thermodynamics. Problems based on above topics.

Criteria of chemical equilibrium, Le Chatelier's theorem, its application to some systems likes ammonia, sulphuric acid, and nitric acid.

(10 Hrs**,** 20 Marks)

UNIT-V:

Surface phenomenon:

Surface tension of liquids, adsorption, adsorption of gases by solids, adsorption isotherm, Freundlich adsorption isotherm, the Langmueirs adsorption isotherm, application of adsorption.

Colloids & emulsion:

Types, methods of preparation, determination of particle size, properties, solution of micro molecules, properties of micro molecular solutions.

(10 Hrs**,** 20 Marks)

REFERENCES

1. Glasstone, Thermodynamics for chemist :McMillan India Ltd.
2. Maron-Prutton, Principles of Physical chemistry: Oxford & IBH publishing Co.Pvt.Ltd. New Delhi
3. Puri & Sharma, A textbook of physical chemistry : S. Chand & Co. Delhi
4. B.S.Behl, Physical Chemistry, S. Chand & Co. Delhi
5. Morrison & Boyd, Organic Chemistry: Allyn Bacon Inc.
6. Pine, Organic Chemistry: McGraw Hill Int.Co.

TERM WORK

Term Work Shall be based on any 08 experiments mentioned below.

1. Preparation of p-nitro acetanilide by nitration.
2. Preparation of Quinone.
3. Determination of rate constant of Hydrolysis of Methyl Acetate.(1^{st} Order)
4. Determination of rate constant of Saponification of Ethyl Acetate.(2^{nd} Order)
5. Determination of surface tension liquids by Stalagmometer.
6. Preparation of colloidal solution of starch.
7. To verify Freundlich adsorption Isotherm
8. Estimation of Acetone
9. Estimation of Aniline
10. Stability of emulsions

REFERENCES

1. S.S.Dara, Experiments and Calculations in Engineering Chemistry, S. Chand & Co. Delhi
2. S.K.Bhasin, Laboratory manual on engineering Chemistry: Dhanpat Rai Pub.New Delhi.

3. IMMUNOLOGY

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs./ Week	Paper: 100 Marks (3 Hrs)
Practicals : 2 Hrs./ Week	Practical: 50 Marks
	Term Work : 25 Marks

UNIT-I

Introduction to Immunology: Properties of immune response, Innate and acquired immunity, active and passive immunity.

Cells & Tissues of Immune System: Lymphocytes, Classes of lymphocytes, antigen presenting cells, NK Cells, Mast Cells, Dendritic Cell, Organs of the Immune System, Bone marrow, Thymus, Lymph node, Spleen, CALT, MALT.

(10 Hrs, 20 Marks)

UNIT-II

Molecular Immunology: - Molecular structure of antibody, Classification, Isotypes, Synthesis assembly and expression of immunoglobulin molecules, Nature of antigens, function and diversity, Generation of anti-body diversity.

Antigens: Different characteristics of antigens, mitogens, Hapten, Immunogen, Adjuvants.

(10 Hrs**,** 20 Marks)

UNIT-III

MHC: Discovery of MHC complex, Role of MHC, Structure of MHC molecule, Binding of peptides to MHC molecules, MHC restriction.

Effecter Mechanism of Immune Response: Cytokines, T- cell receptors, cell activation, complement system, antigen processing and presentation, regulation of immune response.

(10 Hrs**,** 20 Marks)

UNIT-IV

Immunological Techniques:- antigen- antibody reactions, Immuno diffusion, immunoelectrophoresis, ELISA, RIA, fluorescence activated cell sorter.

(10 Hrs**,** 20 Marks)

UNIT-V

Applied Immunology:- Immune system in health and disease, autoimmunity, hypersensitivity, tumor immunity, tissue and organ transplant, Synthetic vaccines.

Hybridoma technology: - Fusion of myeloma cells with lymphocytes, production of monoclonal antibodies and their application.

(10 Hrs**,** 20 Marks)

REFERENCES

1. R. A. Goldsby, T.J. Kindt, B.A. Osborne Kuby- Immunology (4th Edition)
2. Ivan Riot- Essentials of Immunology (6th Edition), Blakswell Scientific Publications, Oxford, 1988.
3. Paul W.E. (Eds.), Fundamentals of Immunology, Raven Press, New York, 1988.
4. Roitt I.M. (1998) Essentials of Immunology. ELBS, Blackwell Scientific Publishers, London.
5. Barrett J.T. (1983). Text book of Immunology. Mosby, Missouri.
6. Kuby J.(1994). Immunology., 2nd Edn. W.H.Freeman and Company, New York.

TERM WORK / PRACTICALS

Term Work Shall be based on any 08 experiments mentioned below.

1. Immunoelectrophoresis
2. Radial immunodiffusion
3. Antigen –Antibody interaction: The Ouchterlony procedure
4. Introduction to ELISA reactions
5. AIDS KIT-1: Simulation of HIV-1 detection
6. Western Blot Analysis – demo

7. Immunology of pregnancy test – demo
8.Viral antigen detection by rapid immuno-chromatographic cassette assay
9. Latex agglutination test
10. Precipitin reaction
11. Antibody titer test
12. Agglutination reaction

REFERENCE

1. Harlow and David Lane Antibodies A laboratory Manual: (1988), Cold spring harbor laboratory.
2.Talwar G.R. and Gupta S.K. (Eds.). A Handbook of Practical and Clinical Immunology, Vol. 1 and 2 (2nd Edn.). CBS Publishers and Distributors.

4. BIOSTATISTICS

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs./ Week	Paper: 100 Marks (3 Hrs)
Term Work : 2 Hrs./ Week	Term Work : 25 Marks

UNIT-I

Presentation of Data: Frequency distribution, graphical presentation of data by histogram, frequency curve and cumulative frequency curves.

Measure of Location and Dispersion: Mean, Medium, Mode and their simple properties (without derivation) and calculation of median by graphs: range, mean deviation, Standard deviation, Coefficient of variation.

(10 Hrs**,** 20 Marks)

UNIT-II

Probability and Distribution: Random distributions, events-exhaustive, mutually exclusive and equally likely, definition of probability (with simple exercises), definition of binomial, Poisson and normal distributions and their inter-relations, Simple properties of the above distributions (without derivation).

(10 Hrs**,** 20 Marks)

UNIT-III

Correlation and Regression: Bivariate data – simple correlation and regression coefficients and their relation, Limits of correlation coefficient, Effect of change of origin and scale on correlation coefficient, Linear regression and equations of line of regression, Association and independence of attributes.

Sampling: Concept of population and sample, Random sample, Methods of taking a simple random sample. **(10 Hrs, 20 Marks)**

UNIT-IV

Tests of Significance: Sampling distribution of mean and standard error, Large sample tests (test for an assumed mean and equality of two population means with known S.D.); small sample tests (t-test for an assumed mean and equality of means of two populations when sample observations are independent, Paired and unpaired t-test for correlation and regression coefficients, T-test for comparison of variances of two populations, Chi-square test for independence of attributes, Goodness of fit and homogeneity of samples.

(10 Hrs**,** 20 Marks)

UNIT-V

Experimental Designs: Principles of experimental designs, Completely randomized, Randomized block and latin square designs, Simple factorial experiments of 22, 23, 24 and 32 types, Confounding in factorial experiments (mathematical derivations not required); Analysis of variance (ANOVA) and its use in the analysis of RBD.

(10 Hrs**,** 20 Marks)

REFERENCES

1. Statistical methods in biology by Norman T.J. Bailey (3rd Edition), Cambridge University Press (1995).
2. Gupta S.C. Fundamentals of Statistics. Himalaya Publishing House, New Delhi.
3. Khan. Biostatistics. Tata Mc Graw Hill Publishers.
4. Daniel W.W.(7^{TH} Edn., 1999). Biostatistics: A Foundation for Analysis in the Health. John Wiley and Sons Inc. New York.
5. Sharma N.K.(1996). Statistical Techniques. Mangal Deep Publications, Jaipur, India.

TERM WORK

Any eight assignments based on the following.

1.Mean , Median, Mode and their properties
2.Calculation of median by graphs, range, mean deviation, standard deviation and coefficient of variation.
3. Exercises on probability, bionomial distribution, Poisson and normal distribution.
4. Problems on coefficient of correlation and regression.
5. Problems on line of regression.
6. Sampling distribution of mean and standard error and Problems on large sample tests.
7. Problems on small sample tests and t- tests for correlation and regression coefficients.
8. T- tests for comparison of variances and goodness of fit.
9. Problems on experimental design.
10. Problems on analysis of variances (ANOVA) and its use in R.B.D.

5. PROCESS HEAT TRANSFER

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practicals: 2 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Oral: 25 Marks
Term Work: 25 Marks

UNIT- I:
Heat transfer by conduction in solids;
Fourier’s law of heat conduction ,steady state heat conduction through walls (single and multilayer), heat flow through cylinder ,unsteady state heat conduction ,Derivation of Fourier’s heat conduction equation in three dimensions , equation for one dimensional conduction , heat conduction through a semi infinite slab , lumped capacity method of unsteady state conduction .
Principles of heat flow in fluids.

(10 Hrs, 20 Marks)

UNIT-II:
Typical heat exchange equipment ,counter current and parallel flows, energy balances, overall heat transfer coefficient , log mean temperature difference, individual heat transfer coefficient, calculation of overall coefficient from individual coefficients , transfer units in heat exchangers.
Heat transfer to fluids without phase change.

(10 Hrs, 20 Marks)

UNIT- III:
Regimes of heat transfer in fluids, heat transfer by forced convection in laminar and turbulent flow, dimensional analysis method, use of imperials equations heat transfer by forced convection outside tubes, natural convection.
Heat transfer to fluids with phase change.
Dropwise and film type condensation, coefficient for film type condensation, practical use of Nusselt’s equations, application to petroleum industries

(10 Hrs, 20 Marks)

UNIT- IV:
Heat transfer to boiling liquids:
Boiling of saturated liquids maximum flux and critical temperature drop, maximum Flux and film boiling.
Radiation heat transfer:
Fundamental of radiation, black body radiation, Kirchoff’s law, radiant heat exchange between non black surfaces. Combined heat transfer by conduction, convection, radiation.

(10 Hrs, 20 Marks)

UNIT- V:

Heat exchange equipments:

Heat exchanger single pass 1-1 exchanger, 1-2 shell and tube heat exchanger, correction for LMTD for cross flow, design calculation (Kern Method) in heat exchanger.

Evaporation:

Liquid characteristics and types of evaporator, single effect evaporator calculation, pattern of liquor flow in multiple effect evaporators.

(10 Hrs, 20 Marks)

REFERENCES

1.W.L.McCabe and J.C.Smith , Unit operations in chemical engineering. McGraw Hill/Kogakusha Ltd.

2.Coulson & Richardson , Chemical engineering. – Volume. I , Pergamon Press

3.Kern D.Q. Process Heat Transfer, McGraw Hill Book 1NC New York, 1950

4.D.S.Kumar, Process Heat Transfer, S.K.Kataria and Sons Publisher, New Delhi

5.Dawande S.D. Principals of Heat Transfer and Mass Transfer. Central Techno Publications, Nagpur.

TERM/PRACTICALS

Term Work Shall be based on any 08 experiments mentioned below.

1) Conductivity of metals and / or insulator.
2) Experiment on Pin fins.
3) Experiment on forced convection apparatus.
4) Experiment on natural convection apparatus.
5) Determination of emmisivity of test plate.
6) Stefan Boltzman apparatus .
7) Parallel / counter flow heat exchanger.
8) Study of pool boiling phenomenon and critical heat flux.
9) Study of heat transfer in evaporator .
10) Temperature profile in a rod .
11) Study of evaporators .
12) Dropwise and filmwise condensation .

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<u>NORTH MAHARASHTRA UNIVERSITY,</u>

<u>JALGAON (M.S.)</u>

THIRD YEAR ENGINEERING(T.E.)

BIOTECHNOLOGY

TERM – I & II

W.E.F. 2008-2009

NORTH MAHARASHTRA UNIVERSITY, JALGAON

STRUCTURE OF TEACHING & EVALUATION

T.E. (BIOTECHNOLOGY) W.E.F.2008-2009

First Term

Sr. No.	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Bio Process Principles	04	--	03	100	25	--	--
2	Chemical Reaction Engineering	04	04	03	100	25	--	50
3	Mass Transfer-I	04	04	03	100	25	50	--
4	Molecular Biology & Genetic Engineering	04	04	03	100	25	--	25
5	Enzyme Engineering	04	--	03	100	25	--	--
		20	12		500	125	50	75
	Grand Total	32			750			

Second Term

Sr. No.	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Instrumentation & Process Control	04	02	03	100	25	--	25
2	Biological Thermodynamics	04	02	03	100	25	--	--
3	Mass Transfer-II	04	04	03	100	25	50	--
4	Biotechnology of Waste Treatment	04	04	03	100	25	--	25
5	Fermentation Biotechnology- I	04	--	03	100	25	--	--
6	Practical Training/Mini Project/Special Study	--	--	--	--	25	--	--
		20	12		500	150	50	50
	Grand Total	32			750			

T.E. BIOTECH TERM I

1. BIOPROCESS PRINCIPLES

Teaching Scheme:	Examination Scheme
Lecturers: 4Hrs/week.	Paper: 100 marks (3Hrs)
	Term work: 25 marks

Unit: I

Introduction: Bioprocess development, Material balance: Procedure for material balance calculations, material balances – worked examples, Material balance with recycle, By pass and purge systems, Growth stoichiometry and elemental balance. Biomass yield, Theoretical O_2 demand, worked out examples on above**,** Energy Balance: Procedure for energy balance calculations without and with reaction, worked out examples, Energy balance equation for cell culture, Fermentation energy balance, worked out examples, Unsteady state material and energy balance (USMEB): Unsteady state material balance equations, unsteady state energy balance equations and worked examples on USMEB.

(10 Hrs, 20 Marks)

Unit: II

Heat transfer in Bioprocess: Design equation for heat transfer process, Energy balance, Logarithmic and arithmetic mean temperature difference, Calculation for heat transfer coefficient for flow outside tubes, without phase change and for stirred liquids, Applications of design equations, Relationship in between heat transfer, cell concentrations and stirring conditions, Numerical based examples on above.

Mass transfer in Bioprocess: Role of diffusion in bioprocessing, Different equations in mass transfer (liquid-solid, liquid-liquid and gas-liquid) , Oxygen uptake in cell culture: Factors affecting cellular oxygen demand, Oxygen transfer from gas bubble to cells, Oxygen transfer in fermenter, measuring dissolved oxygen concentrations, Measurement of K_La: Oxygen balance method, Gassing out techniques (static method of Gassing out and dynamic method of Gassing out) Sulphite oxidation, Factors affecting K_La, Oxygen transfer in large vessels, Numerical based examples on above.

(10 Hrs, 20 Marks)

Unit: III

Fermentation broth: Viscosity, Viscosity measurement, types of viscometers, uses of viscometer with fermentation broths, Rheological properties of fermentation broths, Factors affecting broth viscosity (Cell concentration, cell morphology, and osmotic pressure, product and substrate concentrations).

Mixing in Fermenters: Mechanism of mixing, Assessing mixing effectiveness, estimation of mixing time, Power requirement for mixing: Ungassed Newtonian fluids, ungassed non-Newtonian fluids, Gassed fluids, Calculation of power requirements, Scale up of mixing systems, Improving mixing in Fermenters, Effect of rheological properties on mixing, Role of shear in stirred fementers: Interaction between cells and turbulent eddies, Bubble shear, operating conditions for shear damage.

(10 Hrs, 20 Marks)

Unit: IV

Kinetics of Substrate utilization, product formation and biomass production in cell cultures, General reaction kinetics for biological systems: Zero order kinetics, First order kinetics, Numerical based examples on this, Yields in cell cultures: Overall and instantaneous yields, Theoretical and observed yields, Numerical based examples on this. Cell growth kinetics: Batch growth kinetics, kinetics of balanced growth, Monod growth kinetics, factors affecting growth kinetics with plasmid instability, kinetic implication of endogenous and maintenance metabolisms, transient growth kinetics, unstructured batch growth model, Growth of filamentous organisms, structured kinetic model, Product formation Kinetics: unstructured model, chemically structured product formation kinetics, model, product formation kinetics by filamentous organisms, segregated kinetics models of growth and product formation, Biomass production: Biomass yield from substrate, Kinetics of cell death, Numerical based examples on this.

(10 Hrs, 20 Marks)

Unit: V

Heterogeneous reactions in bioprocessing, Concentration gradient and reaction rates in solid catalyst: True and observed reaction rates, Interaction between mass transfer and reaction, Mass transfer and reaction: Steady state shell mass balance, first order kinetics and spherical geometry, zero order kinetics and spherical geometry, Michaelis-Menten Kinetics and spherical geometry, Prediction of observed reaction rates, The Thiele modulus and effectiveness factor: Zero order kinetics, First order kinetics, Michaelis-Menten Kinetics, The observable Thiele Modulus, Weiss's criteria, Minimum intracatalyst substrate concentration, External mass transfer, Liquid-solid mass transfer correlations: Free moving spherical particles, Spherical particles in packed bed, Minimizing mass transfer effect: Internal mass transfer and external mass transfer, Evaluation of true kinetic parameters, General comments on Heterogeneous reaction in bioprocessing.

(10 Hrs, 20 Marks)

References

1. Pauline M. Doran, Bioprocess Engineering Principles, Academic Press an Imprint of Elsevier.
2. James E. Bailey, David F. Ollis, Biochemical Engineering Fundamentals, Mc Graw-Hill Book Company.
3. Michael L. Shuler, Fikret Kargi, Bioprocess Engineering, Basic concepts, Prentice Hall India Pvt. Ltd., New Delhi.
4. J. F. Richardson and D. G. Peacock, Coulson and Richardson's Chemical Engineering (Vol: 3) Asian Books Pvt. Ltd., New Delhi.
5. Murray Moo-Young, Comprehensive Biotechnology (Vol: 1), Pergamon Press, An imprint of Elsevier.

Term Work shall be based on the following assignments:

1. Material and Energy balances in Bioprocesses
2. Unsteady state material and Energy balances and fermentation energy balances
3. Heat and Mass transfer in bioprocesses
4. Oxygen transfer in fermenter

5. Fermentation broth(Viscosity and Rheological properties)
6. Mixing in fermenter
7. Kinetics of Substrate utilization, product formation and biomass production in cell Cultures
8. Heterogeneous reactions in bioprocesing

2. CHEMICAL REACTION ENGINEERING

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs. / Week	Paper: 100 Marks (3 Hrs)
Practical: 4 Hrs. / Week	Oral: 50 Marks
	Term Work: 25 Marks

Unit: I

Introduction to chemical reaction engineering: Review of chemical reaction equilibrium, Classification of chemical reaction, rate of reaction, order and molecularity of reaction, rate constant, Temperature dependent term of rate equation, comparison of theories, Activation energy and temperature dependency, rate of reaction predicted by theories, Reaction mechanism.

(10 Hrs, 20 Marks)

Unit: II

Collection and interpretation of kinetic data, Constant volume batch reactor, integral and differential method of analysis of data, Variable volume batch reactor, integral and differential method of analysis of data, The search for rate equation.

(10 Hrs, 20 Marks)

Unit: III

Ideal batch reactor, mixed flow reactor, plug flow reactor, space time and space velocity, holding time and space time for batch, mixed and plug flow reactors, comparison in mixed and plug flow reactors, Combined flow system, Recycle reactor, Autocatalytic reaction, Introduction to multiple reactions: Series and parallel reactions. Introduction to non-ideal flow.

(10 Hrs, 20 Marks)

Unit: IV

Introduction – Rate equations for heterogeneous systems, Contacting patterns in Two – Phase system, Introduction to fluid particle reaction non-catalytic reactions, unreacted core model for Spherical particle of unchanging size, Rate of reaction for shrinking spherical particles, Determination of rate controlling step, Various contacting patterns in fluid solid reactors for fluid-particle non-catalytic reactions

(10 Hrs, 20 Marks)

Unit: V

Introduction to solid catalyzed reactor, Rate equation for adsorption, desorption and surface reaction, Diffusion and reaction in spherical catalyst pellets, Internal effectiveness factor, Over all effectiveness factor, Estimation of diffusion and reaction limited regimes, Mass transfer and reaction in a packed bed, The determination of limiting situation from reaction data, Introduction to heterogeneous catalytic reactors with applications.

(10 Hrs, 20 Marks)

References

1. Octave Levenspiel, Chemical reaction engineering, John Wiley and sons.
2. J.M. Smith, Chemical engineering kinetics, McGraw Hill
3. S.D. Dawande, Principles of reaction engineering, Central Techno publication, Nagpur.
4. H.Scott Fogler, Elements of chemical reaction engineering, Prentice Hall New Jersy.
5. Lanny D. Schimdt , Chemical reaction engineering, Oxford University Press.

Practical and Term work shall consist of minimum eight experiments from list given below.

1. To determine the reaction rate constant {k} for given reaction.(CSTR / BATCH / SEMIBATCH / PFR)
2. To determine the effect of temperature on reaction rate constant. .(CSTR / BATCH / SEMIBATCH / PFR)
3. To determine the activation energy {E} for the given reaction. .(CSTR / BATCH / SEMIBATCH / PFR)
4. To draw C [t], E [t] and F [t] curve and to calculate the mean residence time {tm} variance { σ^2} and skew ness { S^3} for plug flow reactor.
5. To draw C [t], E [t] and F [t] curve and to calculate the mean residence time {tm} variance {σ^2} and skew ness {S^3} for packed Bed reactor.
6. To study the cascade CSTR.
7. To study the reaction of solid liquid system for an instantaneous reaction for benzoic acid, NaOH and calculate the enhancement factor.
8. To study the isothermal decomposition of ethyl alcohol in tubular reactor packed with activated alumina catalyst.
9. Adsorption: To study the adsorption of Acetic acid on charcoal.

3. MASS TRANSFER-I

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs. / Week	Paper: 100 Marks (3 Hrs)
Practical: 4 Hrs. / Week	Practical: 50 Marks
	Term Work: 25 Marks

Unit: I

Introduction to mass transfer operations, Steady state molecular diffusion in fluid at rest, Multicomponent mixture diffusion, Maxwell's law of diffusion. Diffusion in solids, unsteady state diffusion

(10 Hrs, 20 Marks)

Unit: II

Eddy (turbulent) diffusion: Relation between mass transfer coefficients. Mass transfer coefficient in laminar and turbulent flow. Theories of mass transfer. Equipments for gas liquid operation

(10 Hrs, 20 Marks)

Unit: III

Equilibrium for mass transfer process: Local two phase mass transfer. Local overall mass transfer coefficient, Use of local overall coefficient. Material balances for steady state co current, countercurrent, cross flow cascade, counter flow cascade. Application of mass transfer processes.

(10 Hrs, 20 Marks)

Unit: IV

Introduction to Gas Absorption Operation: Equilibrium solubility of gases in liquids. Material balance for one component transferred in countercurrent flow and co current flow. Countercurrent multistage operation, one component transferred. Continuous contact equipment. Introduction to multi component system. Absorption with chemical reaction. Different absorption operation equipments (plate tower, packed tower, venturiscrubber) Operational difficulties like coning weeping, dumping, priming, flooding in plate and packed tower.

(10 Hrs, 20 Marks)

Unit: V

Introduction to Humidification: Vapour liquid equilibrium, Humidification terms. Determination of humidity, Humidification and dehumidification. Water cooling operation equipment. Introduction to Drying operation: Rate of drying, Mechanism of moisture movement during drying, Drying equipments, Different methods of drying

(10 Hrs, 20 Marks)

Practicals and term work shall be based on experiments mentioned below.

1. Diffusion in Still Air: To estimate mass transfer coefficient for given system at room temperature.
2. Liquid – Liquid Diffusion: To determine diffusion coefficient for given system as function of concentration.
3. Solid – Liquid Diffusion: To determine mass transfer coefficient for dissolution of benzoic acid without chemical reaction.
4. Wetted Wall Column: To determine mass transfer coefficient for air – water system.
5. Absorption in Packed Column: To find mass transfer coefficient of given system.
6. Cooling Tower: To determine volumetric mass transfer coefficient for air – water system.
7. Natural Drying (Batch): To obtain drying curve for batch drying operation.

8. Fluidized Bed Dryer: To determine the rate of drying and to obtain mass transfer coefficient for the given material.

References:

1. R.E.Treybal , Mass transfer operation ,McGraw Hill Publication
2. Coulson and Richardson Chemical Engineering (Vol. I and II), Pergamon Press
3. Christie J.Geankoplis ,Transport Processes and Unit Operations ,Prentice Hall inc
4. P. Chattopadhayay ,Unit operation in Chemical Engg. (Vol. I and II), Khanna Publications Delhi.

4. MOLECULAR BIOLOGY AND GENETIC ENGINEERING

Teaching Scheme:	Examination Scheme
Lecturers: 4Hrs/week.	Paper: 100 marks (3Hrs)
Term work: 4Hrs/week	Oral: 25 marks
	Term work: 25 marks

Unit: I

Introduction, Replication, DNA repair and DNA recombination:

C-value paradox, organization of genes (overlapping genes, antigens), central dogma, one gene – one polypeptide hypothesis. Replication: Enzymes and proteins involved in DNA replication: Structure and functions of DNA polymerase I,II,III, primase, polynucleotide ligase, endonuclease, helicase, single stranded binding proteins, topoisomerase. Types of DNA replication: Semi conservative method of replication, Meselson and Stahl experiment, bidirectional DNA replication, generalized model for the DNA replication, replication of E.Coli and eukaryotes chromosomes. DNA repair: Mismatch repair, base-excision repair, nucleotide excision repair, direct repair. DNA recombination: Homologous genetic recombination, site –specific recombination. Enzymes in DNA recombination

(10 Hrs, 20 Marks)

Unit: II

Gene expression

Transcription: RNA polymerase of prokaryotes and Eukaryotes (structure, types and function), transcription factors, Basal transcription factors, mechanism of transcription in eukaryotes and prokaryotes, Eukaryotic promoters, the enhancers.

RNA processing: Introduction, processing of the ribosomal RNA, transfer RNA, and the messenger RNA (eukaryotic),RNA splicing by group 1 and group 2 introns (mechanism).

Translation:-Genetic code; wobble hypothesis, ambiguity, degeneracy, universality of the genetic code. Protein synthesis:-Structure of Ribosome, t –RNA, messenger RNA. Steps in the protein synthesis: Activation of the amino acids, initiation (formation of amino acyl t –RNA), Elongation; termination and release, folding and post translational processing

(10 Hrs, 20 Marks)

Unit: III

Regulation of gene expression in prokaryotes and eukaryotes:

Introduction, levels of DNA regulation:-DNA replication in gene regulation, regulation of the transcription, Operon concepts (lac, tryptophan and arabinose operon) regulatory proteins, DNA binding proteins (zinc finger and helix –turn- helix), protein binding domains (leucine-Zipper and basic helix -loop-helix), Regulation of translation, regulation of genes expression in eukaryotes.

(10 Hrs, 20 Marks)

Unit: IV

Genetic engineering

Introduction, Brief outline of the genetic engineering (rDNA)

Properties of good vectors, vectors used in genetic engineering: plasmid vectors (PBR 322, PUC plasmids, M13 vectors), cosmids, bacteriophages, yeast artificial chromosomes, bacterial artificial chromosomes. Enzymes used in genetic engineering: Restriction endonuclease (type I, II and III), DNA ligase, DNA polymerase, Reverse transcriptase, polynucleotide kinase, terminal deoxynucleotidyl transferase, alkaline phosphatase. Integration of the DNA insert into the vector: Both ends of the cohesive and the compatible, Both ends cohesive and separately matched, Both ends cohesive and mismatched, both ends flush / blunt one end cohesive and compatible.

(10 Hrs, 20 Marks)

Unit: V

Construction of the DNA libraries: Isolation and purification of nucleic acids, isolation of plasmids, construction of the genomic and cDNA libraries, methods of gene transfer: direct transformation (polyethylene glycol, Ca++, microinjection, nuclear transplantation), Using vectors (Ti plasmids in plants,SV40 vectors for animals), using viruses (cauliflower mosaic virus, Gemine virus, papilioma virus, retro virus), Gene transfer in bacteria (conjugation, transformation and transduction), analysis and expression of cloned gene ,Gene amplification ,PCR and its application: Basic PCR and inverse PCR, molecular probes and its application, Labeling of probes: radioactive and non radioactive probe labeling.

(10 Hrs, 20 Marks)

References:

1. B.D. Singh, Genetics –Rastogi publication
2. Lehninger , Principles of the biochemistry- Nelson MacMillan press
3. B.D. Singh Basic biotechnology , Kalyani Publisher.
4. Primrose S. B. Principles of gene manipulation- Blackwell scientific publication
5. Bruse Albertis , Molecular biology of the cell , Garland publication.

Practical and Term work shall consist of minimum eight experiments from list given below .

1. Isolation of genomic DNA from bacteria.
2. Isolation of RNA from yeast.
3. Isolation of total plasmid DNA from bacteria.
4. Restriction digestion of genomic DNA of bacteria.
5. Ligation of bacterial DNA.

6. Calculation of molecular weight by using DNA marker with agrose gel electrophoresis.
7. DNA extraction from Blood.
8. Plasmid preparation.
9. DNA fingerprinting (by RFLP)
10. To study Bacterial transduction.

References:
1. S. Harisha. An Introduction to Practical Biotechnology. Laxmi Publications (P) Ltd. New Delhi.
2. Aneja K.R.(2nd Edn., 1996). Experiments in Microbiology, Plant pathology, Tissue Culture and Mushroom Cultivation. Wishwa Prakashan, New Age International (P) Ltd.
3. Plummer David T. "An Introduction to Practical Biochemistry", Tata McGraw-Hill Pubblishing Co. Ltd., New Delhi.
4. Jayraman J. A Laboratory Manual in Biochemistry. New Age International Publishers

5. ENZYME ENGINEERING

Teaching Scheme:
Lecturers: 4Hrs/week.

Examination Scheme
Paper: 100 marks (3Hrs)
Term work: 25 marks

Unit: I
Introduction, Nomenclature and classification of enzyme, Chemical nature and properties of enzymes: General basis of catalysis (Activation energy), Thermodynamic definition of enzyme catalysis, Binding energy, Transition state, Specificity (Substrate Specificity , Stereo specificity and Geometric specificity), Active site, allosteric site. Structure and Function of some cofactor and coenzymes. Factors effecting enzymes activity, Models of enzyme activity: Lock and key model, Induced fit, Substrate Strain model. Isoenzyme, with example and its application.

(10 Hrs, 20 Marks)

Unit: II
Kinetics of enzyme:
Enzyme kinetics, rate equation, Rate of reaction, First order and second order reaction, Michaelis – menten equation (Steady state kinetics) and Haldane relationship, Significance of Km, Lineweaver – Burk or Double – reciprocal plot, Eadie-Hofstee plot, Hanes plot, Turnover number, Specificity constant, Bisubstrate reaction, Inhibition kinetics : Reversible inhibition (Competitive, uncompetitive and Mixed inhibition) with kinetics, Irreversible inhibition, Application of enzyme inhibition, Regulation of enzyme activity (coarse control and fine control) and it's types, Allosteric enzymes, Kinetic properties of Allosteric enzymes , models for allosteric behaviors (MWC model and KNF model), Feedback inhibition, Cascade system (Genetic regulation) ,Numerical on above kinetics.

(10 Hrs, 20 Marks)

Unit: III

Enzymatic catalysis**:**

Catalytic mechanism : Acid-base catalysis, Covalent catalysis, Metal ion catalysis, Electrostatic catalysis, Proximity and Orientation effects, preferential binding of the transition state complex, Mechanism and action of some enzymes: chymotrypsin, RnaseA, Lysozyme, Hexokinase, Enolase, Lactate dehydrogenase, Alcohol dehydrogenase, Glutathione reductase, Pyruvate dehydrogenase.

Bisubstrate or Multisubstrate reaction: Ping – Pong mechanism, sequential mechanism, (Compulsory ordered and Random ordered), Enzyme model

(Host guest complexation chemistry).

(10 Hrs, 20 Marks)

Unit: IV

Immobilization of enzymes**:**

Techniques of enzyme Immobilization : Adsorption, Covalent linkage, Matrix entrapment, Encapsulation with example, Kinetics of immobilized enzyme, effect of solute Partition and diffusion on the kinetics of immobilized enzymes, Immobilized enzyme in bioconversion process (Production of L-amino acid from racemic mixture), Bioreactors using immobilized enzymes.

Enzyme Purification –

Introduction, objective in enzyme Purification, Steps involved in enzyme purification: Choice of source, Method of homogenization, Methods of separation: Depends on size or mass (Centrifugation, Gel filtration), Method depend on Polarity (Ion-exchange, electrophoresis, Iso-electric focusing), depends on changes in solubility (change in pH, ionic strength, Dielectric constant), Based on specific binding (Affinity chromatography)

Example of purification procedure (Adenylate kinase, RNA polymerase).

(10 Hrs, 20 Marks)

Unit: V

Enzyme engineering and Industrial uses of enzymes:

Design and construction of novel enzymes (protein engineering), Artificial Enzymes, Enzymes used in detergents, use of Proteases in food, Leather and wood industries, methods involved in production of Glucose syrup from starch, production of maltose and sucurose, glucose from cellulose, Use of Lactase in dairy industry, glucose oxidase and catalase in food industry, medical application of enzymes, Enzymes in biosensors.

(10 Hrs, 20 Marks)

References:

1. Lehninger, Nelson and cox. Principles of Biochemistry –Macmillan publishers.
2. Voet and Voet, Biochemistry, Wiley publisher.
3. Biotol series, Principles of Cell energetics , Butterworth- Heinemann Ltd,Jordan Hill, Oxford.

4. Biotol Series, Principles of enzymology and its application, Butterworth-Heinemann Ltd,Jordan Hill, Oxford.
5. Nicholascprice and Tewis stereous, Fundamentals of Enzymology, Oxford University press.
6. Palmer, Enzymes, Oxford University press.
7. Michael L. Shuler, Fikret Kargi, Bioprocess Engineering, Basic concepts, Prentice Hall India Pvt. Ltd., New Delhi.. .
8. J. F. Richardson and D. G. Peacock, Coulson and Richardson’s Chemical Engineering (Vol: 3) Asian Books Pvt. Ltd., New Delhi
9. Murray moo-young, Comprehensive Biotechnology Pergemon Press(Vol 2)
10. Pauline M. Doran, Bioprocess Engineering Principles, Academic Press an Imprint of Elsevier.
11. James E. Bailey, David F. Ollis, Biochemical Engineering Fundamentals, Mc Graw-Hill Book Company.

Term work shall be based on following assignments:

1. Enzymes: Nomenclature, Classification and Properties.
2. Enzyme Kinetics: Michaelis – Menten Equation and evaluation of parameters of Michaelis – Menten Equation.
3. Inhibition kinetics of enzyme.
4. Enzymatic catalysis.
5. Bisubstrate or Multisubstrate reaction.
6. Immobilization of enzyme.
7. Enzyme purification.
8. Enzyme engineering and Industrial application of enzymes.

T.E. BIOTECH TERM II

1. INSTRUMENTATION AND PROCESS CONTROL

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs. / Week	Paper: 100 Marks (3 Hrs)
Practical: 2 Hrs. / Week	Oral: 25 Marks
	Term Work: 25 Marks

Unit: I

Qualities of Measurement: The meaning of measurement, the elements of instruments, Static Characteristics, Dynamic characteristic. Expansion Thermometers: Introduction, Temperature scales, Constant volume gas thermometer, Bimetallic Thermometer, Industrial pressure spring thermometer, Response of Thermometer.

Thermoelectric Temperature Measurement: Introduction, Simple thermocouple circuit, Industrial thermocouples, Thermocouple lead wires, thermal wells, response of thermocouples. Resistance Thermometer: Introduction, Industrial resistance-thermometer bulbs, Resistance Thermometer element, Resistance thermometer circuit, RTD.

(10 Hrs, 20 Marks)

Unit: II

Pressure and Vacuum Measurement: Introduction, Indicating pressure gage, Bellows pressure element, Useful ranges of absolute pressure measuring gages, Mclead vacuum gage.

Measurement of Level: Float and tape liquid level gage, Float and shaft liquid level unit, Level measurement in pressure vessels, Gamma ray method, Ultrasonic method and resistive method.

Introduction, Theory, Instrumentation, advantages, and Application of: pH measurement, Refractrometry, Potentiometry, colourometry and Flame photometry.

(10 Hrs, 20 Marks)

Unit: III

Characteristics of Chemical Process Control, Mathematical Modeling of Chemical Processes, State Variables and State Equation for Chemical Processes. Input –Output Model, Linearization of non linear systems, Solution of Linear differential equation using Laplace Transform.

First order system and their transfer functions. Dynamic behavior of first order system , Pure capacity process, First order system with variable time constant and gain, Response of first order system in series :Interacting and Non-interacting.

(10 Hrs, 20 Marks)

Unit: IV

Second order system and their transfer function. Dynamic behavior of second order system: under damped and over damped and critically damped systems, Transportation lag. Higher order systems.

(10 Hrs, 20 Marks)

Unit: V

Introduction to feedback control, Controllers and final control elements. Control action block diagram of chemical reactant control systems.

Dynamic behavior of feedback control processes: P, PD, PI, and PID.

Stability analysis by Routh criteria, Root Locus Diagram

Frequency response analysis of linear processes: Bode's diagram, Nyquist plots.

(10 Hrs, 20 Marks)

Reference:

1. D.P.Eckman, Industrial Instrumentation, Willey Eastern Ltd., New Delhi.
2. Patranabis D. Industrial Instrumentation, Tata – Mcgraw Hill Publications, New Delhi.
3. Gurdeep Chatwal and Sham Anand, Instrumental methods of Chemical analysis, Himalaya publication House, Mumbai.
4. V.P. Kudesia and S.S. Sawhaney, Instrumental methods of chemical analysis Pragati Prakashan, P.O.Box No. 62, Begum Bridge,Meerut250001,U.P.
5. Nakra B.C. and K.K. Chaudhary, Instrumentation Measurement and Analysis, Tata – McGraw Hill, New Delhi.
6. B.K.Sharma.Goel, Instrumentation methods of chemical analysis, Publishing House,11,Shivaji Road, Meerut-250001,U.P.
7. George Stephanpolous, Chemical Process Control, Prentice Hall of India.
8. D.R. Coughnour, Process System Analysis and Control, McGraw-Hill.
9. R.P.Vyas, Process Control and Instrumentation {2nd edition}. Central Techno publication, Nagpur.
10. K. Krishnaswamy, Process Control, New age International.

Practical and term work shall consist of minimum eight experiments given below.

1. To study the response of bimetallic thermometer.
2. Calibration of thermocouple.
3. To measure the pH of given solution..
4. To determine concentration of given solution by colorimeter
5. Flame photometry
6. Abbey's refractometer
7. Dynamic behavior of first order system: Single tank system.
8. Dynamic behavior of first order system in series: Two tank non-interacting system.
9. Two tank interacting system.
10. Dynamic behavior of second order system: Mercury Manometer
11. Dynamic behavior of final control Element: Pneumatic control valve.
12. Study of Pneumatic controllers: Proportional Controller/ Proportional Derivative Controller/ Proportional Integral Controller/ Proportional Integral Derivative Controller

2. BIOLOGICAL THERMODYNAMICS

Teaching Scheme:
Lecturers: 4Hrs/week.
Term work: 2Hrs/week

Examination Scheme
Paper: 100 marks (3Hrs)
Term work: 25 marks

Unit: I
Introduction:
Distribution of energy, system boundary and surroundings, energy and biological world, energy flow (transformation), mass and energy recycling, energy conversions, energy (nutritional) requirements of living systems, cell structure and division of labor in cells, metabolism (anabolism, catabolism), energy relations between catabolic and anabolic pathways, intermediary metabolism, three types of non linear metabolic pathways, Energy production and consumption in metabolism, flow of electrons in organisms, energy coupling reactions, activation energy(enzyme reaction), living cells as self regulating chemical engines, assembly of information macro molecules .

(10 Hrs, 20 Marks)

Unit: II
Biological Thermodynamics Concepts:
Types of systems, biological thermodynamics, zeroth law and first law of thermodynamics, internal energy, enthalpy, Hess's law, entropy and second law of thermodynamics, entropy in biological world, Gibb's free energy, Gibb's and Helmholtz function(derivation), relation between Gibb's energy and equilibrium, standard free energy change in biochemical reactions, additive nature of standard free energy with examples, effect of pH and temperature on Gibb's function and equilibrium, third law of thermodynamics, thermodynamic aspects of protein folding, thermodynamics of renaturation and denaturation of DNA, Thermodynamics of transport systems through membranes.

(10 Hrs, 20 Marks)

Unit: III
Energy Currency:
Structure and properties of ATP, ADP and AMP, ATP-hydrolysis and free energy change, calculation of ultimate standard free energy change during ATP-hydrolysis, standard free energy of hydrolysis of phosphate containing compounds (4 examples), energy production by group transfer (ATP), ranking of biological phosphatic compounds in cell, nucleophilic displacement reaction of ATP, ATP and active transport system, ATP and muscle contraction, conditions affecting the standard free energy change of hydrolysis of ATP, dynamics of phosphate group turnovers in cell, Transphosphorylation between nucleotides, inorganic polyphosphate, requirement of ATP (energy currency) in signal transduction processes (Insulin receptor, Epinephrine cascade) and others.

(10 Hrs, 20 Marks)

Unit: IV
Oxidation – Reduction:
Thermodynamics and compartmentalization, biological oxidation and reductions, flow of electrons to do biological work, conjugate redox pair, electrochemical cell, electromotive force (emf), electrode potential, standard reduction potential measurement, standard

reduction potentials of some biological important half reactions, standard potentials and Gibbs free energy , standard reduction potential to calculate free energy change, effect of concentration, pH, temperature on redox potential, structure and function of electron carriers in cells: NADH, NADPH, FADH, FMN.

(10 Hrs, 20 Marks)

Unit: V

Oxidative Phosphorylation and photophosphorylation:

Structure of mitochondria, electron transport system through complex I, II, III and IV in detail with structure, proton gradient and proton-motive force, ATP synthesis (chemiosmotic model), structure of ATP synthetase, mechanism of ATP synthesis by ATPase, shuttle system (malate aspartate shuttle, glycerol 3-phosphate shuttle), regulation of oxidative phosphorylation .

Photosynthesis: Introduction, ultra-structure of chloroplast, primary and secondary photo-pigments, Hills reaction, light dependant reactions, cytochrome complex, Photo system I and II, ATP synthesis by photophosphorylation, stoichiometry of photophosphorylation, carbon fixation reaction or dark reaction.

(10 Hrs, 20 Marks)

Reference:

1. Lehninger, Nelson and cox. Principles of Biochemistry Macmillan publishers.
2. Voet and Voet, Biochemistry, wiley publisher.
3. Biotol series, Principles of Cell energetics , Butterworth- Heinemann Ltd,Jordan Hill, Oxford.
4. Robert K.Murray, Daryl K.Granner, Harpers Illustrated Biochemistry, Mc Graw Hill.
5. Lubert Strayer, Jeremy M.Berg, Biochemistry , W.H.Freeman and Company. Newyork.
6. K.V.Narayan, Chemical Engineering Thermodynamics, PHI.

Term work shall consist of any eight assignments from the following

1. Enthalpy and First law of thermodynamics.
2. Entropy and second law of thermodynamics.
3. Calculation of Standard Gibbs free energy in biological reaction.
4. Energy production during metabolism.
5. Study of Energy Currency in Living organism.
6. Biological oxidation-reduction reaction.
7. Calculation of Standard electrode potential in biological system.
8. Oxidative Phosphorylation
9. Photophosphorylation.

3. MASS TRANSFER-II

Teaching Scheme:
Lectures: 4 Hrs. / Week
Practical: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Practical: 50 Marks
Term Work: 25 Marks

Unit: I
Introduction to distillation process, Vapor liquid equilibrium, The methods of distillation (Binary mixture), The fractionating column, Condition for varying overflow in non-ideal system(Binary), Batch distillation, Multi component mixture, Azeotropic, extractive and steam distillation, Introduction to distillation equipments.

(10 Hrs, 20 Marks)

Unit: II
Introduction to extraction process, Liquid equilibria, Material balances for stage wise contact methods, Extraction with reflux, Fractional extraction, Stage contact and continuous contact type extractors.

(10 Hrs, 20 Marks)

Unit: III
Introduction to crystallization, Growth and properties of crystals, Effect of impurities in crystallization, Effect of temperature on solubility, Fractional crystallization, Caking and yield of crystals, Different type of crystallizers.

(10 Hrs, 20 Marks)

Unit: IV
Introduction to adsorption operation, Type of adsorption operation, Nature of adsorbents, Adsorption equilibria, Adsorption of vapor, gas mixture and liquids, Material balances for stage wise for operation, Continues contact process for adsorption, Unsteady state fixed bed adsorption, Principle of ion exchange operation, Equilibria for ion exchange operation, Rate of ion exchange operation, Application of ion exchange operation.

(10 Hrs, 20 Marks)

Unit: V
Introduction to leaching operation, Mass Transfer in leaching operation, Calculation of stages for different processes, Graphical method for calculation of no. of stages ,counter current washing process, Equipments for leaching operation, Introduction to membrane separation process, Different Types of membrane separation process, (Ultrafilteration , Reverse Osmosis, Dialysis, Electro Dialysis, Pervaporation), General membrane equation, Liquid membrane

(10 Hrs, 20 Marks)

Practical and Term Work shall consists of any eight experiments from the following

1. Simple Distillation: To verify Rayleigh's equation for simple distillation
2. Ternary Diagram: To construct ternary diagram for acetic acid –water – benzene
3. Tie Lines

4. Liquid – Liquid Extraction: To study and determine the efficiency of cross current liquid- liquid extraction.
5. Leaching
6. Crystallization
7. Adsorption: To study adsorption of acidic acid on activated charcoal
8. Determination of HTU, HETP and NTU
9. Spray Column
10. Ion Exchange
11. Bubble Cap Distillation
12. Study of Mass Transfer Equipments

Reference:

1. Coulson and Richardson, Chemical Engineering (Vol. II), Pergamon Press
2. R. E. Tryebal, Mass Transfer Operation, McGraw hill.
3. Christie J. Geankoplis ,Transport Processes and Unit Operations ,Prentice Hall inc
4. P. Chattopadhyay, Unit operations in Chemical Engg. Vol. I and II, Khanna Publication,New Delhi.

4. BIOTECHNOLOGY OF WASTE TREATMENT

Teaching Scheme:	Examination Scheme
Lecturers: 4Hrs/week.	Paper: 100 marks (3Hrs)
Term work: 4Hrs/week	Oral: 25 marks
	Term work: 25 marks

Unit: I
Introduction:
Introduction to waste treatment, site surveys for waste treatment programme, strengths of fermentation waste, disposal of effluents, treatment process(physical, chemical and biological),introduction to microorganisms,bacterial growth and factors affecting growth kinetics, introduction to stoichiometry and kinetics of waste treatment, important biological reactions: Aerobic heterotrophic reaction, nitrification, denitrification, anaerobic digestion.
(10 Hrs, 20 Marks)

Unit: II
Biochemistry of Waste Treatment:
Introduction, oxygen uptake, dissolved oxygen, enzymes, inhibition, nitrogen metabolism, phosphorus and sulphur, elements and growth factors, fate of individual chemicals, structure-activity relationships, multisubstrates and species interactions, biochemical indicators, precipitation in waste treatment, coagulation in waste treatment, ecology of polluted water (physical, chemical and biotic effects) in brief. Problems on measurement of dissolved oxygen.
(10 Hrs, 20 Marks)

Unit: III
Waste Treatment Processes:
Characteristics of activated sludge, theory of activated sludge process, design, operation and control, operation and design features of trickling filters , rotating biological contractor, aerated lagoons, anaerobic digestion, packed beds, land farming.

(10 Hrs, 20 Marks)

Unit: IV
Nitrification and Denitrification and Anaerobic Treatment:
Introduction, forms of nitrogen, nitrifying and denitrifying bacteria, stoichiometry of nitrification and denitrification, process variables in nitrification and denitrification process, Nitrification processes: plug flow v\s complete mix, single stage v\s two stage systems, biofilm nitrification, denitrification using methanol, organic matter and thiosulfate and sulfide. Anaerobic treatment by methanogenic method, anaerobic reactor system.

(10 Hrs, 20 Marks)

Unit: V
Biological Degradation:
Introduction, determination of biological degradability, Pilot studies: PCB (polychlorinated biphenols) biodegradation, methyl ethyl ketone, Aerobic biodegradation: TCE (trichloro ethane) degradation, polycyclic aromatic hydrocarbon degradation, oil degradation, phenanthrene degradation, Treatment scheme of some industrial waste: dairy, paper, tannery distillation, and sugar. Biodegradation of waste by fungi, anaerobic biodegradation, engineering strategies for bioremediation.

(10 Hrs, 20 Marks)

Reference:

1. Bruce E Rittmann, Rurry L.Mc carty, Environmental Biotechnology:Principles and applications (Mcgraw Hill international)
2. A.K.Chatterji, Introduction to environmental biotechnology (Eastern Economy edition)
3. Nicholas P.Cheremisinoff, Biotechnology for waste water treatment (Eastern Economy edition)
4. Murray Moo - Young, Comprehensive biotechnology, vol 4- (Pergamon Press)
5. P. F. Stanbury, A. Whitaker and S. J. Hall, Principles of fermentation technology (Aditya book private limited)

Term Work shall consists of any eight experiments from the following

1. To determine alkalinity and pH of given sample.
2. To determine total solids and suspended solids of given sample.
3. To determine dissolved oxygen of given sample.
4. To determine initial oxygen demand.
5. To determine B.O.D. of the given sample.
6. To determine C.O.D. of the given sample.
7. To determine sludge volume index of the sample.
8. To determine M.P.N test of the given water sample.
9. To study Microorganisms of the given water sample.
10. Estimation of inorganic ion in water.

11. Evaluation of the effect of process, variables in the performance of activated sludge process (DEMO) / Study of activated sludge process
12. Evaluation of performance of anaerobic digestor (DEMO)/ Study of anaerobic digester

5. FERMENTATION BIOTECHNOLOGY- I

Teaching Scheme:
Lecturers: 4Hrs/week.

Examination Scheme
Paper: 100 marks (3Hrs)
Term work: 25 marks

Unit: I
An introduction to fermentation process, Isolation methods for Industrial microorganisms, Culture preservation and stability, the improvement of industrial microorganisms.

(10 Hrs, 20 Marks)

Unit: II
Media for Industrial fermentation, Introduction ,typical media, Medium fermentation: Water, Energy sources, Carbon sources, Nitrogen sources, Minerals, Growth factors, Nutrient recycle, Buffers, Precursors, Metabolic regulators, Oxygen requirement and antifoams, Medium optimization: Animal cell media, serum, serum free media, supplement, protein free media, trace element, osmality, pH, Non-nutritional media supplements.

(10 Hrs, 20 Marks)

Unit: III
Sterilization: Introduction, Medium sterilization, Design of Batch sterilization process: Calculation of Del factor during heating and cooling, Calculation of holding time at constant temperature, Richard's rapid method for the design of sterilization cycles, the scale up of batch sterilization processes, Method of batch sterilization, Design of continuous sterilization process, Sterilization of the fermenter, Sterilization of the feeds, Sterilization of liquid wastes, Filter sterilization: Filter sterilization of fermentation media, air and fermenter exhaust air, the theory and design of depth filters.

(10 Hrs, 20 Marks)

Unit: IV
The development of Inocula for industrial fermentation: Introduction, Criteria for the transfer of inoculums, The development of inocula for yeast processes, The development of inocula for bacterial processes, The development of inocula for mycelial processes, The aseptic inoculation of plant fementers, Solid state fermentation.

(10 Hrs, 20 Marks)

Unit: V
Ageing and Death in microbes, Basic principles: Ageing of microbes, Death of microbes, Viability among microbes, Survival and populations: Cryptic growth, Injury among microbes, Stress and survival: The physiological status of the population, overt and acheal stress, Starvation: Substrate accelerated death (SAD), Metabolic and substrate injury, Thymine – Len death, survival of slowly growing bacteria, Differentiation and

survival, Effect of Environment on microbial activity: Introduction, mechanism of microorganism response to the environment, dissolved oxygen, redox potential, and response to CO_2, water activity, effects of pH, temperature and shear, General control strategies, Mixed culture and mixed substrate systems: Introduction, mixed cultures, mixed substrate, co metabolism.

(10 Hrs, 20 Marks)

References

1. P. F. Stanbury, A. Whitaker and S. J. Hall, Principle of Fermentation Technology, Aditya Books (P) Ltd, New Delhi.
2. Murray Moo-Young, Comprehensive Biotechnology (Vol: 1), Pergamon Press, An imprint of Elsevier.
3. L. E. Casida, Industrial Microbiology, New Age Industrial Publishers.
4. Pauline M. Doran, Bioprocess Engineering Principles, Academic Press an Imprint of Elsevier.

Term Work shall consist of any eight assignments from the following.

1. Isolation methods of industrial microorganisms
2. Maintenance and preservation of cultures
3. Media for industrial fermentation
4. Sterilization of media
5. Air sterilization
6. Inoculum development
7. Solid state fermentation
8. Ageing and death in microorganisms
9. Effect of environment on microbial activity

6. PRACTICAL TRAINING / MINI PROJECT / SPECIAL STUDY

Examination Scheme
Term work: 25 marks

• Every student has to undergo industrial/practical training for a minimum period of two weeks during summer vacation between (S.E Second Term) fourth and (T.E. First Term) fifth term or during winter vacation between fifth and sixth term (T.E. First Term and Second Term).
• The industry in which practical training is taken should be a medium or large scale industry.
• The paper bound report on training must be submitted by every student in the beginning of (T.E. Second Term) sixth term along with a certificate from the company where the student took training.
• The report on training should be detailed one.
• Maximum number of students allowed to take training in company should be five. Every student should write the report separately.

• In case if a student is not able to undergo practical training , then such students should be asked to prepare special study report on a recent topic from reported literature
Or
A mini project related to the Biotechnology.
Fields includes like Microbiology, Immunology, Molecular biology, Bioprocess, Biochemistry and on Enzyme technology.
Project report should be details of work, carried out by student.
• The practical training/special study/ mini project shall carry a term work of 25 marks.
Every student shall be required to present a seminar in the respective class in the presence of two teachers. These teachers (fixed by the head of department in consultation with the Principal) shall award marks based on the following:
(a) Report 10 marks
(b) Seminar presentation 10 marks
(c) Viva-voce at the time of Seminar presentation 05 marks

Total 25 marks

============XXXXX==========

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

SYLLABUS OF

FINAL YEAR ENGINEERING (B.E.)

BIOTECHNOLOGY

TERM – I and II

W.E.F. 2009-2010

NORTH MAHARASHTRA UNIVERSITY, JALGAON

STRUCTURE OF TEACHING and EVALUATION

B.E. (BIOTECHNOLOGY) W.E.F.2009-2010

First Term

Sr. No.	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Bioprocess Engineering - I	04	--	03	100	25	--	--
2	Bioprocess Modeling and Simulation	04	04	03	100	25	25	--
3	Bioseparation Processes	04	--	03	100	25	--	--
4	Elective –I	04	--	03	100	--	--	--
5	Fermentation Biotechnology-II	04	04	03	100	25	--	50
6	Project –I	--	02	--	--	25	--	25
7	Seminar	--	02	--	--	25	--	--
		20	12		500	150	25	75
	Grand Total	32			750			

Second Term

Sr. No.	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Bioprocess Engineering -II	04	04	03	100	25	--	25
2	Bioprocess Engineering and Economics	04	02	03	100	25	--	25
3	Bioinformatics	04	04	03	100	25	25	--
4	Elective –II	04	--	03	100	25	--	--
5	Project –II	--	04	--	--	100	--	50
6	Industrial Visit / Case Study	--	--	--	--	25	--	--
		16	14		400	225	25	100
	Grand Total	30			750			

Elective – I

1. Advanced Biomaterials.
2. Plant Tissue Culture and Plant Biotechnology.
3. Protein Engineering.
4. Food Biotechnology.

Elective – II

1. Metabolic Engineering.
2. Biosafety and Bioethics.
3. Biomedical Fluid Dynamics.
4. Applied Genetic Engineering

B.E.BIOTECH. TERM-I

1. BIOPROCESS ENGINEERING-I

Teaching Scheme:
Lectures: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Term Work: 25 Marks

Unit: I
Design of bioreactors and scale up:
Introduction, Basic objective in design of a reactor, aseptic operation and containment, body construction, aeration and agitation, stirrer glands and bearings, baffles design, sparger system, achievement and maintenance of aseptic conditions, valves and steam traps, types of valves and pressure control valves.
Scale up of fermenters, design condition for scale up, scale-up methods.
(10 Hrs, 20 Marks)

Unit II
Bioreactors
Types of bioreactors: Batch bioreactors, Continuous bioreactors, Semicontinuous bioreactors, Stirred tank bioreactors, Airlift bioreactor systems, Trickle bed bioreactor, Airlift external loop bioreactors, waldhof-type fermenter, Tower fermenter, Cylindro-conical vessel, Deep jet fermenters, Cyclone column, Rotating disc fermenters, Reactor dynamics: Dynamic models and stability.
Solid state fermenter: Introductions, types of solid state fermenter, few examples of bioproducts produced from solid state fermenter.
(10 Hrs, 20 Marks)

Unit III
Bioreactors configuration:
Enzyme reactors, batch growth of microorganisms, continuous culture of microorganisms, stirred tank reactor with recycle of biomass, continuous stirred tank fermenters in series, Fed batch fermenters, plug flow fermenters, problems on above, estimation of kinetic parameters (batch and continuous culture experiments).
(10 Hrs, 20 Marks)

Unit IV
Bioreactor Design Considerations:
Design consideration: Design codes, maximum working pressure, design pressure, design temperature, design stress, factor of safety, and selection of factors of safety, design of wall thickness, corrosion ratio, Poisson ratio, criteria of failure.
Materials of construction: mechanical properties, materials, corrosion, protective coating, choice of materials, corrosion prevention.
Brief introduction to pipe joints. (10 Hrs, 20 Marks)

Unit-V

Process design of bioreaction vessel: Introduction, materials of construction, agitation, classification of bioreaction vessels, heating systems, design of bioreaction vessels.
Agitators: Introduction, types of agitators, baffling, power requirements, design of turbine agitator.
(10 Hrs, 20 Marks)

REFERENCES:

1. Cooney and Humphery, Comprehensive Biotechnology, Volume-2, Elsevier Publication.
2. Syed Tanveer Ahmad Inamdar, Biochemical Engineering Principles and Concepts, , PHI Publication.
3. James E. Bailey, David F. Ollis, Biochemical Engineering Fundamentals, Mcgraw –Hill, International Edition.
4. Paulin.M.Doran, Bioprocess Engineering Principles, Elsevier Publication.
5. Michael L. Shuler, Fikret Kargi, Bioprocess Engineering - Basic Concepts, PHI Publishers.
6. P. F. Stanbury, A. Whitaker and S. J. Hall, Principles of Fermentation Technology, Aditya books, Private Limited New Delhi.
7. B.D Singh, Biotechnology- Expanding Horizons, Kalyani Publications.
8. Operational Mode of Bioreactors- Biotol series ,Elsevier Publications.
9. B.C.Bhattacharya, Introduction to Chemical Equipment Design (Mechanical Aspects), CBS publisher and Distributors, New Delhi.
10. M.V.Joshi, V.V.Mahajan, Process Equipment Design, Macmilan India Ltd.
11. S.D.Dawande, Process Design of Equipments (vol 1and2) Central Techno Publications, Nagpur.
12. J.H.Perry, Chemical Engineer's Hand Book, Mcgraw Hill, New Delhi
13. H.C.Vogel, Woyes Coulson and Richardson,Principles, Process Design of Equipment, (vol 6).

Term Work shall be based on the following assignments:

1. Design of Bioreactors and Scale up.
2. Types of Bioreactors by taking example of product produced.
3. Solid state fermenter with example of bioproduct produced.
4. Bioreactor Design consideration.
5. Pipe joints and types of pipe joints.
6. Process design of bioreaction vessel.
7. Design of Agitators.
8. Types of Agitators.

2. BIOPROCESS MODELING AND SIMULATIONS

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs. / Week	Paper: 100 Marks (3 Hrs)
Practical: 4 Hrs. / Week	Practical: 25 Marks
	Term Work: 25 Marks

Unit I

Introduction to modeling:

Introduction: Role of process dynamics and control, historical background, Laws and Languages of process control, Mathematical Modeling of Bioprocess Engineering System: Fundamentals uses of mathematical model, scope of coverage, principles of formulation; Fundamental Laws of Modeling: continuity equation, energy equation,

equation of motion, transport equation, equation of state, phase and chemical equilibrium, chemical kinetics;
Lumped parameter and distributor parameters.

(10 Hrs, 20 Marks)

Unit II

Study of mathematical models of Biochemical Engineering Systems:
Introduction, modeling of CSTRs (isothermal, constant hold up, variable hold up), Batch reactors, non isothermal CSTR, Plug flow reactor, Fluidized bed reactor, Reactors used in effluent treatments, Trickle bed reactor, Fermenter.

(10 Hrs, 20 Marks)

Unit III

Computer aided design of heat and mass transfer equipment:
Batch distillation with hold up, Ideal binary distillation column, Multicomponent nonideal distillation column, Reactor with mass transfer, Design of shell and tube heat exchangers, Double pipe heat exchangers, Design of gas dryer.

(10 Hrs, 20 Marks)

Unit IV

Biological Models:
Modeling of gene regulation, Modeling of signal transduction in prokaryotes and eukaryotes, Models for inheritance, Genetic inbreeding model, Simple logistic models, Simple prey predator models, Volterra's model of an interacting species, Microbial population models (growth model, product formation), Pharmaceutical models, Blood glucose in diabetic patients.

(10 Hrs, 20 Marks)

Unit V

Simulation:
Introduction, Computer programming, Computational methods, Runga-Kutta Method, Newton Raphson Method; Simulation of reactors, Simulation of Double pipe and Shell tube heat exchangers, Simulation for catalyst surface temperature, Simulation of rotary dryer.

(10 Hrs, 20 Marks)

REFERENCES:

1. Luyben W.L. "Process Modeling Simulation and Control for Chemical Engineers", McGraw Hill, 1988.
2. Chapra S.C., R.P. Canale, "Numerical Methods for Engineers", Tata-McGraw Hill Publications.
3. Franks R.E.G., "Modeling and Simulation in Chemical Engineering", Wiely Instscience, NY
4. John Ingam, Irving J. Dunn., "Chemical Engineering Dynamic Modeling with PC simulation", VCH Publishers.
5. J.R. Leigh, Modeling and Control of Fermentation Processes, Peter Peregrinus, London, 1987.
6. J.N.Kapur, Mathematical Models in Biology and Medicine.
7. Cooney and Humphery, Comprehensive Biotechnology,Volume-2,Elsevier Publication.

8. James E. Bailey, David F. Ollis, Biochemical Engineering fundamental, Mcgraw –Hill, International edition.
9. Pevzner, Computational Molecular Biology- An Algorithmic Approach, PHI, New Delhi.
10. Setubal, Introduction to Computational Molecular Biology, Cengage Learning PVT.
11. Vose, Simple Genetic Algorithms, The- Foundations and Theory, PHI, New Delhi.

Practical and Term work: Practical and term work shall consist of minimum eight experiments from list given below.

1) CAD of shell and tube exchanger.
2) CAD of adsorption column.
3) CAD of single effect evaporator.
4) Computer controlled heat exchanger.
5) CAD for rotary dryer.
6) Simulation of temperature on surface catalyst.
7) Simulation of reactor design.
8) Simulation of ammonia production system.
9) Modeling and simulation of protein.
10) Drug designing.

3. BIOSEPARATION PROCESSES

Teaching Scheme:
Lectures: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Term Work: 25 Marks

Unit I

Introduction and separation of particles:

Role and importance of downstream processing in biotechnology, characteristics of biological mixtures (broth), criteria of recovery process, process design criteria.

Separation of particles:

Introduction, filtration, filter media, theory of filtration, types of filters (vacuum filter, plate and frame filter, leaf filter),centrifugation, theory of centrifugation, types of centrifuge (tubular bowl centrifuge, basket centrifuge, ultra centrifuge), sedimentation, precipitation and flocculation.

(10 Hrs, 20 Marks)

Unit II

Cell disruption methods:

Introduction, types of intracellular products and importance, methods of cell disruption, physico-mechanical cell disruption: liquid shear (high pressure homogenizer), solid shear agitation and abrasives (bead mill, kinetics of bead mill), freezing - thawing, ultrasonication (ultrasonic vibrators), thermal shock, osmotic shock, chemical treatment: alkali treatment, detergent solubilization, lipid solubilization, enzymatic method.

(10 Hrs, 20 Marks)

Unit III

Extraction and Concentration:

Extraction, modes of extraction, liquid-liquid extraction, two phase aqueous extraction, super critical extraction, solvent recovery, extraction application.

Concentration of products:

Evaporation, types of evaporation, membrane process, design and configuration of membrane separator equipment, ultrafiltration, reverse osmosis, dialysis, nanofiltration, sorption, sorption mechanism, materials of sorption, modes of operation in sorption process, adsorption.

(10 Hrs, 20 Marks)

Unit IV

Purification of product:

Fractional precipitation, Chromatography: Types of chromatography: Adsorption, Ion exchange, Gel permeation, Affinity, Molecular Exclusion, High Performance Liquid Chromatography (HPLC), Gas Liquid Chromatography (GLC); Crystallization, Drying, types of drying (spray drying, vacuum drying, freeze drying), Electrophoresis: Theory of electrophoresis, gel electrophoresis, SDS-page electrophoresis, isoelectric focusing, immunoelectrophoresis.

(10 Hrs, 20 Marks)

Unit V

Formulation and Case studies:

Introduction, importance of formulation, formulation of baker's yeast, enzymes (glucose isomerase, detergent enzymes), formulation of pharmaceutical products, application research, Granulation: wet granulation, dry granulation or slugging, Tabletting: compressed tablets, tablet formulation, coating, pills, capsules, Case studies of recovery process of penicillin, cephatomycin, nuclease, citric acid, proteins, etc.

(10 Hrs, 20 Marks)

REFERENCES:

1. Biotal series, Product Recovery in Bioprocess Technology, Elsevier Publisher
2. Murray Moo-Young, Comprehensive Biotechnology (Vol: 1), Pergamon Press, An Imprint of Elsevier.
3. Michael R Ladisch, Bioseparation Engineering Principles, Practice and Economics, Wiley-Inter science
4. Syed Tanveer Ahmad Inamdar, Biochemical Engineering Principles and Concepts, , PHI Publication
5. Gary Walsh, Biopharmaceuticals: Biochemistry and Biotechnology.
6. P. F. Stanbury, A. Whitaker and S. J. Hall, Principles of Fermentation Technology, Aditya Books (P) Ltd, New Delhi
7. Belter P.A. and Cussier E, Bioseparations, Wiley, 1985.

Term Work shall be based on the following assignments:

1. Role and importance of downstream processing in biotechnology.
2. Separation of particles.
3. Cell disruption methods.
4. Extraction methods.
5. Concentration of products.
6. Chromatography and its types.

7. Electrophoresis and its types.
8. Case studies of recovery process of some bioproducts.

ELECTIVE – I
1. ADVANCED BIOMATERIALS

Teaching Scheme	Examination Scheme
Theory: 4 Hours/Week	Paper: 100 Marks (3Hrs)

Unit-I

Applications of biomaterial, tissue engineering for artificial organs, Types of biomaterials and their applications for the human body, issues of biocompatibility and its evaluation, Surface characterization of biomaterials, biomaterials-blood (bio-fluid) interface, Surface modification for improved compatibility.

(10 Hrs**,**20 Marks)

Unit-II

Biomaterials in cardiovascular System: Collagen hyaluronic acid and other biopolymer applications, Cardiovascular implant biomaterials: artificial heart valves, Mechanicals and bioprosthetic valves; Vessel grafts, Endothelial cell seeding as a surface modification of biomaterials.

Orthopedic implant materials: Materials for reconstruction of cartilage, ligaments and tendons, Bone replacement and bone cement, Artificial joint replacement.

(10 Hrs**,** 20 Marks)

Unit-III

Artificial red blood cells, artificial lung surfactants, artificial saliva, artificial synovial fluid, dialysis membranes, artificial liver, artificial pancreas, biodegradable block copolymers and their applications for drug delivery materials used for neuronal reconstruction and regeneration.

(10 Hrs**,**20 Marks)

Unit- IV

Polhydroxyallalkaloids and polylactides, Biodegradable plastic: characteristics, production and application.

Cyclodextrins: Properties, production and applications.

Biomaterials for development of biosensors enzymes, pigments etc.

(10 Hrs**,**20 Marks)

Unit - V

Bionanomaterials: Silver and Gold nanoparticles, other nanoparticles, its biological properties, its production, agents for its dispersion and application.

Ophthalmology: Artificial cornea, intraocular lenses, artificial tears, Tissue engineering and artificial organs, Wound dressings, artificial skin, facial implants, Dental restorative materials, implanted dental interfaced.

(10 Hrs**,**20 Marks)

REFERENCES:

1. D.L. Wise et al. (Eds.): “Encyclopedic Handbook of Biomaterials and Bioengineering (4Vols.)”, Marcel Dekker, New York, 1995.
2. S. Fredrick: “Biomaterials, Medical Devices and Tissue Engineering”: An Integrated Approach. Chapman and Hall, 1994.
3. L.L. Hench, E.C. Ethridge: “Biomaterials”, An interfacial Approach. Academic

Press, New York, 1982.
4. S. Frederick, H. Chrstiansen, L. Devid: “Biomaterial Science and Biocompatibility”.

ELECTIVE – I
2. PLANT TISSUE CULTURE AND PLANT BIOTECHNOLOGY

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs. / Week	Paper: 100 Marks (3 Hrs)

Unit I
Introduction to plant tissue culture:
Introduction, history of tissue culture, general techniques (about aseptic conditions), requirements (equipments), media, media constituents, media selection, types of media, totipotency of cells, explant, criteria for selection of explant, surface sterilization of explant, classification of tissue culture, callus culture, cell suspension culture, application of callus culture and cell suspension culture, regeneration of plantlet by callus culture.
(10 Hrs, 20 Marks)

Unit II
Tissue culture methods:
Meristem culture, anther culture, ovary culture, embryo culture, somatic hybridization, protoplast culture (isolation of protoplast, purification of protoplast and culture media of protoplast), protoplast fusion methods, Micro propagation, Somatic embryogenesis, somaclonal variation, haploid plants, cybrids, Gynogenesis, synthetic seeds and preservatives, cryopreservation.
(10 Hrs, 20 Marks)

Unit III
Plant Biotechnology:
Plant viruses, classification of plant viruses, virus as a tool to deliver foreign DNA, gene construction of plants, vectors for production of transgenic plant, transformation techniques: Agro bacterium mediated gene transfer, Agro infection, direct gene transfer method; integration of the transgenes, analysis of transgene integration, Nitrogen fixation, nif gene.
(10 Hrs, 20 Marks)

Unit IV
Transgenic plants I:
Introduction, characteristics of transgenic plants, herbicide resistance, insect resistance, virus resistance, drought resistance, microbial disease resistance, stress tolerance, genetic manipulation of flowers pigmentation, fruit ripening and flower wilting.
(10 Hrs, 20 Marks)

Unit V
Transgenic plants II:
Modification of starch, plant nutritional content, food plant taste and appearance, oil and seed protein quality, male sterility, biochemical production, pharmaceutical products, plant derived vaccines, biofertilizers.
(10 Hrs, 20 Marks)

REFERENCES:
1. R.A.Dixon and Gonzales, Plant cell culture : A Practical Approach, IRL Press.
2. S.S.Purohit, Biotechnology Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.
3. B.D.Singh, Biotechnology-Expanding Horizons, Kalyani Publishers, New Delhi, Second Revised Edition, 2008.
4. S.S.Bhojwani and M.K.Razdan, Plant Tissue Culture : Theory and Practical, (1996) Elsevier, Amsterdam.
5. J.Hammond,P.McGarvey and V.Yusibov (Eds.), Plant Biotechnology New Products and Applications, Springer.
6. S.B Primrose and R.M.Twyman, Principles of Gene Manipulation and Genomics, Blackwell publishing, 7th edition, 2006.
7. Bernard R. Glick, Molecular Biotechnology 3rd edition, CBS Publishers Distributors.

ELECTIVE – I
3. PROTEIN ENGINEERING

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs. / Week	Paper: 100 Marks (3 Hrs)

Unit I

Introduction to Proteins:

Introduction, biosynthesis of protein, post translation modification, primary, secondary, tertiary and quaternary structure of proteins, conformational analysis and forces that determine protein structure, energy status of a protein , effect of amino acids on structure of proteins with example, structure and functional relationship.

(10 Hrs, 20 Marks)

Unit II

Structure Determination:

Methods of protein isolation, purification and quantification, physical methods to determine protein structure: X-ray crystallography, NMR spectroscopy; amino acid sequencing methods.

(10 Hrs, 20 Marks)

Unit III

Protein Engineering:

Mutagenesis, types of mutagenesis, site directed mutagenesis, protein engineering, modifications to 3D structure of proteins, design and synthesis of peptides, PCR, PCR in site directed mutagenesis.

(10 Hrs, 20 Marks)

Unit IV

Application of Protein Engineering:

Specific examples of engineered enzymes, Tryesyl tRNA synthetase, Dihydrosolate reductase, Subtilisin, Pepsin class of enzymes, Lysozyme, charging tRNA, Peptide vaccines, Engineered Proteins in medical application, Chemical modifications: phosphorylation, glycosylation, methylation, formylation, Application of engineered proteins.

(10 Hrs, 20 Marks)

Unit V

Protein Modeling and Drug Design:

Protein database, structure database, alignment methods to determine protein function and similarity, structure prediction, molecular modeling, structural similarities and super-imposition techniques, Molecular interactions: docking, calculation of molecular properties, energy calculation in docking, introduction to software used in protein modeling and drug design.

(10 Hrs, 20 Marks)

REFERENCES:

1. Klaus Demobowsky, “Novel Therapeutic Proteins”: Wiley Publications.
2. Messer- Schmidt, “Handbook of Metaloproteins” – Wiley Publications.
3. Ronald Kellner et al., “Microcharacterisation of proteins”, 2nd ed. Wiley, Publications
4. Susane Brakmann, “Directed Molecular Evolution of Proteins”- Wiley Publications
5. Walsh, “ Protein: Biotechnology and Biochemistry”, 2nd ed., Wiley Publications
6. Westermeier – “Proteomics in Practice”- Wiley Publications.
7. Buchanan B.B. Grussem. W. and Jones. R.L. 2000. ‘Biochemistry and Molecular Biology of Plants”. American Society of Plant Physiologists, Maryland, USA.

ELECTIVE – I
4. FOOD BIOTECHNOLOGY

Teaching Scheme: Examination Scheme:

Lectures: 4 Hrs. / Week Paper: 100 Marks (3 Hrs)

Unit I:

Introduction, world food requirement, aims of food biotechnology, interdisciplinary approach, constituents of food, functional properties of dietary carbohydrates and their sources, fatty acids in food, functions of dietary proteins and their sources, dietary requirement of vitamins, Food quality: evaluation (sensory) of food quality, quality factors for the consumers safety, food safety standards.

(10 Hrs, 20 Marks)

Unit II:

Microorganisms in food:

Types of microorganisms in food, role and significance of micro organisms in foods, factors influencing microbial activity.

Microbial examination of foods, food borne diseases: food infection, viral infections, food borne parasites, food intoxication.

(10 Hrs, 20 Marks)

Unit III:

Food spoilage and Preservation:

Food fit for consumption, deterioration of food quality, causes of food spoilage, spoilage of various foods and food products; food preservation using high temperature, evaporation ,drying, low temperature and irradiation.

(10 Hrs, 20 Marks)

Unit IV:

Food Biotechnology:

Food fermentation, microbial culture in food industry, fermented dairy products (milk, yogurt and cheese), fermented meat products and vegetable products, fermentation for flavor production, idali, vinegar, colors, vitamins, beverage, single cell proteins, sauerkraut, deoxygenation and desugaring by glucose oxidase.

(10 Hrs, 20 Marks)

Unit V:

Unit operations:

Food engineering operations, size reduction, screening, mixing, emulsification, filtration, membrane separation, centrifugation, extraction, expression, crystallization, heat processing.

(10 Hrs, 20 Marks)

REFERENCE:

1. B. Sivashankar, Food Processing and Preservation, Prentice Hall ,India.
2. Powar and Daginawala, General Microbiology (vol 2), Himalaya Publishing House.
3. Murray Moo-Young, Comprehensive Biotechnology (Vol: 3), Pergamon Press, An imprint of Elsevier.
4. S.S. Purohit, Microbiology: Fundamentals and Application, Agrobios India.
5. Fraizer, Food Microbiology ,TMH publication
6. Hiller, Genetic Engineering of Food: Detection of Genetic Modifications, Willy Publication.

5. FERMENTATION BIOTECHNOLOGY-II

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs. / Week	Paper: 100 Marks (3 Hrs)
Practical: 4 Hrs. / Week	Oral: 50 Marks
	Term Work: 25 Marks

Unit I

Beverage products:

Fermentative production Alcoholic beverages: Beer, Wine, Rum, Gin, Whisky, Brandy, Champaign.

Industrial Chemicals:

Fermentative production of citric acid, acetic acid, lactic acid, ethanol, acetone and butanol, gluconic and itaconic acid, fumaric acid, steroid biotransformation.

(10 Hrs, 20 Marks)

Unit II

Fermentation of food products:

Fermentative production of food products: cheese and types of cheese, fermented soyabean foods, biomass production (single cell protein, baker’s yeast), fermented dairy products like yogurt, cultured buttermilk;

Microbial flavors and fragrances (methyl ketones, lactones, butyric acid, terpenes and terpene transformation).

Biofertilizers: Production of Rhizobium, Bacillus thuringienesis, Trichoderma viride.

(10 Hrs, 20 Marks)

Unit III

Biomolecules:

Enzyme production- Amylases, Proteolytic enzymes, Invertase enzyme, Pectinases, Lipases; Vitamins: Vitamine B12, Riboflavin, Vitamin A, Amino acid production: L-Glutamic acid, L-Lysine, L-Threonine; Microbial pigments, Microbial polysaccharides.

(10 Hrs, 20 Marks)

Unit IV

Biopharmaceuticals and Biotransformation:

Production of penicillin, B-Lactum antibiotics, Streptomycin, Cephalosporins, Aminoglycoside, Tetracyclines, Steroid Biotransformation.

(10 Hrs, 20 Marks)

Unit 5

Important products through r-DNA technology:

Hepatitis B, vaccine, interferons, Insulin, somatotrophic hormone, therapeutic proteins Vaccines.

Production of biodiesel and biogas, Biological production of hydrogen and biofuel cells Biological waste treatment (utilization of mixed culture).

(10 Hrs, 20 Marks)

REFERENCES:

1. L.E.Casida,JR ,Industrial Microbiology, New Age International (P) Ltd Publication.
2. Jayanta Achrekar, Fermentation Biotechnology, Dominant Publishers and Distributors
3. D.Lanch,Drew,Wang, Comprehensive Biotechnology-Volume 3,Elsevier Publication.
4. B.D.Singh, Biotechnology, Kalyani Publication.
5. Michael L. Shuler, Fikret Kargi, Bioprocess Engineering: Basic Concepts, Prentice Hall India Pvt. Ltd., New Delhi.
6. Prescot and Dun, Industrial Microbiology, McGraw-Hill Book Company, Inc. New York.

Practical and Term work: Practical and term work shall consist of minimum eight experiments from list given below.

1. Study of growth curve of microorganisms.
2. Production of ethyl alcohol using yeast.
3. Citric acid production using Aspergillus niger.
4. Penicillin production using Penicillium crysogenum.
5. Production of enzyme by solid state fermentation.
6. Isolation of bacterial pigments.
7. Production of enzyme by submerged fermenter.
8. Production of bakers yeast (biomass production).
9. Vinegar production by fermentation.
10. Analysis of molasses.
11. Analysis of finished product (rectified spirit, beer, etc.).

6. PROJECT-I

Teaching Scheme: Examination Scheme:
Practical: 2 Hrs./ Week Oral : 25 Marks
Term Work: 25 Marks

The project topic shall consists of either some investigation work or design problem or experimental set up of some development work or prototype equipment or dissertation related to field of Biotechnology, Biochemical Engineering and allied fields.

Project shall be taken in the beginning of the seventh term in consultation with concerned guide and must be completed in eighth term. The project proposal must be submitted in the beginning of the seventh term by every student or a group of students (not more than five students in a group).

The students shall submit the report to the corresponding guide, present their work in due time based on following points,

- Introduction.
- Literature survey.
- Physical / chemical properties etc.
- Experimental setup and procedure.
- Extent of project completed.

Presentation can be performed with OHP slides / LCD.

The progress of the project shall be evaluated by a committee of internal teachers which shall include concerned guide also and shall award the term work marks.

The oral examination of the project shall be conducted by concerned guide and external examiner jointly.

7. SEMINAR

Teaching Scheme: Examination Scheme:
Practical: 2 Hrs./ Week Term Work: 25 Marks

During seventh term, every student individually will study a topic assigned to him and submit a report in a typed form and shall deliver a short lecture / seminar on the topic at the time of seminar oral examination .The topic assigned will be related to the field of Biotechnology, Biochemical Engineering and allied fields.

The students shall deliver the seminar (10 to 15 minutes) and submit the seminar report to the staff member on different technical subjects during the semester. The assessment of the term work shall be based on the: -

1. Attendance to the seminar
2. Performance of the seminar delivery
3. Seminar reports and
4. Viva voce during the seminar.

The staff member/members shall guide the students in:

1. Selecting the seminar topic.
2. Information retrieval (literature survey)
    a) Source of Information i.e. names of the journals, reports, books etc.
    b) Searching for the information i.e. referring to chemical abstracts etc.

3. Preparing the seminar report
4. Delivering the seminar

The oral examination shall be conducted by a committee of teachers internally which shall include the concerned guide also and shall award the oral marks (in the seventh term / at the end of seventh term).

B.E. BIOTECH. TERM II.

1. BIOPROCESS ENGINEERING – II

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs. / Week	Paper: 100 Marks (3 Hrs)
Practical: 4 Hrs. / Week	Oral: 25 Marks
	Term Work: 25 Marks

Unit-I

Plant Tissue Engineering-I:

Introduction to tissue engineering, media components (micro and macro nutrients) and preparation, media selection, cellular totipotency,practical application of cellular totipotency, criteria for selection of explant, classification of tissue culture, callus culture, cell suspension culture, application of callus culture and cell suspension culture, single cell culture, meristem culture.

(10 Hrs, 20 Marks)

Unit-II

Plant Tissue Engineering-II:

Bioprocess consideration in using plant cell cultures, bioreactors for suspension cultures, bioreactors for organized tissue, production of secondary metabolites, anther culture, ovary culture, embryo culture, protoplast culture, synthetic seeds and preservations.

(10 Hrs, 20 Marks)

Unit-III

Animal Tissue Engineering-I:

Introduction, Culture environment: substrate, gas phase, media, constituents of media, types of media; isolation of tissue, primary culture, culturing and maintenance of different cell lines, cloning and selection of specific cell types, stem cell isolation and culture, instability, variation and preserving of cell lines, short term lymphocyte culture, fibroblast cultures from chick embryo, epithelial cells culture.

(10 Hrs, 20 Marks)

Unit-IV

Animal Tissue Engineering-II:

Bioreactors considerations for animal cell cultures, Bioreactors for animal cell lines: Monolayer culture (Air lift fermenter, Roux flask, Roller bottle, Hollow fiber cartridge), Suspension cultures (stirred tank bioreactors, packed glass bead reactors), Immobilized cell reactors; Products of animal cell cultures, culture of tumor tissue. Three dimensional culture systems: organ culture, Histotypic culture; a brief about transgenic animals.

(10 Hrs, 20 Marks)

Unit V

Instrumentation and control:

Introduction, methods of measuring process variables, In-line measurements: parameters like temperature, pressure, agitator speed and power consumption, foam detection, liquid and gas flow rates, volume, chemical environment like pH, dissolved oxygen ,dissolved CO_2, redox probe, ion probe, microbial biomass; On line measurement: Ion specific sensors, enzyme and microbial electrodes, infrared spectroscopy, mass spectrometers; off line analytical methods, computer applications in fermentation technology, Biosensors.

(10 Hrs, 20 Marks)

REFERENCES:

1. R.A.Dixon and Gonzales, Plant Cell Culture : A Practical Approach, IRL Press.
2. S.S.Purohit, Biotechnology: Fundamentals and Applications, Agrobios (India), 4th Edition, 2005.
3. B.D.Singh, Biotechnology: Expanding Horizons, Kalyani Publishers, New Delhi, Second Revised Edition, 2008.
4. S.S.Bhojwani and M.K.Razdan, Plant Tissue Culture : Theory and Practical, (1996) Elsevier, Amsterdam
5. J.Hammond,P.McGarvey and V.Yusibov (Eds.), Plant Biotechnology New Products and Applications, Springer.
6. S.B Primrose and R.M.Twyman, Principles of Gene Manipulation and Genomics Blackwell Publication, 7th Edition, 2006.
7. Bernard R. Glick, Molecular Biotechnology 3rd edition, CBS Publishers and Distributors.
7. P.F.Stanbury, A.Whitkar and S.J.Hall, Principles of Fermentation Technology, Aditya Book House, New Delhi.
9. R. Ian Freshney,Culture of Animal Cells: A Manual of Basic Technique, A John Wiley and Sons Publications

Practical and Term work: Practical and term work shall consist of minimum eight experiments from list given below.

1. Growth kinetics of microorganisms using shake flask method.
2. Determination of specific thermal death rate constant (Ka).
3. Determination of Volumetric oxygen transfer coefficient (K_La), effect of aeration and agitation speed.
4. Preparation of Immobilized enzymes and cells and evaluation of kinetic parameters.
5. Kinetics study of Product formation.
6. Effect of substrate and product concentration on biomass yield for bakers yeast production.
7. Studies on settling characteristics of various microbial cultures.
8. Explant preparation and their inoculation on suitable plant growth media.
9. Callus induction technique and regeneration of plant from callus culture.
10. Artificial seed production.
11. Shake flask studies of plant cell culture.

2. BIOPOCESS ENGINEERING AND ECONOMICS

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs. / Week	Paper: 100 Marks (3 Hrs)
Practical: 2 Hrs. / Week	Oral: 25 Marks
	Term Work: 25 Marks

Unit I

Bio process Design Considerations**:**

Technical feasibility survey, process development, flow diagram, equipment design and specifications, marketability of product, availability of technology, raw material equipment, human resources, land and utilities, site characteristics, waste disposal, government regulations and other legal restrictions, community factors and other factors affecting investment and production cost, Indian Bioprocess Industry - Current Status and Trends.

(10 Hrs, 20 Marks)

Unit II

Cost Estimation:

Factors affecting investment and production cost, capital investment, fixed investment and working capital, estimating equipment cost by 6/10 factor rule, method of estimating capital investment. Different costs involved in total product cost, computer automization in costing.

(10 Hrs, 20 Marks)

Unit III

Investment Cost and Profitability:

Interest and investment cost, type of interest, types of taxes and tax returns, types of insurance and legal responsibility, depreciation, types of depreciation, methods of determining depreciation.

Profitability, mathematical methods of profitability evaluation, cash flow diagram, break even analysis, balance sheet, pricing issue method and income statement.

(10 Hrs, 20 Marks)

Unit IV

Fermentation Economics:

Introduction, isolation of microorganisms of potential industrial interest, strain improvement, market potential, effects of legislation on production of antibiotics and recombinant proteins, plant and equipment, media, air sterilization, heating and cooling, aeration and agitation, batch process cycle times, continuous culture, recovery costs, water usage and recycling, effluent treatment.

(10 Hrs, 20 Marks)

Unit V

Bioproduct Economics:

Bioproduct regulation, Fermentation process economics: A complete example, Economic consideration of commercial Bioproduct: Enzymes, Proteins via rDNA, Antibiotics, Vitamins, Alkaloids, Nucleosides, Steroids, Monoclonal antibodies, Brewing and wine making, Fuel Alcohol Production, Organic and Amino acid manufacture, Single cell protein, Anaerobic methane production.

(10 Hrs, 20 Marks)

REFERENCES:

1. Peter M.S. Timmerhaus K.D. Plant Design and Economics for Chemical Engineers. McGraw Hill.
2. Vilbrandt F.C. and C.E. Dryden , Chemical Plant Design. McGraw Hill
3. T.R. Banga and S.C.Sharma, Industrial Organization and Engineering Economics, Khanna Publications, New Delhi.
4. O.P.Khanna Industrial Engineering and Management, Dhanpat Rai Publications Pvt. Ltd. New Delhi.
5. Dewett and Varma, Elementary Economic Theory, S Chand and Company Ltd New Delhi
6. James E. Bailey, David F. Ollis, Biochemical Engineering Fundamentals, Mc Graw-Hill Book Company.
7. P. F. Stanbury, A. Whitaker and S. J. Hall, Principles of Fermentation Technology, Aditya Book Private Limited.

TERM WORK: Term work shall be based on any eight of the following:

1. Indian Bioprocess (biotech) industry.
2. Location of bioprocess plant.
3. Cost estimation.
4. Interest and investment cost.
5. Taxes and insurance.
6. Profitability.
7. Break even analysis.
8. Fermentation economics.
9. Bioproduct economics.

3. BIOINFORMATICS

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs. / Week	Paper: 100 Marks (3 Hrs)
Practical: 4 Hrs. / Week	Practical: 25 Marks
	Term Work: 25 Marks

Unit -I

Introduction:

Entropy and information, Shannon's formula, Ergodic process-Redundancy concepts, Introduction to bioinformatics, bioinformatics and internet, DNA sequencing methods.

Databases:

Introduction, primary and secondary databases, format v/s contents, the database, the Gen bank flat files and its format, database at NCBI, Databases : DDBJ, EMBL, Genbank, submitting DNA sequence to database; Structure database: PDB, Molecular modeling database at NCBI, structure file format, Database structure viewers.

(10 Hrs, 20 Marks)

Unit-II

Sequence alignment:

Introduction, types of sequence alignment, evolutionary basis of sequence alignment, Algorithms for sequence alignment: Needlemen-Wunsch and Smith-Waterman algorithm, methods of pair wise sequence alignment, Database similarity searching: FASTA, BLAST, Substitution Score and Gap penalties, PAM matrix, multiple sequence alignment, Hidden markov models and threading methods.

(10 Hrs, 20 Marks)

Unit-III

Phylogenetic analysis:

Introduction, elements of phylogenetic models, phylogenic data analysis, relation between Phylogenetic analysis and multiple sequence alignment, evolutionary trees, methods for Phylogenetic prediction: Maximum Parsimony method, Distance methods, Maximum likelihood approach, Phylogenetic software.

(10 Hrs, 20 Marks)

Unit-IV

Gene prediction:

Introduction, open reading frame based gene prediction, procedure for gene prediction, gene prediction in microbial genomes, gene prediction in eukaryotes, neural networks and pattern, Discrimination methods, Promoter prediction in E.Coli, Promoter prediction in eukaryotes, gene finding methods: GRAIL, GENSCAN, PROCRUSTES, Gene parser.

(10 Hrs, 20 Marks)

Unit-V

Structure prediction:

Prediction of RNA structure:-

Introduction, features of RNA secondary and tertiary structure, sequence and base pairing patterns for structure prediction, methods predicting RNA structure: Energy minimization and identification of base covariation.

Prediction of protein structure :-

Introduction, protein structure description, classes of protein structure, protein structure classification in databases, structural alignment methods, protein structure prediction by amino acid sequence: use of sequence patterns, prediction of secondary structure, prediction of 3D structure.

(10 Hrs, 20 Marks)

REFERENCES:

1. Andreas D. Boxevanis, Bioinformatics, Wiley International.
2. David W. Mount, Bioinformatics: Sequence and Genome analysis, Cold Spring Harbour.
3. T.K.Attwood and Parry – Smith D.J, Introduction to Bio Informatics, Pearson Education Ltd, South Asia.
4. Vittal.R.Srinivas, Bioinformatics: A Modern Approach, PHI.
5. S.C.Rastogi, N.Mendiratta, P.Rastogi, Bioinformatics: Methods and Applications, PHI.

Practical and Term work: Practical and term work shall consist of minimum eight experiments from list given below.

1. Databases search: protein and nucleic acid database.
2. Restriction mapping.

3. Sequence (FASTA and BLAST) searches.
4. Pair wise comparison of sequences.
5. Multiple alignments of sequences.
6. Phylogenetic analysis.
7. Gene structure prediction.
8. Protein database retrieval and visualization.
9. RNA structure prediction.
10. Protein structure prediction.

ELECTIVE II

1. METABOLIC ENGINEERING

Teaching Scheme:
Lectures: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Term Work: 25 Marks

Unit-I

Basic concepts of metabolic engineering, overview of cellular metabolism, introduction to various metabolic pathways, primary and secondary metabolites, medical and agriculture, importance of secondary metabolites.

(10 Hrs, 20 Marks)

Unit-II

Metabolic Regulation:

Metabolic regulation of genome level, Jacob and Monad model, coordinate regulation of prokaryotic gene expression, lactose operon, tryptophan operon, feed back regulation, cumulative feed back regulation, regulation of gene expression.

(10 Hrs, 20 Marks)

Unit-III

Computational Methods for Pathways:

Introduction, Analysis of pathways: metabolic pathways, genetic pathways, signaling pathways, pathway resources, metabolic control analysis, simulation of cellular activities, biological markup languages.

(10 Hrs, 20 Marks)

Unit-IV

Metabolic Flux:

Metabolic pathway synthesis algorithms, metabolic flux analysis and its application, mathematical calculation for the flow of carbon and nitrogen fluxes, methods for experimental determination of metabolic fluxes by isotope labeling, stereochemistry of regulatory molecules, concepts of regulatory analogs.

(10 Hrs, 20 Marks)

Unit-V

Different models for cellular reactions, genetic regulation of metabolic fluxes, examples of metabolic pathway manipulations and engineering, analysis of metabolic control and structure metabolic networks, thermodynamics of cellular processes.

(10 Hrs, 20 Marks)

REFERENCE:

1. James Bower and Itamid Bodour, Computational modeling of Genetic and Biochemical Networks,
2. Valino, Metabolic Flux Analysis.
3. Vittal.R.Srinivas, Bioinformatics: A Modern Approach, PHI.
4. S.C.Rastogi, N.Mendiratta, P.Rastogi, Bioinformatics: Methods and Applications, PHI.
5. D. Voet and J.G. Voet 1990, Biochemistry, John Willey and Sons.
6. Szallasi, Stelling, Periwal, System Modeling in Cellular Biology: From Concepts to Nuts and Bolts, PHI, New Delhi.

TERM WORK: Term work shall be based on any eight of the following:

1. Overview of cellular metabolism and metabolic pathway.
2. Primary and Secondary metabolites.
3. Metabolic regulation.
4. Regulation of gene expression.
5. Computational analysis of metabolic pathway.
6. Metabolic flux analysis.
7. Metabolic pathway synthesis algorithms.
8. Examples of metabolic pathway engineering.

ELECTIVE II

2. BIOSAFETY AND BIOETHICS

Teaching Scheme:
Lectures: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Term Work: 25 Marks

Unit I

Biosafety:

Introduction, objectives of biosafety guidelines, risk assessment, risk regulation, containment, planned introduction of genetically modified organism, biosafety during industrial production, Biosafety levels: experiment with microorganism, research involving plants, research involving animals, Good manufacturing and Good Laboratory practices.

(10 Hrs, 20 Marks)

Unit II

Biosafety regulation and guidelines:

Biosafety guidelines and regulation, biosafety guidelines in India, National and International guidelines with regard to rDNA technology, transgenic science, GM crops, hazardous material from bioprocess, pharmaceutical product; GM food debate, Biosafety assessment procedures for Biotech food and related products, ecological safety assessment of recombinant organism and transgenic crops, Bioterrorism and convention on biological weapons.

(10 Hrs, 20 Marks)

Unit III

Introduction:

Bioethics: Legality, morality and ethics, principle of bioethics: autonomy, human rights, beneficence, privacy, justice, equity etc; Biotechnology and society: Introduction to science, technology and society, public acceptance issues in biotechnology

Ethical conflicts in biotechnology: Fear of unknown, black face of biotechnology? When transgenes wander, should we worry? BT cotton creating resistance to biotechnology? Conflicts of BT cotton, some case studies, unequal distribution of risk and benefit of biotechnology.

(10 Hrs, 20 Marks)

Unit IV

Bioethics in animal genetic engineering: Introduction, Issues concern to use of animals, case studies, Animal as a tennis ball? Gene therapy and transgenic animal. Should animal be patentable?

Bioethics in plant genetic Engineering, bioethics and moral concern, Gene flow in crops, BT-cotton case studies, transgenic plants are not absolutely safe, Public education of biotechnology.

Bioethics in Microbial Technology.

(10 Hrs, 20 Marks)

Unit V

Intellectual property rights:

Introduction, IPR in India , intellectual property , protection of IPR : Trade secret, Patent, Copyright, Plant variety protection , International Harmonization of patent laws: Trips, India and Trips ,WTO-GATT; methods of application of patent, protection of biological inventions, plant breeders right ,examples of patents in biotechnology, choice of IPR protection, management of IPR, benefits and problems from IPR, Indian response to the IPR upheaval.

(10 Hrs, 20 Marks)

REFERENCES:

1. Thomas J A Fucnh – Biotechnology and Safety Assessment, Academic Press.
2. Fleming D A, Hunt D L, Biological Safety Principles and Practices, Assm Press Washington.
3. Singh K ,Intellectual Property Rights on Biotechnology, BCIL New Delhi.
4. Moo-Young ,Compressive Biotechnology Vol.4, Elsevier Publisher.
5. B D Singh , Biotechnology, Kalyani Publishers.
6. S S Purohit, Biotechnology, Agro Bios.

TERM WORK: Term work shall be based on any eight of the following:

1. Biosafety, risk assessment and regulation.
2. Good manufacturing and Good Laboratory practices.
3. Biosafety guidelines and regulation.
4. National and International biosafety guidelines.

5. Bioethics and public acceptance issues in biotechnology.
6. Bioethics in animal and plant genetic engineering with Case studies.
7. Intellectual property rights.
8. Examples of patent in biotechnology.

ELECTIVE II
3. BIOMEDICAL FLUID DYNAMICS

Teaching Scheme:
Lectures: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Term Work: 25 Marks

Unit-I
Introduction to fluid mechanics: Fluid properties, basic laws governing conservation of mass momentum and energy; Laminar flow, Couette flow and Hagen-Poiseulille equation, turbulent flow.

(10 Hrs**,**20 Marks)

Unit-II
Flow dynamics study of circulatory system, heart and blood vessels, anatomy and physiological considerations

(10 Hrs**,**20 Marks)

Unit-III
Components and functions of arterial and venous systems; Lymphatic system; Body fluids and their motions; Flows of Newtonian and non-Newtonian fluids in rigid tubes, flexible tubes and collapsible tubes.

(10 Hrs**,**20 Marks)

Unit-IV
Blood flow through arteries and veins; Holt and Conrad's experimental investigations. Kinetic energy, flow, pressure-flow, pressure-flow relations in vascular beds.

(10 Hrs**,**20 Marks)

Unit-V
Cardiac cycle; Cardiac value dysfunctions; Blood pressure,regulation and controlling factors; Coronary Circulation, heart failure.

(10 Hrs**,**20 Marks)

REFERENCES:

1. J.F. Green, "Fundamental Cardiovascular and Pulmonary Physiology", Lea and Febiger, Philadelphia, 1982.
2. C.A. Keele, E. Neil and N. Joels: Samson Wright's Applied Physiology 13th Ed., Oxford University Press, Delhi 1982.
3. A. Noordergraft: 1978., "Circulatory System Dynamics" Academic Press, New York,
4. R.R. Puniyani: , , 1996. , "Clinical Haemorheology" New Age Int. Publishers. New Delhi.

TERM WORK: Term work shall be based on any eight of the following:

1. Introduction to fluid mechanics.
2. Anatomy and physiological of circulatory system.
3. Flow dynamics study of circulatory system.
4. Components and functions of arterial, venous and lymphatic system.
5. Body fluids and their motion.
6. Pressure – flow relations in body fluids flow.
7. Cardiac value dysfunction.
8. Blood pressure regulation and controlling factors.

ELECTIVE II
4. APPLIED GENETIC ENGINEERING.

Teaching Scheme:
Lectures: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Term Work: 25 Marks

Unit I
Genetic Engineering Techniques:
Blotting methods: Western, Northern and Southern blotting; DNA sequencing methods, synthesis of DNA (gene), PCR, Types of PCR: Inverse, RT-PCR, site directed mutagenesis using PCR, overlap extension PCR, asymmetric PCR, nested PCR, PCR application, Antisense technology, microarrays.

(10 Hrs, 20 Marks)

Unit II
Genomics:
Human genome project, mode of human inheritance, genetic linkage and gene mapping, molecular markers in genome analysis: RFLP, AFLP, RAPD, SCAR, micro satellites, protein based markers; detection of mutations in human genes: single-strand conformation analysis, denaturing gradient gel electrophoresis, heteroduplex analysis, chemical mismatch cleavage, direct DNA sequencing; applications of molecular markers.

(10 Hrs, 20 Marks)

Unit III
Transgenic Animals:
Animal vectors, artificial chromosome (MAC) vectors, transaction methods, embryonic stem cell transfer, detection of transgenic and transgene function, transgenic animals: mice, rabbits, cattle, goat, sheep, pigs and fish; Invitro fertilization and embryo transfer.

(10 Hrs, 20 Marks)

Unit IV
Gene Therapy:
Introduction, types of gene therapy: Somatic and Germline therapy; methods of gene therapy, gene therapy in immuno deficiency disease and cancer, targeting and destroying artificial clotting (thrombosis) by using plasminogen, curing Severe Combined Immunodeficiency (SCID) by Adenosine Deaminase (ADA) gene, breast cancer

treatment (genetically modified antibody), prevention of tissue and organ graft rejection, gene augmentation therapy, gene medicine, transgenic animals as models of human disease.

(10 Hrs, 20 Marks)

Unit V

Genetic Engineering for Human Welfare:

Production of human peptide hormone, insulin, somatotropin, somatostatin, human interferon genes, human growth hormone, tumor necrosis factor alpha, vaccines for hepatitis B virus, vector vaccines, vaccines for rabies, polio virus, foot and mouth disease, malaria vaccines, monoclonal antibodies as therapeutic agents, nucleic acid as therapeutic agents, animal bioreactors and molecular farming, DNA profiling (DNA fingerprinting):methods and applications.

(10 Hrs, 20 Marks)

REFERENCES:

1. S.B.Primrose and R.M.Twyman, Principles of Gene Manipulation and Genomics, 7^{th} Edition, Blackwell Publishing.
2. Bernard R.Glick and Pasternak , Molecular Biotechnology, CBS publishers Distributors , New Delhi
3. B.D Singh, Biotechnology – Expanding Horizons, Kalyani Publishers.
4. R.C.Dubey, A Textbook of Biotechnology, S.Chand Publishers, New Delhi
5. S.S.Purohit , Biotechnology, Agrobios India.

TERM WORK: Term work shall be based any eight of the following:

1. Genetic Engineering Techniques.
2. PCR and its types, Antisense technology, Microarrays.
3. Molecular markers in genome analysis.
4. Transgenic Animals.
5. Invitro fertilization and embryo transfer.
6. Gene Therapy.
7. Genetic Engineering for Human Welfare.
8. DNA profiling (DNA fingerprinting): methods and applications.

5. PROJECT- II

Teaching Scheme	Examination Scheme
Practical: 4 hrs / week	Oral: 50 Marks
	Term Work: 100 Marks

The students are required to carry out one of the following projects.

1. Processes based Project: Manufacture of Bioproduct.
2. Equipment based Project: Detailed design and fabrication of the equipment for a given capacity.
3. Experimental based Project: Experimental investigation of basic or applied research problem in the field of Microbiology, Immunology, Molecular biology, Bioprocess, Biochemistry, Genetic Engineering, Bioinformatics, Enzyme technology and Environmental Biotechnology.

4. Industrial Problems: Any problem or project directly related to existing plants for modification of process or equipment or regarding pollution control and energy conservation under the guidance of a staff member and /or staff members and submit a typed report in duplicate.

The Project Work consists of collection of literature, study of various processes, selection of the process, computation of material and energy balances, process design of important equipments, detailed design of one of the main equipment, plant location and layout, cost estimation, economic analysis, details of experimental set up, analysis of data, pollution control, safety, marketing, conclusions and recommendations, bibliography, etc., as applicable to the individual problem.

The object of the project is to make use of the knowledge gained by the student at various stages of the degree course. This helps to judge the level of proficiency, originality and capacity for application of the knowledge attained by the student at the end of the course.

Each group should consist of maximum 5 students. For term-work (Internal) of 100 marks, the assessment should be by conducting frequent written tests, seminars during the year and an oral examination at the end of the year conducted by all the staff members of the department. The Head of the Department should see that the assessment procedure should be the same for all the students of the class. For external 50 marks, the project work shall be assessed by an oral examination by at least two examiners, one internal and one must by external at the end of the year.

The object of the VIVA VOCE examination (Internal and External Orals) is to determine whether the objectives of the project work have been met by the student as well as to assess the originality and initiative of the student as demonstrated in the project work.

6. INDUSTRIAL VISIT / CASE STUDY

Examination Scheme:
Term Work: 25 Marks

During seventh term, every student shall visit minimum two to three industries or organization pertaining to the Biotechnology arranged by College and accompanied by departmental teachers as per AICTE and University norms. The report of technical visit shall be submitted by every student at the end of eighth term which shall be evaluated by the concerned teachers through internal Viva Voce.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
STRUCTURE OF TEACHING AND EVALUATION
S.E .(CIVIL ENGINEERING)
First term

Sr. No.	Subject	Teaching Scheme Hours/week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Strength of Material	4	1	--	3	100	25	--	--
2	Surveying-I	4	--	2	3	100	25	50	--
3	Building Construction and Materials	4	--	4	3	100	25	--	25
4	Concrete Technology	4	--	2	3	100	25	--	25
5	Engineering Mathematics-III	4	1	--	3	100	25	--	--
6	Computer Graphics	--	--	2			25		
	Total	**20**	**2**	**10**	**--**	**500**	**150**	**50**	**50**
	Grand Total	**32**			**750**				

SECOND TERM

Sr. No.	Subject	Teaching Scheme Hours/week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Theory of Structures-I	4	1	--	3	100	25	--	--
2	Surveying-II	4	--	2	3	100	25	50	--
3	Building Design and Drawing	4	--	4	4	100	50	--	25
4	Fluid Mechanics-I	4	1	2	3	100	25	--	25
5	Engineering Geology	4	--	2	3	100	25	--	--
	Total	**20**	**2**	**10**	**--**	**500**	**150**	**50**	**50**
	Grand Total	**32**			**750**				

NORTH MAHARASHTRA UNIVERSITY, JALGAON.

SYLLABUS OF SECOND YEAR (CIVIL)

TERM-IST (w.e.f. 2006-07)

STRENGTH OF MATERIALS

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks(3 Hrs)
Tutorials: 1 Hour/Week	Term Work: 25 Marks

UNIT-I: **(11 Hrs., 20 marks)**

Normal stress & strain, Hooke's law. Axial force diagrams. Deformation in prismatic, stepped, linearly varying & composite members under concentrated load & self-weight. Stress & strain in indeterminate members. Temperature stresses.

UNIT-II: **(9 Hrs., 20 marks)**

[A] Shear stress & strain. Modulus of rigidity. Poison's ratio, relation between E & G. Generalized Hooke's law. Bulk modulus, stress strain diagram, working stress, factor of safety.

[B] Thin cylindrical & spherical shells.

[C] Stresses due to impact load using strain energy method.

UNIT-III: **(10 Hrs., 20 marks)**

[A] Shear force & bending moment. Relation between SF, BM & loading. SFD & BMD for determinate beams viz. cantilever, simply supported, overhanging and compound beams under various loads viz. concentrated, uniformly distributed & varying, couples etc. Determination of critical SF & BM and points of contra-flexure. Construction of loading diagrams from shear force & beading moment diagram.

[B] Bending stresses in beams. Theory of bending. Flexural formula. Section modulus. Moment of resistance.

UNIT-IV: **(10 Hrs., 20 marks)**

[A] Shear stresses in beams. Shear stress formula, shear stress determination in symmetrical section.

[B] Shear stresses in shafts due to torsion. Stress, strain & deformation in determinate & indeterminate shafts of hollow or solid cross-sections. Composite shafts.

[C] Axially loaded columns. Buckling effect. Euler's formula. Various end conditions & concept of equivalent length. Rankine's formula. Limitations of formulae.

UNIT-V: **(10 Hrs., 20 marks)**

[A] Direct & bending stresses in short columns & other structural components due to eccentric or lateral loads. Core of section.

[B] Principle stresses & strain. Stresses on inclined plane. Graphical method. Theories of Failure.

[C] Stresses due to combined bending and torque in shafts.

TERM WORK:-

It shall consist of at least two assignments for each unit of above syllabus.

REFERENCE BOOKS:-

1) E.P.Popov - Mechanics of Solids

2)Timoshenko - Strength of Materials

3) V.L.Shah - Strength of Materials

4) Ramamrutham - Strength of Materials

SURVEYING -I

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks(3 Hrs)
Practical: 2 Hour/Week	Term Work: 25 Marks
	Practical: 50 Marks

UNIT-I **(10 Hrs., 20 marks)**

LEVELLING:

a. Instruments used in levelling, Dumpy level, Automatic Level, Types of levelling staves.
b. Principal axes of Dumpy level. Testing and adjustments of Axis of Bubble tube, a line of collimation of dumpy level.
c. Reciprocal levelling , curvature and refraction correction, Distance to the visible horizon .
d. Profile levelling : L - section and cross -sections.

ROUTE SURVEY:

Reconnaissance survey; Locating obligatory points, preliminary Survey, fixing gradients, paper and field location survey, Plotting L -section and cross -section, construction survey.

UNIT-II **(10 Hrs., 20 marks)**

THEODOLITE:

a. Principal axes and permanent adjustments of transit theodolite.
b. Uses of theodolite : measurement of horizontal angles , vertical Angles, magnetic bearings, prolonging a line, lining in, measuring deflection angles, setting out the angles.
c. Theodolite Traversing: Computation of consecutive and independent co-ordinates, Adjustments of closed traverse, Gales Traverse by co-ordinate method, omitted measurements.

UNIT-III **(10 Hrs., 20 marks)**

TACHEOMETRY:

a. Principle of stadia method, fixed hair method with vertical staff to determine horizontal distances and elevations of the points.
b. Use of Tacheometry in surveying, Tacheometric contour survey, use of tacheometric tables.

UNIT-IV **(10 Hrs., 20 marks)**

CURVES:

a. Horizontal and vertical curves and their purposes.
b. Simple circular curves - Elements and setting out by linear & angular methods.
c. Compound curves -Elements and setting out of compound curves.
d. Introduction to reverse curves (No numerical problem to be asked). Elements, Location and uses.
e. Transition curves -Types and uses, Length of transition curves, Elements of cubic parabola, Length of combined curve, setting out the combined curve by deflection angle method.

(No numerical problem to be asked).

UNIT-V **(10 Hrs., 20 marks)**

PLANE TABLE SURVEY:

a. Objective and equipment required for plane table survey.
b. Methods of plane tabling - Radiation, Intersection, Traversing and Resection .

c. Two point & Three point problems and their solutions by different methods, strength of fix.
d. Advantages, disadvantages, limitations and errors of plane Table surveying.

Minor Instruments:

Study and use of Abney Level, Box sextant, Indian pattern clinometer and pantagraph

TERM WORK:

Details of practical Exercises and projects:

1. Measurements of horizontal and vertical angles by transit Theodolite,
2. Measurements of horizontal angles of a triangle by repetition method.

Project-1

3 Theodolite Traverse survey project of a closed traverse with at least four sides.

4 Computation of horizontal distances and elevations by Tracheometry for horizontal and inclined sights.

Project-2

5 Tacheometric contouring project with at least two instrument stations at 60 m apart.

6 Radiation and intersection method in plane Table survey.

Project-3

7 Plane table survey project of a closed traverse of minimum four sides.

8 Solution of three - Point problem in plane tabling.

9 Use of box sextant and Abney level.

10 Study and use of Indian pattern clinometer and pantagraph.

Project-4

11 Road project for minimum length of 500m, including fixing of alignment, profile leveling, and cross sectioning.

Note: The Term Work will consist of:

(i) Field book containing record of all exercises and projects listed above.

(ii) File of full imperial size drawing sheets as mentioned below

1) Theodolite Traverse survey project. 1 sheet
2) Tacheometric contouring project………..1 sheet
3) Plane Table Traverse survey project…..1 sheet
4) Solution of three -point problem………… 1 sheet
5) Road project showing L- section, plan of road and Typical cross -section ……………………………………….Min -1 sheet

REFERENCES BOOKS

1) Prof. T.P. Kanetkar and prof. S.V.Kulkarni. - Surveying and leveling Vol. I & II
2) Prof. B.C. Punmia - Surveying vol. I & II
3) Late David clark. - Plane and Geodetic Surveying for Engineers, Vol. I
4) Cliver and clendening - Principles of surveying
5) P.B. Shahani - Advance surveying , Vol.I & II

Handbook

S.P.Collins - A handbook of accurate surveying methods .

BUILDING CONSTRUCTION & MATERIALS

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hours/Week	Theory Paper: 100 Marks(3 Hrs)
Practical: 4 Hour/Week	Term Work: 25 Marks
	Oral/Sketches: 25 Marks

UNIT I **(10 Hours, 20 marks)**

a) Types of building, load bearing , framed structure, steel structure, timber structure, composite structure. Various parts of building- sub structure & super structure. Plinth & plinth level, sill & sill level, lintel & lintel level, floor & floor level, roof & roof level, plinth height, plinth protection, cornice, coping etc. function of each.

b) Foundation- purposes & classification (detailed) , advantages & disadvantages of each & circumstances under which each is used. Factors considered for selection of foundation.
Design considerations for spread footing(load bearing structure) Design of wall footing.

c) Bearing capacity of soil, safe B.C. of soil, factor of safety, methods of improvement of B.C. of soil, types of soil & bearing capacity of each type of soil.

UNIT II **(10 Hours, 20 marks)**

a) Masonry:- Principles of masonry construction, types of masonry, types of walls i.e. load bearing, partition and retaining walls, various types of partition walls such as brick partition , timber partition, glass partition etc.

b) Stone masonry:- types of stone masonry & construction method, Dressing and bonding , precast stone masonry, through stone, proportions of mortars used for stone masonry.

c) Brick and Block Masonry:- various types of bonds in brick masonry, reinforced brick masonry, precautions to be taken in masonry constructions, composite masonry , solid & hollow blocks used for masonry , methods of preparation of blocks, cavity wall & cavity wall construction.

d) form and formwork: function of forms, form erection, oiling and stripping of form, requirement of form and form work, form work for various civil engineering structures, materials used for form work.

UNIT III **(10 Hours, 20 marks)**

Super Structure

a) Types of lintels and arches, stability consideration for arches, laying of arch, detailing of R.C.C. lintel and chajja.

b) Doors and windows: types of each and circumstance under which each is used, minimum area of windows openings for different climatic conditions, various materials used for doors and windows, fixtures and fastenings used. I.S. notations for doors & windows.

Special flooring: marble, Granite, kota, ceramic tiles, artificial granite, acid proof floors.

c) Circulation:- Horizontal & vertical , stair and staircase planning & design , types of staircases as per shape and material used. Design of staircase.

Details of ramps, ladders, lifts & escalators used for vertical circulation.

d) Floor and Roof:- ground floor, upper floors, mezzanine floor, design & construction requirements, various types of floor finishes used, advantages & disadvantages & circumstances under which each is used. Damp proof construction of floors, walls & finishes.

Types of roof & roof covering, flat roof & its drainage, water proofing, false ceiling & method of fixing.

Different types of shell structures, barrel arch, cone, hyperbolic, parabolic, folded plate, space frame, & their uses.

UNIT IV **(10 Hours, 20 marks)**

a) Steel trusses, various sections used for steel work method of connections i.e. riveted, bolted & welded, types of trusses & their uses, roofs, covering materials & method of fixing tubular structures.
b) Building finishes, objective & processes, pointing, plastering & painting, white wash & co lour wash, distempering etc, on old & new surfaces, repairs & maintenance.
c) Scaffolding, shoring, under pinning & strutting, types, purposes & precautions.
d) R.C.C. framed structure, column, beam, footing, slab & their connections, general requirement and details.

Industrialization of Building:-

Modular co-ordination: modular planning & recommendation, modular tolerances, prefabrication, advantages of prefabrication, prefabrication systems, principles of design of prefabrication, components of precast construction, Ferro cement & Ferro concrete construction.

UNIT- V **(10 Hours, 20 marks)**

a)Stone :- natural bed of stones, stone quarrying uses of stones, qualities of good building stone ,test on stone, preservation of stone.

b)Bricks:- composition of good brick earth, classification of burnt brick, manufacture of bricks, uses of bricks, qualities of good bricks, tests of bricks.

c)Timber:- properties and uses, testing, conversion and sawing, defects. in timbers,

d)Artificial timber, Veneers, Plywood and Block board.

Aluminum, Glass. Heat insulating materials, Sound absorbent materials.

TERMWORK:- shall consist of sketch book having 1/4 imperial size sheets showing following details.

1) Free hand sketching practice: different type of lines, squares, rectangle, circles, plans of buildings.
2) Lettering 6 mm, 4mm , 2mm with technical terms regarding construction.
3) Different types of lines, method of dimensioning as per I.S. code
4) Symbols & conventional sign of materials.
5) Orthographic, isometric, oblique & axonometric views.

   Sketches after actual measurements (6 to 9) on drawing sheets.
6) C.C.T.W. paneled door: plan, elevation, section.
7) Flush door: plan, elevation, section.
8) Arches in stone & brick.
9) Stone masonry: U.C.R, C.R., Ashlar.
10) Bonds in brick work with isometric view for one bond for one brick.
11) Different types of roofs.
12) Steel trusses, shells, folded plate, space frames etc. orthographic and three dimensional sketches.
13) Types of stairs.
14) Report regarding visits to the construction sites.(minimum two visits)
15) Materials & their rates.

REFERENCES BOOKS:

1. Rangwala - Building construction
2. Sushil kumar - Building construction
3. Bindra and arora - Building construction
4. Punmia - Building construction

5. Rangwala - Engineering Materials
6. Dr.S.V.Deodhar - Civil Engineering Materials

CONCRETE TECHNOLOGY

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks(3 Hrs)
Practical: 2 Hour/Week	Term Work: 25 Marks

UNIT-I **(10 Hours 20 marks)**

A) Cement: - Manufacture of cement, chemical composition, setting and hydration of cement. Types of cement, properties and testing of cement.

B) Aggregates – Classification, properties, grading and testing of aggregates, requirements of aggregate for mortar and concrete, impurities in aggregates and its effect on strength of concrete.

C) Water:- Characteristics of water, suitability to be used in concrete, tests on water, mixing of water, Seawater

UNIT-II **(10 Hours 20 marks)**

Concrete:

A) Fresh Concrete:- Definition and its ingredients, grades of concrete, concreting process, significance of water cement ratio. Properties of fresh concrete, form work for good concreting, Tests on fresh concrete.

B) Hardened Concrete:

Various properties of hardened concrete, factors affecting various properties, micro cracking, and stress - strain relation, testing of hardened concrete, creep and shrinkage of concrete.

C) Quality control during concreting.

UNIT-III **(10 Hours 20 marks)**

A) Admixtures, classification and their effects on various properties of concrete.

B) Types of Concrete: -

Light weight concrete, polymer concrete, fiber reinforced concrete, ready mixed concrete, self compacting and high performance concrete, Ferro cement.

C) Special concreting techniques:

Pipe Crete concrete, under water concreting, concreting in extreme weather conditions.

UNIT-IV **(10 Hours 20 marks)**

Concrete mix design

A) Introduction, object of mix design, factors to be considered, statistical quality control. introduction to different methods of mix design.

B) Concrete mix design by I.S. method and IRC method., High strength concrete mix design.

UNIT-V **(10 Hours 20 marks)**

A) Introduction to Non-destructive testing of concrete, rebound hammer, ultrasonic pulse velocity, pull out test, impact echo test.

B) Deterioration of concrete, Permeability, Durability, Chemical attack, Carbonation of concrete , corrosion of reinforcement.

C) Repair – Symptoms and diagnosis of distress, Evaluation of cracks, common types of repair, shotcrete.

D) Introduction to lime & lime concrete.

LIST OF EXPERIMENTS:-

1. Testing of Cement -
   a). Fineness of cement
   b) Setting time
   c) Compressive strength
   d) Soundness
2. Testing of aggregate -

a) Fineness modulus and sieve analysis,
b) Crushing value
c) Impact value
d) moisture content
e) Abrasion test,
f) shape test,
g) specific gravity

3. Testing of concrete –

a) Workability of concrete (Slump cone and compaction factor)
b) Compressive strength (Cubes and cylinders),
c) Split test ie tensile test of cylinders
d) Modulus of rupture (flexural strength)
e) Concrete mix design by I.S. method

TEXT BOOKS:-

Concrete Technology by

1. M.S.Shetty (S Chand Publication)
2. M.L.Gambhir (T M H Publication)
3. S.V.Deodhar (Central Techno Publication)

REFERENCE BOOKS:-

1. A.N. Neville, J.J. Brooks - Concrete Technology - Addition Weslley
2. R.S. Varshney - Concrete Technology - Oxford & I B H.
3. P Kumar Mehta - Concrete - Gujrat Ambuja

ENGINEERING MATHEMATICS – III

Teaching Scheme:
Lectures: 4 Hours/Week
Tutorials: 1 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks(3 Hrs)
Term Work: 25 Marks

UNIT-I **(10 Hours, 20 marks)**

Linear Differential Equations:

Linear Differential equation of order n, Solution of LDE with constant coefficient, method of variation of parameters, equations reducible to linear form with constant co-efficients, Cauchy's linear equation, Legendre's linear equation. Applications of linear differential equations to cantilever, loaded beams, whriling of shafts.

UNIT-II **(10 Hours, 20 marks)**

A. Simultaneous linear differential equations of the forms:
   (i) $f_1 (D)\, x + \Phi_1 (D)\, y = \psi_1 (t)$
       $f_2 (D)\, x + \Phi_2 (D)\, y = \psi_2 (t)$, where $D \equiv d/dt$
   (ii) $\frac{dx}{P} = \frac{dy}{Q} = \frac{dz}{R}$ (Symmetrical form)
B. Differential equation of 1st order, and higher degree (Clauriats form)
C. Applications of Partial Differential equations to:
   (i) Vibration of strings or wave equations:
   $$\frac{\partial^2 y}{\partial t^2} = a^2 \frac{\partial^2 y}{\partial x^2}$$
   (ii) One dimensional heat flow equation
   $$\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$$
   (iii) Laplace equation Two dimensional heat flow equation.
   $$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial x^2} = 0$$
   by separating variables only.
   Applications of partial Differential equations to problems of civil and allied engineering.

UNIT-III: **(10 Hours, 20 marks)**

Statistics: Mean, Mode, Median standard deviation, Variance, co-efficient of variation, Moments, Skewness and kurtosis, Bivariate distribution, Correlation and Regression, Rediability of Regression estimates.

UNIT-IV **(10 Hours, 20 marks)**

Probability:Theorems on Probability, Binominal Distribution, Poisson distribution , Normal distribution, Beta distribution, Gamma distribution, Chi-Square distribution.

UNIT-V **(10 Hours, 20 marks)**

Theory of Sampling: Sampling, Types of sampling, Sampling distribution, Testing Hypothesis, Null Hypothesis level of Significance, Test of significance, Test of Significance of large sample. Decision quality control.

TEXT BOOKS:

1. H.K. Dass - Advanced Engineering Mathematics 5th Revised Edition 2006 (S. Chand Publication) New Delhi.
2. Erwin Kreyszig - Advanced Engineering Mathematics (Wiley Eastern Ltd.)
3. B.S. Grewal - Higher Engineering Mathematics, Khanna Publication, Delhi

REFERENCE BOOKS:

1. Wylie C.R. & Barrett - Advanced Engineering Mathematics - Mc Graw Hill
2. B.V. Raman - Engineering Mathematics - Tata Mc- Graw – Hill.
3. P.N. Wartikar & J.N. Wartikar - Applied Mathematics (Volume I & II) - (Pune Viduarthi Griha Prakashan, Pune)
4. Thomas L. Harman James - Advance Engineering Mathematics with MATLAB 2e - (Thomson Learing)
5. Dr. Gokhale, Dr. Chaudhari & Dr. Singh - Engineering Mathematics – III

COMPUTER GRAPHICS

Teaching Scheme:	**Examination Scheme:**
Practical : 2 Hours/Week	Term Work: 25 Marks

Study of any computer drafting software. Using Various Drawing and editing menu commands. Inserting / editing text, arrows & dimensions.

TW shall consist of drawings on A4 size sheets of the following

1) One sheet each showing use of commands viz array, arc, rotate, mirror, offset, etc.
2) A plan of 2 BHK house.
3) Typical Reinforcement details of beam & column

N O R T H   M A H A R A S H T R A   U N I V E R S I T Y ,   J A L G A O N .

SYLLABUS OF SECOND YEAR (CIVIL)

TERM-IIND (w.e.f. 2006-07)

THEORY OF STRUCTURE - I

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks(3 Hrs)
Tutorials: 1 Hour/Week	Term Work: 25 Marks

UNIT-I

a) Deflection of Beams.: - **(11 Hours, 20 marks)**
Relation between BM, slope and defection , determinate beams by double integration method. Concept of moment area method, Mohr's theorem. Use of moment area method to calculate deflections of beams such as simply supported, over hanging and of uniform cross sections and different cross sections. Conjugate beam method. Application of conjugate beam method to simply supported, overhanging and compound beams. Propped cantilevers.

b) Energy methods for deflection:-
Concept of strain energy, Maxwell's reciprocal theorem of deflection. Castiglino's theorm . Use of strain energy and unit load methods for finding out of deflections for beams & bends.

UNIT-II

a) Deflection of trusses:- **(10 Hours, 20 marks)**
Deflection of statically determinate plane trusses by Castigliano's first theorem

b) Analysis of redundant trusses by Castiglino's second theorem, lack of fit and temperature changes in members, sinking of supports (degree of indeterminacy maximum upto 2 only).

UNIT-III **(10 Hours, 20 marks)**

a) Fixed Beams:- Concept, advantages and disadvantages. Nature of B.M. Diagrams. Fixed end moment due to various types of loads such as point, uniformly distributed, Uniformly varying, couples for beams of uniform c/s and stepped cross sections. Effect of sinking of support. B.M.D & S.F.D.

b) Continuous Beams:- Concept , Nature of B.M. diagrams, Clapyeron's theorem of three moments for beams due to concentrated load, UDL, couples etc. Effect of sinking of supports, plotting of B.M.& S.F. diagrams.

UNIT-IV **(9 Hours, 20 marks)**

b) Three hinged arch:- Concept of three hinged arch as a haunched beam, support reactions. B.M., S.F. and axial thrust diagrams for circular and parabolic three hinged arches. Influence lines for B.M., S.F. and axial thrust. Maximum B.M., S.F. and axial thrust due to point load & UDL.

b) Two hinged arches :-
Horizontal thrust at supports. Shear, normal thrust and BM at a point, BM diagrams for concentrated load and udl, parabolic and semicircular arches.

UNIT-V **(10 Hours, 20 marks)**

a) Influence lines:- Basic concepts , influence line for reactions, B.M.& S.F. for simply supported, overhanging, & compound beams. Influence lines for members of statically determinate plane trusses.

Calculations for S.F & B.M for beam and for force in the truss member using influence lines.

b) Moving loads:- Introduction, conditions for maximum BM and maximum S.F. at a section due to moving point loads, UDL longer or shorter than span and train of moving loads. Absolute maximum B.M. & S.F., Construction of Max. B.M. diagram.

TERM WORK:-

Term work shall consist of ten assignments given on the syllabus given above.

REFERENCE BOOKS:-

1) Junnarkar and shah - Mechanics of structures Vol – II.
2) V.N.Vazirani & M.M.Ratwani - Analysis of structures (Volume - I & II)
3) S. Rammamrutham - Theory of structures
4) C.S.Reddy - Basic structural analysis.
5) C.K.Wang - Indererminate structures

SURVEYING- II

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks(3 Hrs)
Practical: 2Hour/Week	Term Work: 25 Marks
	Practical : 50 Marks

UNIT-I **(10 Hrs., 20 marks)**

Geodetic Surveying:

Objects ; methods in geodetic surveying , Triangulation figures; Strength of figure; Classification of trangulation systems; Selection of stations ; intervisibility and height of stations, towers, signals and their classification ;phase of signals ; measurement of angles; instruments used , methods of observation of angles ; satellite station and Reduction to centre ; Eccentricity of signals ; Base line measurement , Apparatus used, Base net; equipment used for base line measurement , field work and corrections ; Reduction to mean sea level; Exetension of a base.

UNIT-II **(10 Hrs., 20 marks)**

Triangulation Adjustments :kinds of errors; laws of weights, determination of the most probable values of quantities; The method of least squares; Indirect observations on independent quantities; normal equation; conditioned quantities ; The probable error and its determination ; distribution of error to the field measurements , method of correlates, station adjustment and figure adjustment; adjustment of a geodetic triangle , figure adjustment of a triangle ; calculation of spherical triangle ; adjustment of geodetic quadrilateral, Adjustment of a quadrilateral with a central station by method of least squares .

UNIT-III **(10 Hrs., 20 marks)**

Photogrammetry: Objects ; application to various fields, terrestrial photogrammetry (only general idea) and aerial photogrammetry ; Aerial camera; comparison of map and vertical photograph ; Vertical tilted and oblique Photographs ; Concept of principal point nadir point, isocentre, horizon point and principal plane, Scale of vertical photograph; computation of length and height from the photograph; relief displacement on vertical photograph; flight planning; ground control ; radial line method; Binocular vision and stereoscopic fusion , mirror and lens Stereoscopes, parallax equation ; measurement of parallax and determining deference of elevation, Stereometers; general idea of stereoscopic plotting instruments.

UNIT-IV **(10 Hrs., 20 marks)**

Remote Sensing :-

Basic principles, importance, scope, signatures in remote sensing, electromagnetic radiation, Atmospheric effects in radiation, interaction of electromagnetic radiation with matter, electromagnetic spectrum, atmospheric windows, sensors used in remote sensing, classification of sensors, remote sensing platforms, data products, multi concept in acquiring remote sensing data, imageries, interpretation techniques, image processing. Applications of remote sensing to Civil Engineering.

UNIT-V **(10 Hrs., 20 marks)**

Hydrographic Surveying :-

Objects; establishing controls; shore line survey, river surveys; soundings, tide gauges, Equipment for taking soundings; signals. The nautical sextant; measuring horizontal and vertical angles with the nautical sextant, sounding party, ranges making the soundings, methods of locating the soundings ;reduction of soundings , the three point problem and methods of solution.

Tunnel Surveying :- Instruments used; Laying of centre line on ground, Transfer of centre line, underground checks for deviation of tunnel driving from original centre.

Mine Surveying:- Special conditions confronted; Equipment for mine surveys; Correction for side telescope horizontal angles and top telescope vertical angle; The stations and station markers; measurement of distance and difference in elevation .

Use of Electronics in Surveys:- Electromagnetic waves and their properties, phase comparison, modulation, types of EDM Instruments, the geodemeter; the tellurometer; the distomat.

LIST OF EXPERIMENTS:-

1. One Second Theodolite :-
   i)Measurement of horizontal and vertical angles.
   ii)Measurement of horizontal angles by reiteration method.
2. Hydrographic survey (Any two exercises)
   i)Study and use of nautical sextant for measurement of angles.
   ii)Plotting the cross-section of the river by sounding method
   iii)Solution of three point problem.
3. Photogrammetry (Any two exercises):
   i)To find out the scale of the photograph .
   ii)Study and use of mirror stereoscope and finding out the air base distance.
   iii)Radial line method of plotting (photo triangulation).
   iv)Use of parallax bar for measuring parallax of two points and finding out the difference of elevation between them.
4. Adjustment of Geodetic quadrilateral by any one method .
5. Study and use of E.D.M. and its principle .

Note : The practical examination will be based on the above exercises.

TERM WORK

The term work shall consists of the record of the above exercises in a journal.

REFERENCE BOOKS –

1) T.P. Kanitkar, & S.V. Kulkarni - Surveying and leveling (vol-II)
2) B.C.Punmia - Surveying Vol. II and Vol .III.
3) P.Somand , B.N.Ghosh - Advance surveying
4) Norman Thomas - Surveying
5) Wolf - Photogrammetry
6) Clarks - Surveying
7) A.N. Patel, Surendra Singh - Principles of remote sensing

BUILDING DESIGN AND DRAWING

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks(4 Hrs)
Practical: 4Hour/Week	Term Work: 50 Marks
	Oral /Sketches:25 Marks

UNIT-I **(10 Hrs., 20 marks)**

a) Introduction :-Building definition and types of building as per occupancy, principles of planning of building, plan sanctioning, Tracing and ammonia print.

b) Building bylaws :- necessity of bye laws, plot size, width of road, open spaces, floor area ratio, marginal distances, building line and control line, height regulation, room sizes, types of area calculation- built-up area, floor area, carpet area, rules for ventilation, lighting, drainage, sanitation and parking of vehicles.

c) Ventilation and air conditioning of building :-
Ventilation: -necessity of ventilation, functional requirements, systems of ventilation and their choice movement of wind through building, wind effect, stack effect.
Air conditioning:- classification, comfort and comfort conditions, principles and system of comfort, object and necessity of air conditioning.

c) Fire protection :- Fire load, fire safety, grading of occupancy by fire load , considerations in fire protection, fire resistant construction of walls ,columns, roof, floor. wall openings, fire escape elements.

UNIT-II **(10 Hrs., 20 marks)**

a) Thermal insulation of buildings:-
Climate, thermal comfort, heat exchange of buildings, general principles and means of thermal insulation, structural control ,heat insulation of exposed walls, roof openings, use of sun breakers, chajja and insulating glass.

b) Noise and acoustics:-
Noise : effects of noise, types, noise control and noise insulation of structures, air borne and structural borne noise, transmission of noise, acceptable noise level.
Acoustics:- reverberation, Sabine's formula, acoustical defects, conditions of good acoustics, acoustics for various types of building.

c) Lighting: Natural and artificial, design of windows for clear daylight, sky daylight factor, necessity of artificial light, maximum light required at working table.

d) Building services: importance of building services, constructional requirements for different building services-electrical, tale communication and entertainment service, plumbing services –layout of water supply and drainage system, one pipe and two pipe system, storage disposal arrangement, septic tank, garbage disposal arrangements, solar water heater.

UNIT-III **(10 Hrs., 30 marks)**

a) Planning of residential building:-
Load bearing/ frame structure- bungalows, row houses, and apartments.

b) Working drawings :- importance of working drawings, use of working drawings.

UNIT-IV

a) Planning of public building (frame structure)- functional requirement of public buildings, following types of public buildings may be considered for planning :
Primary or secondary school building , hostel building, lodge building, hotel building, primary health center, factory building, bus stand, library building, commercial complex building, bank building ,post office building , marriage hall.

(13 Hrs., 20 marks)

b) Perspective drawings **(5 Hrs., 10 marks)**

One point and two point perspective drawings .

Note: 1) Theory questions shall be asked on Units I ,II.

2) Only drawing questions shall be asked to draw on drawing sheets from unit III and IV .

TERM WORK

A . Drawing file (full imperial sheets)

a) Planning of a small bungalows from given data load bearing or framed structure plan showing furniture arrangement, front elevation ,two sectional elevations, site plan, built up area calculation and schedules.
scale for all views (1:50) except site plan.
for site plan it is (1: 100) or suitable. (sheet no.1)

b) perspective of sheet no- 1 with suitable scale. (sheet no -2)

c) Tracing and ammonia print for (sheet no-1).

d) Drawings:-Plan and elevation using computer drafting software on A4 size sheet for (sheet no-1)

Project work

Project work shall consist of preparation of working drawings after planning and designing buildings mentioned in unit No.III-part (a) and unit No IV-part (a). Every student shall select different type mentioned.

Drawing for project work shall consist of following drawings at Scale 1:50 or suitable.

i) lay-out plan of project building showing different types of buildings, internal roads , compound walls, entrance gate ,garden ,electrical poles, free plantation etc. (project sheet no -1)

ii) Plan/typical floor plan . (Project sheet no- 2.)

iii) Car parking plan. /Terrace plan. (Project sheet no- 3.)

iv) Foundation plan. (Project sheet no-4)

v) Structural plan : (Project sheet no-5)

vi) Front elevation. : (Project sheet no-6)

vii) Sectional elevations.: (Project sheet no-7)

viii) Lay-out plan showing water supply and drainage arrangement.:(Project sheet no -8)

ix) Axonometric view . (project sheet no-9)

x) Drawings:- Layout plan and elevation using computer drafting software on A4 size sheet.

B. File work shall consist of

a) project work.
i) Data given for project work.
ii) Planning of different units of project building.
iii) Approximate cost of project building.(Cost per m^2).

b) Report regarding visit to construction sites , preferably visit to the type of buildings given for the project. (Minimum two)

REFERENCE BOOKS:-

1) M.G. Shah, C.M. Kale, S.Y. Patki - Building Drawing.

2) Y.S.Sane - planning & Designing Building

3) Dr S.V.Deodhar - Civil Engineering Drawing .

FLUID MECHANICS - I

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks(3 Hrs)
Practical: 2Hour/Week	Term Work: 25 Marks
	Oral---------:25 Marks

UNIT-I **(13 Hrs., 20 marks)**

a) Introduction :- Scope and application of fluid mechanics, Newton's law of viscosity, classification of fluids: Newtonian and non-Newtonian fluids, ideal and real fluids. Physical properties of fluids – density, specific weight, specific volume, specific gravity, dynamic and kinematics viscosity, compressibility, surface tension, capillarity , vapour pressure.

b) Fluid statics – fluid pressure, pressure head, measurement of pressure, manometers, introduction to mechanical gauges. Civil engineering applications of pressure forces on plane and curved surfaces and buoyancy and flotation.

UNIT-II **(11 Hrs., 20 marks)**

a) Kinematics of fluid flow- types of fluid flow – steady and unsteady: uniform and non-uniform: laminar and turbulent: one, two, three dimensional flows: rotational and irrational flows, velocity & acceleration of fluid particles, stream lines and equipotential lines and flow net.

   Equation of continuity for one-dimensional and three-dimensional flows. Electrical analogy method of drawing flow net related to civil engineering.

b) Dynamics of fluid flow – Forces acting on fluids in motion. Mention of various equations of motion, Euler's equation of motion, Bernoulli's theorem, simple applications of continuity and Bernoulli's equation such as Pitot tube, Venturimeter. orificemeter. Introduction to linear momentum principle.

UNIT-III **(9 Hrs., 20 marks)**

a) Dimensional analysis and Hydraulic similitude – Dimensions of physical quantities, dimensional homogeneity, Buckingham pi-theorem, important dimensionless parameters and their significance.

   Model analysis: geometric, kinematics and dynamic similitude. Model laws: Reynold's and Froude's model laws. Application of dimensional and model analysis to fluid flow problems.

b) Laminar flow – Flow through pipes, flow between parallel plates, Stoke's law, various methods of measurement of viscosity, Darcy's law, Reynold's experiment. Transition from laminar to turbulent flow.

UNIT-IV **(9 Hrs., 20 marks)**

a) Flow through opening – Orifices: types, coefficients of velocity, contraction and discharge, small and large orifices, submerged orifices.

   Mouthpieces: types, external cylindrical mouthpiece.

b) Flows over notches and weirs – Rectangular, triangular and trapezoidal notches and weirs, Cipolleti weir, empirical formulae for discharge over rectangular weirs, corrections for velocity of approach and end contractions, broad crested weirs.

UNIT-V **(8 Hrs., 20 marks)**

Open Channel flow – Classification of open channels, geometric elements, steady and unsteady flows, uniform and nonuniform flows, continuity and energy and momentum equations, kinetic energy and momentum correction factors.

Uniform flow: Chezy's and Manning's equations, roughness coefficients, concept of normal depth, calculation of normal depth for triangular & wide rectangular channels. Hydraulically efficient section.
Critical flow: Specific energy, specific energy diagrams, conditions for critical depth in rectangular and triangular channels.

LIST OF EXPERIMENTS:-

Experiments will be based on the critical portion as detailed below.

1. Measurement of viscosity.
2. Study of simple and differential manometers.
3. Buoyancy: metacentric height of ship model.
4. Study of Bernoulli's theorem.
5. Calibration of Venturimeter / Orificementre.
6. Electrical analogy method.
7. Study of laminar flow/ Heleshaw's apparatus.
8. Coefficients of Orifice / Mouthpiece / notches.
9. Study of Impact of jet.
10. Study of uniform flow formulae in open channel (Chezy's & Manning's formulae) / velocity distribution in open channel.
11. Specific energy and specific force.

TERM WORK: Termwork will consist of a journal giving details of experiments performed. Minimum eight experiments should be performed.

ORAL:- Oral shall be based on term work.

REFERECNE BOOKS

1) Dr. A.K.Jain - Fluid Mechanics
2) Dr. P.N.Modi , Dr. S.M. Seth - Hydraulic and Fluid Mechanics
3) R.K.Bansal - Hydraulic and Fluid Mechanics.
4) Dr. K. Subramanya. - Flow in Open channels
5) Dr. K. Subramanya - Theory and applications of Fluid Mechanics.
6) Ramamurthum - Hydraulic , Fluid Mechanics and Fluid Mechanics.
7) Dr.Garde and Mirajgaokar. - Fluid Mechanics
8) Som and Biswas - Fluid Mechanics
9) Streeter and Wylie - Fluid Mechanics

ENGINEERING GEOLOGY

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks(3 Hrs)
Practical: 2Hour/Week	Term Work: 25 Marks

UNIT-I **(10 Hrs., 20 marks)**

Introduction :- Objects, scope, and subdivisions.

Rock and minerals :- Rock forming minerals, primary and secondary minerals.

Igneous Rocks:- Mineral composition, felsic and mafic minerals. Textures, reasons for textural variation, crystalline matter and glass; dependence of degree of crystallization and shape and size of crystals. conditions of cooling. Conditions of cooling of plutonic, hypabyssal and volcanic rocks, classification.

Study of common rock types prescribed in practical work.

Secondary Rocks:- Rock Weathering, decomposition and disintegration, favourable conditions, processes and products of decomposition and disintegration. transport and deposition.

Classification:- Residual, sedimentary, Chemical and organic deposits.

Sedimentary deposits:- Agents of transport. Textural characteristics of aqueous, aeolian and glacial deposits , clastic texture, stratification and lamination, current bedding, consolidation by welding and cementation, grain size classification, study of common rocks prescribed in practical work.

UNIT-II **(10 Hrs., 20 marks)**

Structural Geology :- Outcrop, Dip and strike, conformable series, unconformity and overlap, Different type of faults and folds in rocks, modes of occurrence of igneous rocks, joints.

Physical Geology :- Geological action of running water, river valley development, waterfalls, ox-bow lakes, flood plain deposits, deltas, rejuvenation and resulting features such as canyons, river terraces and incised meanders.

UNIT-III **(10 Hrs., 20 marks)**

Ground Water :- Meteoric, connate and juvenile water, watertable and depth zones, relation between surface relief and water table, perched water table,

Influence of textures and structures of rocks on ground water storage and movement, pervious and impervious rocks, Geological conditions favourable for natural springs and seepages, depression and contact springs, hot springs and geysers. wells and drillholes, fluctuations in water table levels, effects of dams and canals, effect of pumping, cone of depression, circle of influence, conservation of ground water, Artesian wells, geological conditions that produce artesian pressure, water bearing capacity of common rocks.

Earthquakes: geological considerations for choosing sites of buildings in seismic areas.

Indian Geology: General principals of stratigraphy, age of the earth and divisions of geological time, physiographic divisions of India and their characteristics, geological history of peninsula, study of formations in peninsula and the significance of their structural characters in major civil engineering activities, economic minerals and building stones.

UNIT-IV **(10 Hrs., 20 marks)**

Preliminary geological Investigation: use of geological maps, aerial photographs, remotely sensed imageries, verification of surface data by subsurface exploration, drill holes, test pits, trenches, exploratory tunnels, shafts, adits, drifts, etc.

Compilation and interpretation of information obtained from these. correlation of surface data with the results of subsurface exploration. Limitations of drilling, comparative reliability of data obtained by drilling and excavation.

Engineering significance of geological structures such as stratification, dip, folds, faults, joints, crush zones, fault zones, dykes etc.
Land Slides: Causes, use of remotely sensed Imageries for identification of land sides, role of water, stability of slopes in consolidated material, influence of dip and slope, safe and unsafe slopes, prevention of landslides, keeping slopes free from water, retaining walls, vegetation, slope treatment. Precautions to be taken while aligning roads etc. across hills and making cuts in hillsides.

UNIT-V **(10 Hrs., 20 marks)**

Tunneling:- Influence of geological conditions on design and construction methods. Preliminary geological investigation for tunnels. Important geological considerations while choosing alignment. Difficulties during tunneling as related with lithology, nature and structures of material to be excavated. Role of groundwater, geological conditions likely to be trouble some. Suitability of common rock types for tunneling, unlined tunnels.
Geology of Dam Sites: - Depending of strength, stability and water tightness of foundation rocks on their physical characters and geological structures, Influence of geological conditions on the choice of type and design of dam , precautions to be taken to counteract unsuitable conditions, treatment of leaky rocks, faults dykes, crush zones, joints, unfavorable dips, etc. Earthquake in regions of dam.
Geology of Reservoir sites:- Dependence of water tightness on physical properties and structure of rocks ,geological conditions suitable and suitable for reservoir sites, precautions of amount of siltation in reservoir. Conditions likely to cause leakage through reservoir rim, importance of growing water studies and effects of raising of the water table.

TERM WORK:- It shall be based upon following :-

1) Study of the following minerals in hand specimen:
   Quartz and its varieties, common varieties of cryptocrystalline ,muscovite,biotite zeolites, calcite,iceland sper, gyspem satinsper ,fluorite, barytes,tourmaline, beryl asbestos ,talc ,kyanite, garnet , galena, magnetite, haematite, limonite, iron pyrites, cchromite, bauxite, azurite, malachite.
2) Study of the following rock types in hand specimens: Granites, syenites ,diorites, gabbros rhyolites trachytes, andesites Basalts, varieties of Deccan trap rocks ,volcanic breccias, pegmatites, dolerites, Graphic granites.Laterrites , Bauxites, Conglomrates, Breccias, Sand stones, Quartzites, Grits Arkose, Shales, Mudstone , chemical and organic lime stone .
   Marbles , quartzites , varieties of Goeisses ,slates,phyllites and varieties of schists.
3) Construction of geological sections from contoured geological maps, interpreting geological features without drawing section, solution of engineering geological problems such as alignment of dams, tunnels,roads,canals, etc. based on geological maps.

REFERENCE BOOKS:-

1. R.B. Gupte - A text book of Engineering geology.
2. D.V. Reddy - Engineering geology for civil Engineers.
3. David Tood - Groundwater Hydrology
4. Keller - Environmental Geology.
5. G.B. Deshpande - Geology of Maharashtra (GSI Publication).

SYLLABUS OF

THIRD YEAR (CIVIL)

NORTH MAHARASHTRA UNIVERSITY, JALGAON.

(w.e.f. 2007-08)

N O R T H M A H A R A S H T R A U N I V E R S I T Y , J A L G A O N STRUCTURE OF TEACHING AND EVALUATION

T.E. (Civil) w. e. f. 2007 - 08

FIRST TERM

Sr. No	Subject	Teaching Scheme Hours/Week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Structural Design & Drawing – I	4	-	4	4	100	50	-	25
2	Fluid Mechanics- –II	4	1	2	3	100	25	-	25
3	Geotechnical Engineering – I	4	-	2	3	100	25	-	25
4	Transportation Engineering – I	4	1	-	3	100	25	-	-
5	Numerical Methods in Civil Engineering	4	-	2	3	100	50	-	-
	Total	20	2	10		500	175	-	75
	Grand Total	32			750				

SECOND TERM

Sr. No	Subject	Teaching Scheme Hours/Week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
01	Structural Design & Drawing – II	4	-	4	4	100	50	-	25
02	Theory of Structures – II	4	1	-	3	100	25	-	-
03	Geotechnical Engineering – II	4	-	2	3	100	25	-	-
04	Transportation Engineering – II	4	1	-	3	100	25	-	-
05	Environmental Engineering – I	4	-	2	3	100	25	-	25
06	Testing of Materials	-	-	2	-	-		-	25
07	Practical Training/Mini Project/Special Study	-	-	-	-	-	25	-	-
	Total	20	2	10		500	175	-	75
	Grand Total	32			750				

N O R T H M A H A R A S H T R A U N I V E R S I T Y , J A L G A O N .
SYLLABUS OF THIRD YEAR (CIVIL)
TERM-IST (w.e.f. 2007-08)
STRUCTURAL DESIGN AND DRAWING-I

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks
Practical: 4 Hour/Week	(4 Hours Duration)
	Term Work: 50 Marks
	Oral: 25 Marks

UNIT I **(12 Hours, 25 marks)**

A) Introduction to various design philosophies of R.C structures: working stress method, ultimate load method, limit state method , limit state of collapse, limit state of serviceability, limit state of durability, characteristic strength, characteristic load, partial safety factors for material strengths and loads. Study of structural properties of concrete.

B) Limit state method for flexure: (Singly Reinforced Rectangular Section) assumptions, stress & strain diagram, MR of Balanced, under reinforced & over reinforced RC sections.

C) MR of Doubly reinforced & flanged section

UNIT II **(12 Hours, 25 marks)**

Design of beams for flexure, shear and bond

A] for simply supported & cantilever beams.

B] for continuous beams using IS code coefficient method.

UNIT III **(12 Hours, 25 marks)**

A] Design of one way simply supported, cantilever & continuous slabs

B] Design of Two way simply supported & continuous slabs

C] Design of dog legged stair case.

UNIT IV **(12 Hours, 25 marks)**

A] Column: Introduction, strain and stress variation diagrams, axially loaded short column with minimum eccentricity requirements, Design of short column for axial load.

B] Design of short column for axial load, uniaxial & biaxial bending.

C] Design of isolated pad footing for axial load & uniaxial bending.

TERM WORK:- shall consist of following

Design of G + 2 building covering slab, beam, column, footing & stair case.
A design report shall be prepared showing details on half imperial drawing sheets. A few typical details of beam column etc. shall be shown on A4 / A3 size sheets using drafting software also.
A report on at least one site visit shall be submitted in term work.

BOOKS :

1) Limit State Analysis and Design : P. Dayaratnram – Wheeler Publishing company, Delhi.
2) Comprehensive Design of R.C. Structures : Punmia, Jain and Jain – Standard Book House –New Delhi.
3) Limit State Theory and Design : Dr.V.L.Shah and Dr.S.R. Karve – Pune Vidyarthi Publication.
4) RCC Analysis and Design Vol.II and I : Sinha – S.Chand and Co., New Delhi.

FLUID MECHANICS - II

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks
Practical: 2 Hour/Week	(3 Hours Duration)
(Two lecture for unit tests)	Term Work: 25 Marks
	Oral --------: 25 Marks

UNIT-I **(10 Hours 20 marks)**

Boundary Layer Theory : Concept of boundary layer, various thickneses of boundary layer, application of momentum equation (no derivation), boundary layer over a flat plate, laminar and turbulent boundary layers, local and average drag coefficients, hydrodynamically smooth and rough boundaries, separation of boundary layer and control of separation.

Fluid Flow around submerged Bodies : Practical problems involving fluid flow around submerged objects, definitions and expressions of drag & lift, drag & lift coefficients, types of drag, drag on sphere, cylinder, airfoil. Karman's vortex street, Lift, Magnus effect , lift on cylinder and aerofoil, polar diagram.

UNIT-II **(9 Hours 20 marks)**

Turbulence Flow Theory : Turbulence phenomenon, instantaneous velocity & temporal mean velocity, scale & intensity of turbulence, Boussinwsqs theory , Reynold's expression , Prandtls mixing length theory, velocity distribution for smooth & rough boundaries, mean velocities in pipes, Karman Prandtls equation.

Darcy Weisbach equation, friction factors for smooth, rough & transition boundaries, Moodys diagram.

Turbulent flow through pipes, minor losses, pipes in series & parallel, three reservoir problem (no trial & error solution), siphon.

Unsteady flow through pipes : Celerity of pressure wave in an elastic pipe, water hammer phenomenon, pressure changes due to changes in valve opening – simple cases neglecting friction. Surge tanks – function, locations, types (no mathematical treatment for surge tank.)

UNIT-III **(9 Hours 20 marks)**

Definition & types of non-uniform flow, Gradually varies Flow (GVF) and rapidly varied flow (RVF), differential equation of GVF- alternate forms, different types of GVF profiles, their characteristics & examples of their occurrence, control sections.

Computation of GVF surface profiles by Direct step method, venture flume, standing wave flum.

Hydraulic Jump :

Phenomenon of hydraulic jump, example of occurrence, application of momentum equation to hydraulic jump in horizontal, frictionless, rectangular channel., specific force, conjugate depths & relation between conjugate depths, energy loss in hydraulic jump, length of jump, classification & practical uses of hydraulic jump.

UNIT-IV **(10 Hours 20 marks)**

Impact of Jet : Impact of jet on stationary & moving , flat & curved surfaces using linear momentum principle, workdone, principle of angular momentum , Eulers momentum equation for turbine & pumps (No derivation)

Hydraulic Turbine :

Elements of hydro elastic power plant, unit & specific quantities, hydraulic turbines, classification of hydraulic turbines, heads & efficiencies of hydraulic turbines.

Theory & design of hydraulic turbines (Pelton, Francis & Kaplan turbines), force and torque development, cavitation, governing of turbines, speed of turbines.

UNIT-V **(8 Hours 20 marks)**

Centrifugal Pumps :

General classification of pumps, classification of centrifugal pumps, specific speed, working of centrifugal pump, priming, theory of centrifugal pump, workdone by impeller, energy losses, heads & efficiencies, minimum starting speed, priming, cavitation, multistage turbine pump.

Model analysis of turbines & pumps. Prediction of performance in terms of unit & specific quantities, characteristic curves of turbine and pump.

PRACTICALS :

Any seven of following experiments should be performed.

1) Study of boundary layer on a flat plate.
2) Flow through pipes (laminar & turbulent) and determination of friction factor.
3) Drag and lift on airfoil.
4) Drag on cylinder.
5) Measurement of different parameters of hydraulic jump (model) in laboratory, OR Study of hydraulic flume. / jump on actual hydraulic structure on canals or dam near the college by arranging visit.
6) Venture flume / standing wave flume.
7) Velocity distribution in open channel .
8) Characteristics of Pelton wheel.
9) Characteristics of Francis turbine or Kaplan turbine.
10) Characteristics of centrifugal pump.

TERM WORK:

Termwork will consist of a journal giving details of at least seven out of 10 experiments above. Minimum seven experiments should be performed.

ORAL:

Oral shall be based on term work.

REFERECNE BOOK

1) Fluid Mechanics : Dr. A.K.Jain
2) Hydraulic and Fluid Mechanics : Dr. P.N.Modi , Dr. S.M. Seth.
3) Hydraulic and Fluid Mechanics : R.K.Bansal.
4) Flow in Open channels : Dr. K. Subramanya.
5) Theory and applications of Fluid Mechanics : Dr. K. Subramanya.
6) Fluid Mechanics : Dr.Grade and Mirakgaokar.
7) Fluid Mechanics : Streeter and Wylie.
8) Hydraulic Machines – Jagdish Lal
9) Hydraulic Machines – Rajpoot.

GEOTECHNICAL ENGINEERING – I

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks
Practical: 2 Hour/Week	(3 Hours Duration)
	Term Work: 25 Marks
	Oral : 25 marks

UNIT I **(9 Hrs.,20 marks)**

a) soil as engineering material:- origin and formation of soil, geological processes, soils of India, geotechnical problems, three phase system, definitions and functional relationships.

b) Geotechnical properties:- physicochemical properties, engineering properties, volume weight relationships. Atterberg's limits, sieve analysis, identification of soil, I.S. classification system

UNIT II **(9 Hrs.,20 marks)**

a) Stresses in soil:-geostatics stresses, stresses due to surface loading, Boussinesq's westerguards theories, point load, area load and strip load, newmarks chart, stress strain relation ship soil modulus, elastic settlement.

b) Soil compaction, M.D.D. and O.M.C. , standard proctors test heavy compaction test, concept of stabilization , different methods of stabilization.

UNIT III **(10 Hrs.,20 marks)**

a) flow of water through soils: soil water, capillarity, Darcy's law laboratory measurement of permeability, flow through layered soils, simple field measurement, laplace equation, flow net, its construction and uses, seepage force, quick sand, critical gradient, reverse filters.

b) Consolidation Theory:- Terzaghi theory, consolidation test, time fitting curves, rate of settlements, Normal consolidated and over consolidated deposits, Pre consolidation pressure.

UNIT IV **(9 Hrs.,20 marks)**

a) shear resistance in soil:- pore pressure and effective stresses failure theories , Mohr - Coulomb's law of shear strength direct shear test, traxial test, unconfined compression test, vane shear test, drained loading , factors affecting the shear strength.

UNIT V **(9 Hrs.,20 marks)**

a) Earth pressures:- Rankine's state of plastic equilibrium at rest, active and passive states, effect of surcharge, wall friction, back fill behind smooth wall , Rankine's theory , Coulomb's theory determination of lateral earth pressure by analytical and graphical methods.(culmann's and poncelete's construction.)

b) Stability of slopes:- finite and infinite slopes , natural and man made slopes, modes of failure, slip circle method, swedish circle method, method of slices,critical height of slopes, stability number, landslides, Remedial measures.

TERM WORK:-

Term work shall comprise of any Ten experiments out of following set :

1) Field density by core cutter method , sand replacement method.
2) Sieve analysis and particle size determination or hydrometer analysis.
3) Specific gravity determination by voluminometer/ pychnometer
4) Determination of liquid limit and plastic limit
5) Determination of shrinkage limit
6) Determination of co-efficient of permeability by constant head or by variable head permeameter
7) Direct shear test

8) Unconfined compression test
9) Vane shear test
10) Proctor's test (MDD / OMC)
11) Tri- axial test
12) C.B.R. test or Consolidation test
13) Differential free swell test or swelling test.

REFERENCE BOOK:

1) Soil Mechanics and Foundation Engineering - V.N.S. Murthy.
2) GeoTechnical Engineering- Gulhati and Datta.
3) Basic and Applied Soil Mechanics- Gopal Ranjan, A.S.R.Rao
4) Modern Geotechnical Engineering & Foundation - Dr. Alam Singh
5) GeoTechnical Engineering – T.N. Ramamurthy and T.G.Sitharam.
6) Geotechnical Engineering - Garg
7) Geotechnical Engineering – C. Venkatramaiah.

TRANSPORTATION ENGINEERING - I

Teaching Scheme:
Lectures: 4 Hours/Week
Tutorials: 1 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks
(3 Hours Duration)
Term Work: 25 Marks

UNIT-I **(9 Hours 20 marks)**

Introduction to railways as a Civil Engineering transportation system, permanent way components, Gauges on Indian railways, need of uniformity of gauge in view of problems of change of gauge, track structure and standards,rails requirments, stresses, wearing, stresses in ballast, coning of wheels, tilting of rails, fuctions, axle loads, defects, rail failure, causes of rail failure, sleepers, types, sleeper density, suitability of engineering materials for use as sleepers, manufacturing, testing and handling of concrete sleepers, rails joints, types, rail fastenings, welded rails, ballast, materials for ballast, requirements, specifications and design of ballast section, typical profiles of track and permanent way, cross sections in banking and filling.

UNIT-II **(9 Hours 20 marks)**

Track geometries ,gradients, types, alignments, curves ,superelevation , equilibrium cant ,cant deficiency, maximum permissible speed, negative superelevation

Horizontal transition and vally curves, Train resistance due to friction , wave action ,track irregularities, wind ,gradient curvature, compensated gradient for curve,resistances due to starting and accelerating,tractive efforts, types of traction, necessity and essentials of good trade management, creep effect and remedy, modern methods of track management, Engineering surveys, priliminary and detailed, information for preparation of project report ,land acquisition plate laying methods requirement of materials.

UNIT-III **(9 Hours 20 marks)**

Points and crossings , functions, constituents of turnouts, types of switches, terms used in crossings , standard turnouts, types of layouts, Diamond crossing , scissor crossing ,signals and interlocking , types of signals and principles of interlocking , CTC and ATC system , types , locations and layouts of stations , equipments for stations and yard platforms , loading gauges, locosheds, need of modernisation of railways, tracks for superhigh speed trains.

UNIT-IV **(9 Hours 20 marks)**

Tunnels, need, classification, choice of open cuts and tunnels, bridge action time and pressure relief, shapes and size, tunnel cross sections, shafts, types and constructions ,Pilot tunnel, tunnelling in rocks, heading and benching method, drilling, blasting, mucking ,ground support ,rock bolting and strata anchoring, lining, shotcreting, Tunnelling in soft stratra, problems encountered, methods of tunnelling, shield method of tunnelling, loads coming on tunnel crown, modern methods of tunnelling –TBM, bentonite slurry, safety measures about dust prevention, ventilation, lighting and drainage in tunnel.

UNIT-I **(9 Hours 20 marks)**

Importance of Docks and Harbours for inland water ways and sea routes, classification of harbours,ports and docks, types of harbours, site selection effectsof winds, waves and tides, littoral drifts, defects in harbours, breakwater , types, design. Construction,quay and quay walls, wharves, fenders, dolphins, piers, slips, moles, berths , pier heads, Jetties, Quay walls, Dock walls, Design criteria, wet docks , dry docks , Reel and bilge blocks, lock purpose and types.

Marine railways, Navigational aids, signals, buoys, light houses, ware house and Transit sheds.

TERM WORK:

1) It will consist of home assignments based on above syllabus and
2) Visit to a Railway station and study its layout..
3) A problem on calculation of loads on tunnel crown.

BOOKS RECOMMENDED

1) Railway Engineering –Rangwala
2) Railway Engineering - Oza
3) Railway Engineering – S.C. Saxena
4) Railway Engineering – Antia
5) Tunnel Engineering –Rangwala
6) Tunnel Engineering – S.C . Saxena
7) Tunnel Engineering – Oza
8) Docks & Harbour- Rangwala
9) Docks & Harbour -Oza

NUMERICAL METHODS APPLICATION IN CIVIL ENGINEERING

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hours/Week	Theory Paper: 100 Marks
Practical: 2 Hour/Week	(3 Hours Duration)
	Term Work: 25 Marks
	Oral --------: 25 Marks

UNIT-I **(9 Hours 20 marks)**

Introduction to Numerical Computation, Errors and approximation –storage, approximation, truncation, round off, absolute and percentage errors

Solution of simultaneous algebraic equation by Gauss Elimination method, Gauss Seidel method, Gauss Jordan method, partial pivoting, methods of iteration and its condition for convergence.

Solution of linear algebraic and transcendental equations by method of simple iteration, bisection, false position, Newton Raphson Method, Generalized Newton Raphson Method.

UNIT-II **(9 Hours 20 marks)**

Liner Programming–Structures, Assumptions, Advantages, Limitations, General Mathematical Model, Guidelines for formulations

Graphical Solution Method – Extreme point enumeration approach, Iso-profit(cost) function line approach, Maximization, Minimization and Mixed Constraints LP problem, Multiple Optimal solution.

Simplex Method – Standard Form of an LP problem, Reduction of Feasible solution to basic feasible solution, Simplex Algorithm for Maximization & Minimization Cases, Two phase method, Big-M method.

UNIT-III **(9 Hours 20 marks)**

Curve Fittings & Interpolation –

Linear Regression, Polynomial Regression, Multiple Linear Regression,

General Linear Least Squares,

Newton's divided difference interpolating polynomials,

Lagrange Interpolating polynomials,

Non-linear regression, Coefficient of interpolating polynomials.

Engineering Application of curve fitting.

UNIT-IV **(9 Hours 20 marks)**

Numerical Differentiation & Integration –

High accuracy differentiation formula – First Derivative & Second Derivatives, Richardson Extrapolation,

Trapezoidal rule, Simpson's one third and $3/8^{th}$ rule, Open Integration Formula, Multiple Integral,

Newton Cotes Algorithm,

Gaussian Quardature – Legendre Polynomials and Hermite Polynomials

UNIT-V **(9 Hours 20 marks)**

Solution of ordinary differential equation – Taylor's series method, Euler's method, Modified Euler's method, Runge Kutta method, Predictor Corrector Method.

Partial Differential Equation – Introduction to initial value and boundary value problem, Finite difference methods for the solution of one dimensional wave equation two dimensional (parabolic and elliptic) and higher order PDE.

TERM-WORK -

The term-work shall consist of computer programs along with the input and output file, flow chart/algorithm and numerical assignments from the list below –

***COMPUTER PROGRAMS** – (Minimum five)*

(1) Gaussian Elimination Method / Gauss Jordon Method
(2) Method of Bisection / method of false position
(3) Newton Raphson Method / Method of Simple Iteration
(4) Method of Least Square / Newton Interpolation / Lagrange Interpolation
(5) Euler's Method / Modified Euler's Method / Runge Kutte Method

***NUMERICAL ASSIGNMENT** – (Minimum three)*

(1) LPP – Graphical Method
(2) LPP – Simplex Method
(3) Curve Fitting
(4) Boundary Value Problem
(5) Simpson's One third/ Simpson's 3/8 rule
(6) Lagrange Formula / Gaussian quardature

BOOKS SUGGESTED –

1 –Steven C Chapra & Raymond P. Canale, "Numerical Methods for Engineers", Tata Mc-Graw HillCompany Limited, New Delhi, 2002
2 –Schilling & Harries, "Applied Numerical Methods for Engineers", THOMSON, Brooks/Cole, Newyork, 2000
3 –S.Rajasekaran, "Numerical Methods in Science & Engineering", A.H.Wheeler & Company Private Limited, 2000
4 –Sharma J.K., "Operation Research", MACMILLAN India Limited, 2003
5 –Jain, Iyenger & Jain, "Numerical Methods", New Age Publishing Company, New Delhi, 2004
6 –Sastry S.S., Introductory Methods of Numerical Analysis", Prentice Hall (India) Limited, New Delhi, 2000
7 –Kanti Swaroop & P.K.Gupta, "Operation Research", Sultan Chand & Sons, New Delhi, 1998
8 –S.S.Rao, "Optimization Theory and Application", Wiley Eastern Limited, 1999

N O R T H M A H A R A S H T R A U N I V E R S I T Y , J A L G A O N .
SYLLABUS OF THIRD YEAR (CIVIL)
TERM-IIND (w.e.f. 2007-08)
STRUCTURAL DESIGN AND DRAWING-II

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks
Practical: 4 Hour/Week	(4 Hours Duration)
	Term Work: 50 Marks
	Oral: 25 Marks

UNIT I **(12 Hours, 25 marks)**

A) Introduction to steel structure, steel grades, Rolled sections. Types of connections Strength of weld & Rivet Value. connections subjected to axial force.

B) Design of axially loaded tension members

C) Design of axially loaded compression members

UNIT II **(12 Hours, 25 marks)**

A) Design of built up columns. Design of lacing. Introduction to battened column.

B) Design of Roof Truss for DL, LL & WL (Excluding purlin design)

UNIT III **(12 Hours, 25 marks)**

A) Design of Laterally restrained and unrestrained simple beams. Design of purlin.

B) Design of Welded plate Girder including Curtailment of flang plate, stiffeners, splices & welded connections.

UNIT IV **(12 Hours, 25 marks)**

A) Design of Column bases: Slab base & Gussetted base.

B) Design of connections subjected to moments. Beam to beam & beam to column connection (framed connections)

C) Design of foot over bridge.

TERM WORK:- shall consist of following

1) Design of roof Truss
2) Design of an industrial building
3) Design of welded plate Girder.
3) A report on at least one site visit.

Drawing shall be on half imperial sheets. At least one sheet of above 3 designs shall be in A3 / A4 size sheets using drafting software.

BOOKS :

1) Design of Steel Structures –L.S. Negi
2) Design of Steel Structures –S. K. Duggal.
3) Design of Steel Structures – Dr.Ram Chandra
4) Design of Steel Structures – Arya and Ajmani.
5) Design of Steel Structures – Dr. B.C.Punmiya.

THEORY OF STRUCTURE II

Teaching Scheme:
Lectures: 4 Hours/Week
Tutorial : 1 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks
(3 Hours Duration)
Term Work: 25 Marks

UNIT-I **(12 Hours 20 marks)**

A) Basic concepts of Structural Analysis:- Types of skeletal structures, static and kinematics indeterminacy, equilibrium and compatibility conditions, stress-strain relations, force-displacement relations. concept of linear /non-linear structures. Energy theorem, Miller Breslau principle, concept of complementary energy, Fundamental concept of Force and the Displacement method of analysis.

B) Analysis of beams and frame by energy methods, (up to two unknown)

C) Slope deflection method, applied to continuous and rigid jointed frames, transverse and rotational yielding of supports.(up to three unknown).

UNIT-II **(10 Hours 20 marks)**

A) Moment distribution method applied to continuous beams and rigid jointed rectangular frames, transnational and rotational yielding of supports.

B) Approximate analysis of multistory frames for vertical and lateral loads, substitute frame, portal frame and cantilever method.

UNIT-III **(10 Hours 20 marks)**

Fundamental concept of flexibility :- Method for structural analysis , flexibility coefficient, matrix formulation for flexibility methods, degree of freedom. Influence coefficients, physical significance, choice of basic determinate structure and redundant forces, compatibility equations, effect of settlement and rotation of supports, temperature and lack of fit, hand solution of simple problems on beams, pin jointed plane truss and rigid jointed frames (involving not more than three unknown)

UNIT-IV **(8 Hours 20 marks)**

Fundamental concept of Stiffness:- Method of structural analysis, stiffness coefficient, matrix formulation for stiffness methods, Degree of freedom.
Influence coefficients, physical significance, effect of settlement and rotation of trusses and rigid jointed plane frames (involving not more than three unknown)

UNIT-IV **(8 Hours 20 marks)**

Plastic Analysis of Steel Structures :- introduction, Shape factor, plastic hinge, collapse mechanism, upper bound and lower bound theories, application to continuous, fixed and single bay single storey rectangular frames.

TERM WORK :

It shall consist of assignments based on above syllabus.

REFERENCE BOOKS

1. Pandit & Gupta -Structural Analysis,TataMcGrawHill,Pub. Co.Ltd ., New Delhi
2. Wang C.K.-Intermediate structural analysis, McGraw Hill, New York.
3 Kinney- Streling J. Indeterminate structural Analysis, Addition Wesley.
1. Reddy C.S.-Basic Structural Analysis Tata McGraw Hill Pub. Co. New Delhi.
2. Norris C.H. Wilbur J.B. and Utkys.-Elementary Structural Analysis, 4/e, Tata McGraw Hill Pub. Co.Ltd.
3. Weaver W & Gere J.M-Matrix Method of framed Structures CBS Publishers & Distributors, Delhi.

4. Ghali A & Neville M. Structural Analysis- A Unified classical and matrix Approach ,Chapman and Hall, New York. .

TEXT BOOKS

1. Theory of Structure – Punmia B.C.
2. Theory of Structure – Ramamrutham
3. Theory of Structure Vol II– Gupta and Gupta

GEOTECHNICAL ENGINEERING – II

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks
Tutorial : 1 Hour/Week	(3 Hours Duration)
	Term Work: 25 Marks

UNIT-I **(10 Hours 20 marks)**

Soil Exploration, Sampling and Testing:- Subsurface exploration trail pits, shafts, boring, geophysical tests wash, boring, representative and undisturbed samples, bore hole sampling, laboratory evaluation of foundation parameters, field testing, penetration tests , plate load test, bore hole tests.

Bearing Capacity:- Load settlement curve, local and ganeral shear, terzaghi b.c. analysis, B.C. factors, mayorhoff and hansel equations, rectangular, square and round footings, effects of water table and depth, bearing capacity of layered soils, effect of eccentricity, B.C. of rocks.

UNIT-II **(9 Hours 20 marks)**

Elastic settlement :- Contact pressure, elastic stresses and strains, pressure bulb, elastic settlement, empirical relation for settlement of basses, total and differential settlement, tolerable settlement, I.S. criteria, effect of lowering water table.

UNIT-III **(9 Hours 20 marks)**

Shallow Foundations :- Spread footings, minimum depth plain and R>C>C> footings, allowable soil pressure, use of SPT blow count, I>S> charts, wall footings, column footings, combined footings, raft foundations, floating foundations, grillage foundations.

UNIT-IV **(9 Hours 20 marks)**

Pile Foundation:- purpose of piles, pile classification carrying capacity – static method, pile load test, dynamic methods, use of cone test ; group action felds rule, rigid block method ; negative skin friction, shearing of loads, settlement of group.

Foundation on black cooton soils:- characteristics of B.C. soil, problems, swelling potential, under-reamed piles, design principles and construction techniques.

UNIT-V **(10 Hours 20 marks)**

Piers and Caissions :- Hand excavated and drilled piers, method of installation, use of drilling mud, caissions and foundation walls open, box, pneumatic caissons, sinking method, sand island method, caisson disease, capacity and settlement of piers and caissons, well foundation.

Sheet piles and cofferdams:- temporary supports and braced sheetings for excavations, pressure distribution cofferdams bracked and cellular, cantilever and anchored sheet piles.

Machine Foundation : Mechanical vibrations, single degree freedom systems, free and forced vibrations, damped systems, natural frequency, resonance magnification, vibration parameters , vibration test, dynamic modules ,coefficient of elestic uniformcompression, block foundation design Balken method, isolation and control of vibration screen barriers.

Problems in foundation engineering .

Tutorial: It shall consists of following based upon above syllabus.:-

A) 1) Preparation of soil exploration, programming and testing report for any two of the following including bore logs.

i) Multy storey building.

ii) Dam.

iii)Bridge.

iv) Harbour.

2) Study of plate load test and presentation of test results.
3) Study of standard penetration test and presentation of result.
4) Study of pile load test and presentation of results.
5) Sketches of various types of sheet piles and coffer dams.
6) Sketches of various types of shallow foundations and deep foundations.

B) Home assignments based upon above syllabus.

BOOKS RECOMMENDED :-

1. Foundation Engineering - Punmia B.C.
2. Foundation Engineering - Kasmalkar
3. Basic and Applied Soil Mechanics- Gopal Ranjan, A.S.R.Rao
4. GeoTechnical Engineering- Gulhati and Datta.
5. Foundation Design – Wayne. C. Teng.

TRANSPORTATION ENGINEERING–II

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks
Tutorials: 1 Hour/Week	(3 Hours Duration)
	Term Work: 25 Marks

UNIT-I **(10 Hrs.,20 marks)**

a) Role of transportation in the development of nation, component of transportation. Principal of highway planning, road development and planning in India, highway financing, Introduction to privatization in transportation projects.
b) Highway alignment:- requirements, factors controlling highway alignment, engineering surveys for highway location, basic requirements for an ideal alignment, special requirement for hill roads.
c) various types of roads, method of construction, quantity of material required and quality control. (Embankment WBM, BM, DBM Layer constructions only)
d) Geometric design:- Cross section, element width, camber, design speed, sight distance, overtaking sight distance, super elevation, gradient, requirement and design of horizontal and vertical alignment.

UNIT-II **(10 Hrs.,20 marks)**

a) Traffic Engineering:- Traffic characteristics, vehicle characteristics, traffic studies and the use, traffic operation , traffic control devices, types of road intersection.
b) Behavior of highway materials:- Properties of sub grade and pavement components, materials, material interaction. Test on sub grade soil, aggregate and bitumen material, test on bitumen and aggregate , requirements of bitumen mixes, marshal tests, stabilized soil mixes.
c) Introduction of pavement design:- Factors in design of flexible and rigid pavement, group index and C.B.R. method, westergaurd analysis of wheel load stresses in rigid pavement I.R.C. recommendations.
d) Typical problems in highway:- Drainage surface and subsoil, pavement failure, evaluation, maintenance.

UNIT-III **(9 Hrs.,20 marks)**

Airport planning:- The important characteristics of airport which influence judicious and scientific planning of airport selection of site for airport important term.

a) Airport layout: - Location of terminal building, aprons and hangers, design criteria, characteristics of good layout for an airfield, zoning requirements regarding the permissible height of constructions and the land use within the airport boundary.
b) Aviation organization and their function, airport drainage surface , subsurface drainage. Airport authority of India's bylaws.
c) Runway and Taxiway:- Influence and wing characteristics on orientation of runways, use of wind rose diagrams basic patterns of runways, basic recommendation regarding length, width and gradients of runways and taxiways.
   Lighting, marking and signs:- approach, runway, taxiway lighting, runway taxiway marking, taxiway sign systems.
d) Heliports:- Main characteristics of Helicopters, nature of helicopters transport, site selection for helicopters. Typical layouts, protection of approach and departure paths, elevated heliports.

UNIT-IV **(9 Hrs.,20 marks)**

a) Classification of bridges, selection of site , determination of design discharge, linear waterway , economical span, location of piers and abutment, afflux, scour depth.

b) Standard specification for bridges:- I.R.C. bridge code, width of carriage way and clearance, loading, Indian railway bridge loading, forces acting on bridge structures, design consideration, aesthetics of bridge design.

UNIT-V **(9 Hrs.,20 marks)**

a) Various types of bridges, culverts slab, pipe and box type, R.C.C. bridge "T" beam, half hollow girder, balanced cantilever, continuous girder, rigid framed arch, bow string girder, prestressed concrete bridges, steel bridges, plate girder, box girder, truss, arch cable stayed, cantilever and suspension bridges, temporary and movable bridges, floating pontoons bridges.

b) Selection of a suitable type of bridge, types of bridge foundation, their choice and method of construction, bearing and their types, design consideration.

Introduction to different techniques of erection of bridge , super structure and bridge maintenance.

TERMWORK:-

T.W. shall be based on Assignment given in lecterns hours.

REFERENCE BOOKS:-

1. Highway Engineering by Justo Khanna.
2. Highway Engineering by Rangwala.
3. Highway Engineering and Airports by K.L. Bhanot & S.B. Sehgal.
4. Airport Engineering by Rangawala.
5. Airport Engineering by G.Venkatappa Rao.
6. Bridge Engineering by S.P.Bindra.
7. Bridge Engineering by S.Ponnuswamy.

ENVIRONMENTAL ENGINEERING - I

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks
Practical: 2 Hour/Week	(3 Hours Duration)
	Term Work: 25 Marks
	Oral --------: 25 Marks

UNIT-I **(9 Hours 20 marks)**

Introduction to Water Supply – Planning and necessity, brief description of different elements of water supply scheme

Water Demand – types, total requirement, per capita demand, factors affecting per capita demand, variations, effect of variation in different component of water supply scheme, design period,

Population – growth of population and forecasting method.

Sources of Water for WSS – Surface sources such as ponds and lakes, streams and rivers, storage reservoirs. Ground water sources such as infiltration galleries, infiltration wells and springs. Quality and quantities of water from different sources, Factors governing the selection of particular source for WSS.

UNIT-II **(9 Hours 20 marks)**

Intake structures – purpose, types such as canal intake, reservoir intake, river intake, intake tower etc, factors governing the location

Hydraulic Design of Intake well, Intake pipe, Jack well, pump house, open dug well (production well)

Pipes for conveyance of Water – (only different class of pipes, available sizes and suitability) AC pipes, MS pipes, CI/DI pipes, PVC pipes, GI pipes,

Stresses in pipes, Water Hammer Effect, Forces at Bends- Thrust Blocks

Hydraulic Design of Rising Main & Gravity Main,

Pipe Appurtenances (Purpose & Functioning) – Air Valves, Sluice Valves, Butterfly Valves, Pressure Relief Valves, Drain/Scour Valves

Pumps for WSS – Types of pumps in common use such as centrifugal, vertical turbine, submersible pumps, their suitability, Estimation of power of motor of pump, Economical diameter of pumping main

Reservoirs (Purpose, Location and Capacity)– Ground Service Reservoirs, Elevated Service Reservoirs, Master Balancing Reservoirs, Pressure Break Tank

UNIT-III **(9 Hours 20 marks)**

Quality of Water - Objectives of determination of quality, Pure water,

Physical Characteristics – Units of measurement, Reasons for their presence & Methods of determination of Colour, Taste and Odour, Turbidity (Turbidity Rod, Jakson Turbidity meter, Nephelometer), Specific Conductivity, Temperature

Chemical Characteristics – Units of measurement Reasons for their presence and determination of total solids, pH value, Hardness, Chloride Content, Nitrogen in its different forms, Alkalnity, Dissoloved Oxygen

Biological/Bacteriological/Microscopical Characteristics – Classification of Micro-organisms, Tests for Biological Characteristics of water (Total Count Test, E-Coli Test). E-Coli Test – (Presumptive Test, Confirmed Test and Completed Test) Determination of Coliform Index (E-coli index) and MPN index

Standard of water with respect to different characteristics as per norms of WHO and BIS

UNIT-IV **(9 Hours 20 marks)**

General Water Treatment of Surface Water – Objective of treatment of water, different elements of WTP for treatment of normal surface water.

Screening – Coarse and fine screens

Aeration Fountain – Types, Necessity and design

Plain Sedimentation – Theory of sedimentation (Laminar and Turbulent Settling of particles), Design Concept, Scouring of deposited particles, Different types of sedimentation tank, Inlet and outlet arrangements

Sedimentation aided with coagulation – Theory of coagulation & flocculant settling, Various types of coagulants and their suitability, Feeding Devices, Mixing Devices, Design of Flash Mixer, Flocculation tank & clarifier (Clariflocculator), Management of sludge in coagulation-sedimentation process

UNIT-V **(9 Hours 20 marks)**

Filtration – Theory of filtration – mechanical straining, flocculation and sedimentation in filter media, biological metabolism, electrolytic changes,

Filter Material – Types, characteristics and requirement of good filter material

Types of filters and their classification

Slow sand filters – Details of features, Operation and design criteria of Different elements of SSF (Tank, filter media, base material, inlet & outlet arrangements, Appurtenances. Efficiency & Performance of SSF

Rapid Sand Filters – Necessity, Details of features, Operation and design criteria of Different elements of RSF (Tank, filter media, base material, under drainage system, inlet & outlet arrangements, Appurtenances, Back wash arrangements). Operational Troubles in RSF, Efficiency & performance of RSF

Pressure Filters – Necessity, Details of Features and working, Efficiency and suitability, Advantages and Disadvantages

Disinfections – Purpose, Brief descriptions about Various Methods of disinfections (boiling, treatment with excess lime, ozone treatment, Iodine treatment, Treatment with potassium permanganate and silver treatment)

Chlorination – Disinfecting action, dosage, different forms of chlorination (Liquid chlorine, bleaching powder, chlorine di-oxide, chloramines, chlorine di-oxide), Types of Chlorination – Plain, Pre, Post, Double, Break point, Super Chlorination and Dechlorination. Importance of Chlorine residual and Testing.

TERM-WORK -

The term-work shall consist of minimum eight experiments and five assignments from the list below –

Experiments – (Any eight)

(1) Determination of pH
(2) Determination of Turbidity and optimum dose of alum
(3) Determination of Total Dissolved Solid
(4) Determination of different forms of alkalinity
(5) Determination of Total and mineral acidity
(6) Determination of Carbonate and Non-carbonate hardness in water
(7) Determination of Chlorine demand of water
(8) Determination of Dissolved Oxygen Content
(9) Determination of Fluoride Content
(10) MPN Test

Assignment – (Any five)

(1) Population Forecast of a town by three methods
(2) Design of Aeration Fountain

(3) Design of Flash Mixer
(4) Design of Clariflocculator
(5) Design of Slow Sand Filter
(6) Design of Rapid Sand Filter
(7) Visit Report of a Water Supply Scheme including WTP

BOOKS RECOMMENDED –

- Garg S.K., “Water Supply Engineering”, Khanna Publisher, New Delhi
- Punamia, Jain & Jain, “Water Supply Engineering”, Laxmi Publications, New Delhi
- Manual on Water Supply & Treatment, Central Public Health & Environmental Engineering, Organization, Ministry of Urban Affairs, Government of India
- Modi P.N., “Water Supply Engineering”, Standard Publications, New Delhi
- Rangwala, “Water Supply and Sanitary Engineering”, Charotar Publishing Company, Anand
- Raju, “Water Supply and Waste Water Engineering”, Tata McGraw Hill Publishing Company, New Delhi
- Sincero & Sincero, “Environmental Engineering – A Design Approach”, Prentice Hall International, New Delhi
- Therous, Eldridge & Mallmann, “Laboratory Manual for Chemical & Bacteriological Analysis of Water & Sewage”, Agro Botanic Publisher, India
- Benergee & Jain, “Handbook of Technical Analysis”, Jain Brothers New Delhi.
- Laboratory Manual for Environmental Quality Testing, Environmental Protection Research Foundation, Sangli

TESTING OF MATERIAL

Teaching Scheme:

Practical: 2 Hour/Week

Examination Scheme:

Term Work: 25 Marks

Oral --------: 25 Marks

List of Practicals to be conducted for Term work

1. Tension Test on metal.
   - Mild steel.
   - Tor steel
2. Hardness test on metal.
3. Impact Test on metal (Izod charpy Test)
4. Test on bricks.
   - Water absorption.
   - Compressive Strength.
5. Test on Tiles.
   - Abrasion and transverse test for floor tile.
6. Test on Timber.
   - Moisture content.
   - Bending.
7. Road Aggregates
   - Abrasion Test
   - Impact Test
8. Test on Bitumen.
   a. Penetration.
   b. Ductility.
   c. Softening point.
   d. Specific gravity.
   e. Flash and fire point.
   f. Viscosity test.
9. Bituminous mix design using Marshall stability test.

BOOKS RECOMMENDED.:-

Civil Engineering Materials by Janardhan Jha.
Civil Engineering Materials by Sushilkumar .
Civil Engineering Materials by Vazirani and Chandola.
Civil Engineering Materials by Rangwala.
Civil Engineering Materials by S.V. Deodhar.
Civil Engineering Materials by D.S. Arora.
Relevant BIS codes

SYLLABUS OF

FOURTH YEAR (CIVIL)

NORTH MAHARASHTRA UNIVERSITY, JALGAON.

(w.e.f. 2008-09)

N O R T H   M A H A R A S H T R A   U N I V E R S I T Y ,   J A L G A O N

STRUCTURE OF TEACHING AND EVALUATION

B.E. (Civil)   w. e. f.   2008 - 09

FIRST TERM

Sr. No	Subject	Teaching Scheme Hours/Week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Construction Management- I	4	-	2	3	100	25	-	25
2	Water Resources Engineering –I	4	-	-	3	100	25	-	-
3	Quantity Surveying & Valuation	4	-	2	3	100	25	-	25
4	Environmental Engineering - II	4	-	2	3	100	-	-	25
5	Elective- I i) Open Channel & Conduit Flow ii) Water Shed Management iii) Finite Element Method	4	-	2	3	100	25	-	--
6	Seminar	-	-	-	-	-	25	-	-
7	Project –Stage I	-	-	2	-	-	25	-	25
	Total	20	-	10	-	500	150	-	100
	Grand Total	30			750				

SECOND TERM

Sr. No	Subject	Teaching Scheme Hours/Week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
01	Structural Design & Drawing – III	4	-	4	4	100	25	-	25
02	Construction Management- II	4	-	2	3	100	25	-	25
03	Water Resources Engineering. –II	4	-	2	3	100	25	-	25
04	Elective–II i) Water Power Engineering ii) Geographical Information System iii) Industrial Pollution & Control	4	-	2	3	100	25	-	-
05	Site Visit /Case Study	-	-	-	-	-	25	-	-
06	Project–Stage II	-	-	4	-	-	100	-	50
07	**Total**	16	-	14	-	400	225	-	125
	Grand Total	30			750				

N O R T H M A H A R A S H T R A U N I V E R S I T Y , J A L G A O N
SYLLABUS OF FOURTH YEAR (CIVIL)
TERM-IST (w.e.f. 2008-09)

CONSTRUCTION MANAGEMENT-I

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks (3 Hrs)
Tutorial: 2 Hour/Week	Term Work: 25 Marks
	Oral: 25 Marks

UNIT--I **(10 Hours, 20 marks)**

Construction industry, construction team, Construction activities, classification of construction ,stages in construction, Need of management in construction, Ownership and entrepreneurship , Small scale industries in construction .
Jab layout, mass housing and value engineering.
Scientific management, Management technique and uses, Definition and objectives of management, levels of management, Leadership and its quality.
Organization, meaning and function , forms of organization - line, line and staff , functional ,Type A, Type B and Type C

UNIT—II **(10 Hours, 20 marks)**

Network Technique :- History, Advantages, Bar charts, S –Curve etc. various terms used in network technique, activity,. event, critical path, duration etc. Development of networks, network scheduling, to find various times and float. EST, EFT, TF etc. Monitoring of Network, Three phases of network technique.
PERT - its concept and PERT Time.

UNIT–III **(10 Hours, 20 marks)**

Cost analysis, Cost Curve, Optimization and crashing of networks. Updating of network During monitoring, resource leveling, allocation, leveling and smoothening.
Line of balance - Concept and uses.

UNIT – IV

Engineering economics, its definition and importance, demand and supply, factors affecting demand and supply. Production, its meaning, different factors of production, economics of production, cost concept, relationship of cost to level of production.
Bank, its type, uses and functions, banking systems, profit and loss account, appreciation and depreciation of money.

UNIT - V

a) Pile driving Equipments:-
Pile hammers, drop, single acting steam, double acting steam, differential acting steam, diesel, vibratory , hydraulic hammers , sonic hammers, selection of pile driving hammers.
b) Crushers – types , primary, secondary ,tertiary crushers, jaw, gyratory, cone crushers, hammer mills, roll crushers, rod and ball mills Screening aggregate, revolving, vibrating screens
c) Ready mix concrete plants :- central concrete batch plant , portable concrete batch plant, ready mixed concrete – central mixed , shrink mixed, truck mixed concrete, concrete pumps.

TERM WORK:- It shall consist of assignments based on each unit of above syllabus.

BOOKS RECOMMENDED:-

1. Mahesh Varma - Construction planning and management
2. S.V.Deodhar - Construction equipment and job planning
3. U.K.Shrivastava - Construction Management

4. Gehlot and Dhir - Construction Management
5. L.S.SrinathEngineering - CPM and PERT
6. Peurifoy - Construction Planning and Management
7. Tarachand - Engineering Economics
8. Sengupta - Construction Management and planning
9. Chitkara - Construction Project Management
10. Mukund Mahajan - Engineering Economics
11. R.L.Peurifoy - Construction planning ,Equipments and Methods.
12. Dr. Mahesh Verma - Construction equipments and its planning and application

WATER RESOURCES ENGINEERING - I

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks (3 Hrs)
Practical: 2 Hour/Week	Term Work: 25 Marks

UNIT I **(10 Hours, 20 marks)**

Hydrologic cycle, Hydrology & Water resources development, Surface hydrology and sub-surface hydrology

Precipitation – Mechanism, essential requirement for occurrence, Different Forms, Types, Measurement of Precipitation – Different types of rain gauges- non-automatic and automatic, Radar measurement, Methods to find out the areal average depth of precipitation, Mean monthly precipitation, annual average precipitation, Optimum number of rain gauge stations, Estimation of missing data, Checking for consistency of data

Rainfall Intensity analysis, Frequency Curve, Depth Area Duration Curve

Disposal of precipitation - Factors affecting disposal, Evaporation Losses, Evapo-transpiration, Factors affecting evapo-transpiration, methods for measurement of evaporation and evapo-transpiration, Infiltration – methods for determination, factors affecting, infiltration indexes

UNIT II **(10 Hours, 20 marks)**

Discharge Measurement in Streams – Methods (Area Velocity, Moving Boat, Chemical), Selection of gauge site, Stage Discharge Relationship, Extension of Rating Curves, Slope Area Method

Run-off – Runoff Process, Runoff Cycle, Factors affecting Runoff, Estimation

Catchment -Classification & Salient Characteristics

Floods – Necessity, Causes, Factors affecting, Classification, Frequency, Estimation

Hydrographs – Definition, Components, Factors affecting the shape, Base flow separation, Flood Hydrograph, Unit Hydrograph, U.H.methods, S-hydograph (S-curve technique), Synthetic Unit Hydrograph

UNIT III **(10 Hours, 20 marks)**

Ground water hydrology: - Occurrences and distribution of ground water, specific yield of aquifers, movement of ground water, Darcy's law, permeability, yield of basins. Hydraulics of well sunder steady flow, condition in confined and unconfined aquifers, specific capacity a well, well irrigation: tube wells, open wells, their design and construction.

Water logging and drainage engineering - Causes of water logging, preventive and curative measures, drainage of irrigated lands, reclamation of water logged, alkaline and saline lands, design and spacing of the tile – drain.

UNIT IV **(10 Hours, 20 marks)**

Reservoir Planning – Advantages, Classification, Types of developments: Storage and diversion works. Single and multi-purposes reservoir, investigation for locating a reservoir, selection of site, height of the dam, reservoir, economics of reservoir planning, Benefit – cost ratio,

Reservoir Sedimentation – Process of Erosion, Factors affecting erosion, Mechanism of Sediment Transport, Sediment Yield, Distribution of sediment in reservoir, Factors affecting silting, Estimation of silt load, & Mode of sedimentation, Trap efficiency of reservoir, Control of reservoir sedimentation

Necessity and layouts of Lift Irrigation Schemes, Drip & sprinkler irrigation system

UNIT V **(10 Hours, 20 marks)**

Introduction to Irrigation - Definitions, functions, necessity, benefits, Ill effect, Irrigation System & its classification, Irrigation Methods & its classification, (Surface & Sub-sub surface Methods), Factors affecting choice of method,

Soil Water Plant Relationship – Classification of soil water, Soil moisture stress, Soil moisture tension, Saturation capacity, Field capacity, Determination of field capacity,
Major Soil Groups in India, Maintaining the soil fertility, Essential Elements for Plant Growth, Quality of Irrigation Water
Water requirement of crop :- Limiting soil moisture condition, Depth of irrigation water and frequency, Principal Indian Crops and their season, Crop and base period, Duty of water and delta, Factors affecting & methods of improving the duty of water, Commanded area their classification, Intensity of Irrigation, Paleo Irrigation, Kor watering, kor depth and kor period, outlet factor, capacity factor, time factor, crop ratio, overlap allowance, Consumptive use of water, factors affecting consumptive use, calculations of canal capacities.
Application of water, water management and distribution, National water policy, warabandi, rotational application.
Various Methods of Assessment of Canal Revenue
TERM WORK:- From each of the following groups minimum two assignments shall be performed. (At least one assignments from group 1 to 3 shall be done by using spread sheet on computer.)
Group 1: -
1) Marking catchment area on a topo-sheet and working out average annual rainfall and determining yield.
2) Checking for inconsistency of precipitation record by double mass curve technique.
3) Frequency analysis of precipitation data (plotting on semi-log graph paper)
Group 2: -
1) Development of flood hydrograph from unit hydrograph and complex storm.
2) Development of unit hydrograph from isolated and composite flood hydrograph.
3) Development of unit hydrographs of different durations use s- curve method.
Group 3: -
1) Determination of canal and reservoir capacity for water requirement of crops.
2) Determination of reservoir capacity from mass inflow and mass demand curve.
3) Benefit cost analysis of water resources project.
4) Determination of yield of well by recuperating test data.
Group 4: -
1) Design of drainage system in water logged area.
2) Design of micro – irrigation system; either sprinkler of drip irrigation system.
3) Design of lift- irrigation system.

BOOKS RECOMMENDED –

- Garg S.K., “Irrigation Engineering, Dams and Hydraulic Structure”, Dhanpat Rai & Sons, New Delhi
- Modi P.N., “Water Resources, Irrigation & Water Power Engineering”, Standard Publisher, New Delhi
- Punamia B.C., “Irrigation & Water Power Engineering”, Laxmi Publications, New Delhi
- Raghunath H.M., “Hydrology”, New Age Publications, New Delhi
- Raghunath H.M., “Ground Water”, New Age Publications, New Delhi
- Mutreja, “Applied Hydrology”, Tata McGraw Hill Company, New Delhi
- Arora K.R., “Irrigation Engineering”, Standard Publications, New Delhi
- P.Jayaram Reddi, “A Text Book of Hydrology”, Laxmi Publications, New Delhi
- Sharma R.K., “A Text Book of Hydrology & Water Resources”, Dhanpat Rai and Sons

QUANTITY SURVEYING & VALUATION

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks (4 Hrs)
Practical: 2 Hour/Week	Term Work: 25 Marks
	Oral: 25 Marks

UNIT I **(08 Hours, 20 marks)**

Estimate, Detailed Estimate, types of detailed estimate, purpose, data required for preparing detailed estimate, factors to be consider during preparation of detailed estimate, methods of taking out quantities, abstracting, units of measurements, building cost index, prime cost, provisional sum, centage charges, work charged Establishment, administrative approval, technical sanction.

Approximate estimate: - Importance, purposes, approximate methods of building estimating and various civil engineering works.

UNIT II **(11 Hours, 20 marks)**

Detailed estimate of buildings (load bearing and framed structure specially RCC flat roof buildings.)

Detailed estimate of community well, septic tank, pipe culvert, earthwork in roads / cannels.

UNIT III **(11 Hours, 20 marks)**

Detailed estimate of reinforcement quantities of R.C.C. elements like slab, beam, column & Isolated column footing, staircase and preparation of bar bending schedule.

UNIT IV **(10 Hours, 20 marks)**

Task work, factors affecting task work, schedule of rate, Task work of various items of construction, Analysis of rates, factors affecting cost of an item of work, material, labour etc. Analysis of various items of construction.

Specifications, purposes, types, drafting of specifications, and specifications of a few main items of civil engineering works.

UNIT V **(10 Hours, 20 marks)**

Valuation, purposes, price cost and value, factors affecting value of a property, various types of value like market value, sentimental value, mortgage, year's purchase and outgoings, legal aspects of valuation and easement act. Methods of valuation, land and building method, rental method, belting method of valuation of land. Standard rent and Standard rent fixation.

depreciation, various methods of depreciation, sinking fund, book value, free hold and lease hold properties.

TERM WORK: - It shall consist of following

1) Units of Measurement of various items of Civil Engg. Works.
2) Approximate estimate of: -
   i) Residential Building. ii) Public Building (Any Two Types).
   iii) Elevated water service reservoir. iv) Road and Bridge.
3) Detailed estimate of a load bearing residential single story structure.
4) Detailed estimate of framed residential double story structure.
5) Detailed estimate of any two of the following:
   a) Community well. b) Pipe Culvert. c) Septic tank. d) Earth work in roads /cannels.
6) Detailed Specifications for any five items of construction.
7) Rate analysis for any five items for buildings.
8) Estimation of detailed quantities of reinforcement for any two of the following:
   i) Slab. ii) Beam. iii) Column and isolated column footing.

BOOKS RECOMMENDED

a) B.N. Dutta - Estimating and Costing.
b) M. Chatroboty - Estimating and Costing.
c) G.S. Birdie - Estimating and Costing for Civil Engg.
d) B.S.Patil - Estimating and Costing , Vol.I & II.
e) S.C Rangwala - Estimating , costing and valuations.

ENVIRONMENTAL ENGINEERING - II

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks (3 Hrs)
Practical: 2 Hour/Week	Oral: 25 Marks

UNIT –I **(10 Hours, 20 marks)**

Definition of sewage, Necessity of sewage treatment, Requirement of a sewage management system. Composition of sewage,

Characteristics of sewage – Physical (Colour, Odour, Solids and Temperature), Chemical (Organic - Carbohydrates, Fats, Oil and Grease, Pesticides, Phenols, Proteins, Surfactants. Inorgainic – Alkalnity, Chlorides, Heavy Metal, Nitrogen, pH, Phosphorous, Sulphur, Toxic Compounds, Gases – Hydrogen Sulfide, Methane, Oxygen), Biological Characteristics

Cycle of Decomposition – Anaerobic and aerobic, Nitrogen and Carbon Cycle

Tests for determining the Oxygen Demand - Biochemical Oxygen demand, (First and Second Stage BOD), Chemical Oxygen Demand, Total Oxygen Demand. Limitation of BOD test, Population Equivalent

Self Purification of Natural Stream – Dilution, Oxidation, Reduction, Sedimentation, Action of Sunlight,

Zones of Pollution – Degradation, Active decomposition, recovery, clear water

Oxygen sag analysis – Deoxygenation and reoxygenation

UNIT –II **(10 Hours, 20 marks)**

SEWER DESIGN – Estimation of dry weather and rain water flow, hydraulic formulae, minimum and maximum velocity of flow, effect of variation in flow of sewage in velocity of flow , Forms of sewers, Design of storm water drains

CONSTRUCTION OF SEWERS – Factors affecting selection of material for sewer construction, materials & shape of sewers, Structural Loads on Sewers, Maintenance, Cleaning and ventilation of Sewers.

APPURTENANCES – Purposes and location of Inlets, catch pits, cleanouts, manholes, drop-manholes, lamp-holes, flushing devices, grease and oil traps, inverted siphons, storm water overflow devices.

UNIT –III **(10 Hours, 20 marks)**

Preliminary & Secondary Treatment of Sewage –

Screening – Purpose, Classification, Types, Cleaning, Design Consideration & Management of screenings material

Comminutors – Purpose and types

Grit Removal – Purpose, Quality and quantity of grit, Types and Design Criteria

Grease Removal – Necessity, Skimming Tanks, Vacuum Floatation, Disposal of skimmings

Flow Equalization – Location, volume Requirement and Benefits

Sedimentation – Characteristics of settleable solids, Types of settling – (Discrete, Flocculent, Zone and Compression Settling), Classification of Settling tanks, Design criteria of settling tanks, Chemical aided settling, coagulants used

UNIT –IV **(10 Hours, 20 marks)**

Biological Treatment of Sewage – Objective and classification

Activated Sludge Process – Process of Treatment, Operations and units, methods of aeration, Loading rate, oxygen requirement and transfer, Design consideration of aeration tank, secondary settling, operational difficulties

Sewage Filtration – Types of and basic functioning of different filters, Constructional features and design of standard trickling filter, Performance and efficiency of standard trickling filter, Troubles and remedies, Comparison of Tricking Filter Process versus ASP

Stabilization Ponds – Purpose and types of stabilization ponds and their functioning (aerobic, anaerobic and facultative ponds

UNIT –V **(10 Hours, 20 marks)**

Solid Waste Management –

Necessity of solid waste management, Types and Sources of solid waste

Properties – Sampling procedure, Determination of Physical (Individual Components, Particle size, Moisture content, Density) and chemical composition (Energy content, chemical content) of solid waste

Elements of Solid Waste Management - Materials flow in society, Reduction in raw material usage, reduction in solid waste quantities, reuse in solid waste material, material recovery, energy recovery.

Functional Element of SWM & their interrelationship –

Waste generation – factors affecting, estimation of quantities

Onsite handling, storage and processing – Municipal and industrial waste, Containers and their locations,

Collection – Collection service, Types of Collection system (Hauled Container System & Stationary Container System – Machine and manually loaded), Determination of Vehicle and Labour requirement, Collection route

Transfer and transport – Transfer stations, factors affecting design, classification (Direct, Storage and combined discharge), Requirements, Locations of Transfer stations, Transfer means and methods

Processing Techniques – Volume Reduction (mechanical, thermal) and recovery, Disposal – Land filling with solid waste – Methods and operations (area, trench method, depression land fills), Occurrence of gases and leachate in land fills

TERM-WORK -

The term-work shall consist of minimum seven experiments and four assignments and one technical report from the list below –

(A) Experiments – (Minimum Seven)

(1) Determination of Total solid, settleable solid, dissolved solid, fixed Soild, filterable & non filterable solids, Mixed Liquor suspended solids in a sample of waste water
(2) Determination of oil and grease in sample of sewage
(3) Determination of BOD of sewage sample
(4) Determination of COD of sewage sample
(5) Determination of Sulphate / Chloride Content
(6) Determination of Salt Content by electrical conductivity Measurement
(7) Determination of Total Nitrogen/Different forms Nitrogen
(8) Determination of Sulphate / Phosphate Content
(9) General techniques of microbiology : Determination of microbial quality of water-
    - standard plate count,
    - standard coliform test,
    - determination of coliform density by MPN method
    - fecal coliform test

(B) Assignments – (Minimum Four)

(1) Estimation of sewage quantity and design of sewer line
(2) Design of Grit Chamber & Settling Tank
(3) Design of Activated Sludge Plant / Standard Trickling Filter
(4) Drawing of Stabilization Pond showing all details
(5) Estimation of Overall Chemical Composition of Solid Waste
(6) Analyzing Hauled/Stationary - Container Collection System of Solid Waste
(7) Economic Comparison of Transport Alternative for SW

(C) Report –

(1) Technical Visit Report of a Waste Water Treatment Plant or Industrial Water Treatment Plant or Solid Waste Management System/Treatment Plant

Books Recommended –

- Punamia & Jain, "Waste Water Engineering", Laxmi Publications, New Delhi
- Modi P.N., "Sewage Treatment & Disposal and Waste Water Engineering", Standard Publications, New Delhi.
- Pevy, Rowe & Tchobanoglous, "Environmental Engineering", McGraw Hill International, New Delhi
- Garg S.K., "Sewage Disposal & Treatment & Air pollution Engineering",Khanna Publisher, New Delhi
- Hammer & Hammer, "Water & Waste Water Engineering", Prentice Hall International, New Delhi
- Sincero & Sincero, "Environmental Engineering – A Design Approach", Prentice Hall International, New Delhi
- Therous, Eldridge & Mallmann, "Laboratory Manual for Chemical & Bacteriological Analysis of Water & Sewage", Agro Botanic Publisher, India
- Benerjee & Jain, "Handbook of Technical Analysis", Jain Brothers New Delhi.
- Laboratory Manual for Environmental Quality Testing, Environmental Protection Research Foundation, Sangli

NORTH MAHARASHTRA UNIVERSITY JALGAON
UNDER GRADUATE COURSE IN CIVIL ENGINEERING (ELECTIVE– I)

OPEN CHANNEL AND CONDUIT FLOW

Lectures : - 04 Hours/ Week Theory paper :- 100 Marks
Practical : - 02 Hours / Week Duration :- 3 Hours
Term Works: - 25 Marks Oral :- 25 Marks

UNIT – I **(12 Lectures, 20 Marks)**

1) Uniform flow in trapezoidal and circular channel, calculation of normal depth and critical depth in trapezoidal and circular, the first and second hydraulic exponents, hydraulically – efficient channel section for trapezoidal and circular channel sections.
2) Transitions – Rectangular channel with a hump and with change in width.

(10 Lectures, 20 Marks)

UNIT –II

1) Gradually varies flow theory and computation for trapezoidal and rectangular Prismatic channels, differential equation of G.V.F., alternate forms, different types of G.V.F. profiles and their characteristics and examples of their occurrence, control section.
Computation of G.V.F. profiles in trapezoidal channel by standard step method, Direct Integration Methods: Ven Te Chow method & Bresse's method & Bresse's method.

UNIT- III **(10 Lectures, 20 Marks)**

1) Rapidly varied flow due to weirs, sluice gates, end depths, hydraulic jump in rectangular channel, standing- wave flume, Parshall flume.
2) Unsteady flow in open channel : - Equation of continuity and equation of motion for GVUF, surges and waves in open rectangular channels – simple cases. Neglecting friction.

UNIT – IV **(08 Lectures, 20 Marks)**

1) Pipe flow : - Three reservoir problem, pipe network. Practical design methods of rising mains and gravity mains using nomograms/ charts, economical diam. Of rising main.

UNIT – V **(10 Lectures, 20 Marks)**

1) Unsteady flow in conduits: - Mention of types, equation of motion, establishment of flow, water hammer, celerity of pressure wave thought rigid and elastic pipes, sudden and gradual and partial opening and closing of valves, details of pressure cycles.
2) Surge tanks : - Necessity, location, function, types, analysis of simple cylindrical surge tank considering frictional effects.

TERM WORK: - Any six of following assignment should be performed

1) Calculation of normal depth & critical depth in trapezoidal / circular channel using graphs/ tables.
2) Example on transition in rectangular channel
3) Computation of G.V.F. profile in trapezoidal channel by standard step method or by Ven Te Chow method.
4) Developing and running computer programming for numerical method for obtaining G.V.F. profile.
5) Calculation of hydraulic jump in open rectangular channel.

6) Calculation of surges in open rectangular channel.
7) Design of gravity/rising main (Dead end system in case of gravity mains).
8) Calculation of water hammer pressures.
9) Design of simple cylindrical surge tank.

ORAL EXAM: - Based on above term work.

Book Recommended: -

1. Flow in open channels:- Dr.K.Subramanya.
   Tata McGraw – Hill publishing company Ltd. New Delhi.
2. Fluid Mechanics:- V.L Streeter and E.B. Wylie.
   Tata McGraw- Hill publishing company Ltd. New Delhi.
3. Fluid Mechanics: - Dr. A.K. Jain.
   Khanna Publishers, Dhelhi.
4. Theory and Application of Fluid Mechanics:- Dr. K. Subramanya.
   Tata McGraw – Hill publishing company Ltd. New Delhi.
5. Water power Engg.:- M.M. Dandekar and K.N. Sharma
   Vikas Publishing House, Pvt. Ltd. Delhi.
6. Open Channel Hydraulics:- Ven Te Chow.
   Tata McGraw – Hill Publishing Company, Ltd. New Delhi.

WATERSHED MANAGEMENT

Lectures : - 04 Hours/ Week Theory paper :- 100 Marks
Practical : - 02 Hours / Week Duration :- 3 Hours
Term Works: - 25 Marks

UNIT -I
Concept of Watershed. Significance of watershed based development, Watershed characteristics – geomorphology and hydrology. Drainage basin, network and channel morphology.

UNIT- II
Watershed Hydrology - Hydrologic cycle, water balance, climate and precipitation, soils and infiltration, interception and evapotranspiration, groundwater, streamflow and runoff, water quality, aquatic ecosystems (eutrophication, habitat disturbance, etc.

UNIT- III
Watershed resource appraisal – Physical, hydrological, land use/cover. Land Capability Classification.
Watershed Management and Planning – objectives

UNIT- IV
Issues in water resources - Point source pollution, agricultural and urban non-point source pollution, erosion, water scarcity, flooding, drinking water protection, wastewater treatment and septic systems
Soil and water conservation measures
Watershed Program – Benefit-Cost Analysis

UNIT- V
Urban Watershed Management – Wet weather flow, Infrastructure Integrity Testing, Effect of discharge to receiving water, Green Roof, Rain water harvesting from urban structures, Urban watershed management – goals & strategies, Sustainability & UWSM, urban stormwater-pollution-abatement technologies and sediment management, Source Loading And Management Model

List of Practical/Term work Assignments -
(Minimum six practicals /Assignments shall be performed)

1. Mapping and demarcation of watershed
2. Morphometric analysis of watershed
3. Areal Precipitation – Thiessen Polygon, Isohyetal methods. Analysis and interpretation of rainfall data.
4. Water balance estimation
5. Estimation of Runoff and streamflow. Flow duration curve, return period. Analysis and interpretation of streamflow data
6. Groundwater contouring and interpretation regarding movement and flow direction
7. Land capability classification

8. Soil loss estimation
9. Visit to a Watershed and submission of report

Text / Reference Books -

1. Murthy, J. V. S. (1994). Watershed Management in India. Wiley Eastern Ltd., New Delhi.
2. Pranjape, S. and Others. (1998). Watershed-based Development, Bharat Gyan Vigyan Samithi, New Delhi.
3. Mutreja, K. N. (1990). Applied Hydrology, Tata McGraw-Hill Pub. Co. Ltd. New Delhi.
4. Singh R. J. (2000): Watershed Planning and Management, Yash Publishing House, Bikaner.

FINITE ELEMENT METHOD

Lectures : - 04 Hours/ Week	Theory paper : 100 Marks
TW/PR : - 02 Hours / Week	Duration : 3 Hours
Term Works: - 25 Marks	Oral : 25 Marks

UNIT I.

Concept of Finite element, Classification of element for discrete and continuum structure , characteristics of an element, Displacement function , General approach for formulation of the problem , Degree of freedom , Assembly rules and boundary conditions. Gradient and divergence theorem.

Matrix's algebra, concept of local and global , coordinates, Rules of transformation of stiffness matrix from local to global axes, Variation methods of Approximations.

Approximation errors in F.E.M. various measures of errors, accuracy of solution.

Advantages and disadvantages of F.E.M.

UNIT - II.

Discretization of the domain into elements, shape function, "Pascal triangle", Selection for the order of polynominal, convergence requirements, inter element compatibility conforming and non conforming element, concept of band width. Principle of minimum potential energy, Rayleighrit method, The method of weight residuals, Saint Vasant Principal. Application of above method to civil engineering fields.

UNIT - III.

One dimensional second order and fourth order equations, Lumped and work equivalent load, Theory of work equivalent load, Shape function for one dimensional analysis, Derivation of element equations.

Analysis of one dimensional structure (beam, coloumn etc.) by F.E.M. with different loading and boundary conditions.

UNIT – IV.

Finite element method for two dimensional problems, second order equation involving scaler-valued function, Two dimensional finite elements and interpolation function.

Direct method for determination of stiffness matrix for plane truss, continuous beams and plane frame elements, solution for displacement unknowns and analysis.

UNIT – V.

Triangular and Rectangular elements for plane stress/strain conditions, effect of element aspect ratio, finite representation of infinite mass.

Formulation of stiffness matrix for slabs using triangular or rectangular elements with different boundary condition.

Introduction of Isoparmetric 1 D and 2 D elements, shape function and natural coordinate system, quadrilateral isoparametric elements for plane stress/ strain conditions.

TEXT BOOKS:-

1) The finite element method (fourth edition) Vol – I & II.
   By O.C. Zinekiewice & R.L. Taylor.

2) An introduction to the finite element method.
   By J.N. Reddy.

3) Introduction to the finite element method.
   By C.S. Desai and J.F. Abel.

4) Rudiments of finite element method.
   By V.K. Manikar Selvam, Dhanpat Rai Pub.

5) Finite element primer.
   By V.K. Manikar Selvam, Dhanpat Rai Pub.

NORTH MAHARASHTRA UNIVERSITY JALGAON
B.E. (CIVIL)

W.E.F : 2008- 09

TERM - I
SEMINAR

Teaching scheme:
Practical: 2 hrs / week

Examination scheme:
Term Work : 25 Marks

1. For seminar every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic at the end of term.
2. Selection of topic should be done by students in consultation with concerned guide
3. A typed report should be submitted in paper bound copy.
   a. Size of report depends on advancement of topic.

4. ASSESSMENT OF SEMINAR for TERM WORK
   Title of seminar: ____
   Name of guide : ____

Sr. No.	Exam Seat No.	Name of Student	Assessment by examiners					Grand Total
			Topic Selection 5	Literature Survey 5	Report Writing 5	Depth of understanding 5	Presentation 5	25

5 . Assessment of Literature survey will be based on
   a. Collection of material regarding history of the topic.
   b. Implementation.
   c. Recent applications.

6. Assessment of Depth of understanding will be based on
   a. Questioning by examiners.
   b. Questioning by students.
   c. What the student understands i.e. conclusion regarding seminar.

7. Assessment of presentation will be based on;
   a. Presentation time (10 minutes)
   b. Presentation covered (full or partial)
   c. Way of presentation
   d. Questioning and answering (5 minutes)

8. Examiners should be a panel of two one of them must be guide.

NORTH MAHARASHTRA UNIVERSITY JALGAON
B.E. (CIVIL)

W.E.F : 2008- 09

TERM - I
PROJECT I

Teaching scheme:
Practicals: 2 hrs / week

Examination scheme:
Oral : 25 Marks
Term Work : 25 Marks

1. Every student individually or in a group shall take a project in the beginning of the (B.E. first Term) seventh term in consultation with the guide and the project must be completed in the (B.E. Second Term) eighth term.
2. The project proposal must be submitted in the institute in the beginning of the (B.E. first Term) seventh term. While submitting project proposal care is to be taken that project will be completed within the available time of two term i.e 2 Hrs per week for (B.E. first Term) seventh term and 4 Hrs per week for (B.E. Second Term) eighth semester (total time become 12*2 + 12*4 = 72 Hrs per project partner). The final title of the project work should be submitted at the beginning of the (B.E. Second Term) eighth semester.
3. The guides should regularly monitor the progress of the project work.
4. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

A) ASSESSMENT OF PROJECT I TERMWORK B.E. FIRST TERM

NAME OF THE PROJECT ____
NAME OF THE GUIDE: ____

Sr No	Exam Seat No	Name Of Student	Assessment by guide (70%)					Assessment by Departmental committee (30%)			Grand Total	Out of 25 Marks
			Literature survey	Topic Selection	Documentation	Attendence	Total	Evaluation (10%)	Presentaion (20%)	Total		
		Marks	10	05	15	05	35	05	10	15	50	25

Sign of Guide Sign. of Committee Members Sign. of H. O. D.

5. The guide should be internal examiner for oral examination.

6. The external examiner should be from the related area of the concerned project. He should have minimum of five years of experience at degree level / industry.

7. The evaluation at final oral examination should be done jointly by the internal and external examiners.

SYLLABUS OF FOURTH YEAR (CIVIL)
TERM-IIND (w.e.f. 2008-09)
STRUCTURAL DESIGN AND DRAWING-III

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks (4 Hrs)
Practical: 4 Hour/Week	Term Work: 25 Marks
	Oral: 25 Marks

UNIT I **(12 Hours, 25 marks)**

R.C. STRUCTURES

i) Ductile detailing of RC members as per Is 13920.
ii) Design of rectangular combined footing.
iii) Design of flat slabs.

UNIT II **(12 Hours, 25 marks)**

i) Design of cantilever retaining wall.
ii) Design of circular water tanks resting on ground.

UNIT III **(12 Hours, 25 marks)**

PRESTRESSED CONCRETE STRUCTURES

a) Introduction :- Basic concept, materials, prestressing systems, stages of loading, stresses in tendons.
b) Losses in prestresses :- Nature of losses, loss due to classic shortening of concrete, successive prestressing of straight cables, relaxation of stress in steel friction in a curved cable anchorage.
c) Design of one way and two way prestressed concrete slabs.

UNIT IV **(12 Hours, 25 marks)**

a) Transfer of prestres in pretensioned members, transmission length, end zone reinforcements. Anchorage Zone stresses in post –tensioned members – Guyan's method.
b) Limit state design of prestressed concrete members philosophy of design, various criteria for limit. States, design loads, strength and serviceability.
c) Design of pretensioned and post tensioned flexural members – Rectangular and flanged sections, cable profile, Design of shear reinforcement, bond partial prestressing limit state method.

TERM WORK:- It shall be based on above syllabus and will consist of

i) At least three numbers of imperial size sheets based on prestressed & R.C. structures.
ii) Demonstration of computer softwares for design of structures.
iii) Report on site visit to at least one structure based on above syllabus

TEXT BOOKS:-

1) N. Krishnaraju - Prestressed Concrete
2) S.R. Karve & V. L. Shah- 'Limit State Analysis & Design of Reinforced Concrete', Structures PublicatinsR.C.C. Structures.
3) Punmia, Jain & Jain – 'Comprehensive R.C.C. Design', Laxmi Publications.
4) S. K. Duggal – 'Earthquake Resistant Design of Structures', Oxford University Press.
5) N. C. Sinha & S. K. Roy – 'Fundamentals of Reinforced Concrete',

CONSTRUCTION MANAGEMENT –II

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hours/Week	Theory Paper: 100 Marks (3 Hrs)
Tutorial: 2 Hour/Week	Term Work: 25 Marks
	Oral: 25 Marks

UNIT –I **(10 Hours, 20 marks)**

A) Important Acts and Laws related to Constructions Industry- Factory act, The Employees Provident Fund Act, Minimum wage Act, Workman Compensation Act, Industrial Dispute Act, Indian Trade Union Act, arbitration act, employees state insurance act.

B) Safety in Construction : Causes of accidents, Classification costs of accident, measurements of accidents ,Injury frequency rate, injury severity rate, injury index, safety programme, accident report,

Safety measures in handling of building materials, construction of elements of building, demolition of buildings, hot bituminous works, scaffolding, formwork and other equipments, excavation.

UNIT–II **(10 Hours, 20 marks)**

Materials management , its aims and functions, inventory analysis , inventory models, ABC analysis, inventory management, buffer stock, lead time, EOQ.

Material requirement, planning , market research, system of purchase of materials, stock of material at site , MAS account, working capital management.

Supervision and quality control, concept of quality, stages of control , measures of control, organization for control, quality control management, sample and sampling technique, inspection, introduction to ISO 9000 and ISO 14000.

UNIT—III **(10 Hours, 20 marks)**

Contract, essentials, types, registration and law of contract, free consent, contract documents , performance of contract, breach of contract, advances to contractor, bills of contract and payments , subletting , inspection of works, tender, tender notice ,various terms used in tender notice such as SD, EMD, estimated cost, Time period of work ,cost of tender form, invitation of tender, time schedule of calling tender, tender documents two envelopes system, scrutiny and acceptance , revocation of tender , extra items , additions and alterations , defect liability , liquidated and unliquidated damages , escalation of rates, work order.

UNIT IV **(10 Hours, 20 marks)**

Excavating & Hauling Equipments :-

a) Power shovels; size, basic parts, selection ,factors affecting output.

b) Draglines:- types, size, basic parts, effect of job and management conditions on the out put of dragline.

c) Clamshells – clamshell buckets

d) Hoes- basic parts working ranges

e) Bulldozers-types, moving earth with bull dozers.

UNIT –V **(10 Hours, 20 marks)**

a) Compacting Equipments:-

Types of compacting equipments. Such as tamping rollers, smooth wheel rollers, pneumatic tyred rollers,

b) Hoisting equipments :Chain, hoist, fork trucks

Cranes : Classification, derrick crane, mobile crane, Tower crane, Hydraulic crane, overhead or gantry crane.

Safety in crane operation
Use of cranes in steel construction
Use of cranes in concrete construction

TERM WORK : Term work shall consist of assignments based on each unit of the above syllabus

BOOK RECOMMENDED

1) R.L.Peurifoy - Construction planning ,Equipments and Methods.
2) Dr. Mahesh Verma - Construction equipments and its planning and application
3) Dr.U.K. Shrivastava - Construction planning and Management
4) Dr. S.V. Deodhar - Construction equipment and planning
5) Sengupta - Construction Management and planning.
6) Chitkara - Construction Project Management
7) B.N.Dutta - Estimating and Costing
8) M.Chakroborty - Estimating and Costing
9) S.C.Rangwala - Estimating and Costing
10) B.S.Patil - Estimating and Costing -Vol-1& 2.

WATER RESOURCES ENGINEERING - II

Teaching Scheme:
Lectures: 4 Hours/Week
Practical: 2 Hour/Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term Work: 25 Marks
Oral: 25 Marks

UNIT I **(11 Hrs., 20 marks)**

1. Dams: - Introduction, types of dams, selection of site for dam, choice of a dam, economical height of dam.
2. Gravity dams: - Introduction, forces acting on dam, elementary and practical profile, modes of failure and stability analysis and design of gravity dam, low and high dam. Construction and materials of construction, control of cracking, galleries, Joints and keys.

UNIT II **(09 Hrs., 20 marks)**

1. Introduction to arch dams (only elementary)
2. Spillways: - Introduction, spillway capacity, different types of spillways: their construction and suitability, design principles of Ogee spillway and siphon spillway.
3. Energy dissipation below spillway, types of hydraulic jump, jump height curves and tail water rating curves, various types of energy dissipators: Indian Standard stilling basins and buckets.
4. Gates: - Various types of spillway crest gates and their uses.

UNIT III **(10 Hrs., 20 marks)**

1. Earth dams :- Introduction, types ,elements of earth dam, basic design considerations, causes of failures, piping and its prevention, control of seepage, drainage in earth dams, phreatic line, stability of U/S and D/S slopes under various situations, introduction to rock-fill dam.
2. Diversion headworks :- Introduction, selection of site, types of weirs and barrages, layout of diversion headwork and its components and functions, causes of failures of weirs on permeable foundations and remedies, Hydraulic design of weir w.r.t. subsurface flow, safety against piping and uplift, Bligh`s, Lane' s and Khosla' theories.

UNIT IV **(10 Hrs., 20 marks)**

Canal irrigation :- Types of canals, canal alignment.
Design of c/s of unlined stable channels in alluvium: Kennedy's and Lacey's theory and their merits and demerits.
Preliminary sediment transport theory, critical tractive force, suspended and bed loads.
Design of c/s of unlined channels in alluvial soil according to IS 7112 – 1973 : Lacey's method and tractive force approach.
Design procedure for L – section for an irrigation canal, balancing depth, losses in canals, schedule of area statistics and channel dimensions, Garret's and Lacey's diagrams.
Lining of irrigation canals, advantages of lining, economics of linings, types of linings. Design of lined Channel, land drainage, discharge and spacing of closed drain.

UNIT V **(08 Hrs., 20 marks)**

1. Canal Masonry Works:- Cross drainage works: necessity, types, selection, comparative merits and demerits. Various types of falls: introduction and necessity (no mathematical treatment for any of above structures)

2. River training works:- necessity and types of river training works and bank protection and their construction details. (No mathematical treatment)
3. Hydropower: - general features of hydropower development, advantages of hydropower, types of hydropower plants and their layouts, assessments of power potential, load factor, capacity factor, diversity factor.

TERM WORK

Minimum six out of following assignments should be performed:-

1. Stability analysis of a gravity dam.
2. Stability analysis of slope of earth dam.
3. Design of Ogee spillway with energy dissipator
4. Analysis of weir on permeable foundation by using Khosla's charts.
5. Design of unlined canal in alluvium by using Garret;s /Lacey 's diagrams (at least three sections
   along the alignment.) and ploting L-section, also preparing schedule of area statistics and Channel dimensions.
6. Any one of the following :
   1. Analysis and layout and section of any one type of cross drainage work or fall or regulator .
   2. Any one type of river training work.
   3. A typical layout of high head hydropower plant and functions of components.
7. Report based on visit to any dam or hydropower plant.
8. Benefit - cost analysis of a water resources engineering project.

ORAL EXAM:- Based on the above T.W.

Imp. Note:- Following charts should be provided to students of B.E. (civil) during theory paper.

i) Dr. A.N. Khosla's curves for design of weir on permeable foundation.
ii) Gaarret's & Lacey's diagrams for design of canals

BOOKS RECOMMENDED:-

- Dr. P.N. Modi, Standard Book House , Delhi. - Irrigation, Water Resources and Water Power Engg.
- S.K.Garg - Irrigation Engg. and Hydraulic Structures .
- Dr. B.C.Punmia - Irrigation Engg. and Water Power Engg..
- Varshney ,Gupta, Gupta -Theory and design of Irrigation structures, Volume I and II .
- Bharat Singh - Irrigation Engg.
- K.B.Khushlani - Irrigation Engg. .
- Justin , Hinds - Irrigation Engg. and Practice

NORTH MAHARASHTRA UNIVERSITY JALGAON
UNDER GRADUATE COURSE IN CIVIL ENGINEERING (ELECTIVE– II)

WATER POWER ENGINEERING

Lectures : - 04 Hours/ Week	Theory paper :- 100 Marks
Practicals : - 02 Hours / Week	Duration :- 3 Hours
Term Works: - 25 Marks	

UNIT -I

General – Conventional Source of Energy, Status of Electrical Power in the World and India, Advantages and dis-advantages of hydro-electric power over other conventional sources, Place of hydropower in the power system, Investigation and studies for hydro power development.

Estimation of Water Power Potential – Mass Curve, Flow Duration Curve, Firm Power & Secondary Power, Power Duration Curve (Available Power)

Power Plant Economics – Types, Factors affecting outline design, Useful Life, Connected Load, Maximum Demand, Demand Factor, Load Factor, Load Curve, Base & Peak Load, Plant Capacity Factor, Plant Use Factor, Diversity Factor, , Economic Load Sharing between Base Load & Peak Load Power Stations., Cost of Electrical Energy, Energy Rates (Tariff)

UNIT- II

Classification of Hydro-electric Power Plants – Run-Of -River Plant, Valley Dam Plant, Diversion Canal Plant, High Head Diversion Plant – General Arrangements & Different Layouts

Storage and Pondage, Pondage Factor

Pumped Storage Plants – Essential Requirements, Necessity, Advantages, Classification of PSP development, Relative Merits of Different Arrangements, Problems in Operation, Layout & Economics

Tidal Power Plants - Principles of power generation - components of power plant – Single and two basin systems – Turbines for tidal power - Estimation of energy – Maximum and minimum power ranges

UNIT- III

Surface Power Stations – Structure, Dimensions, Lighting & Ventilation, Variations in design

Underground Power Station – Location, Types of Layout, Components, Advantages

Penstock & Accessories – Classification, Design Criteria, Economical Diameter, Anchor Blocks, Conduit Valves, Bends & Manifolds Water Hammer & Surges in Penstocks – Phenomenon, Resonance, Surge Tanks Intakes – Types, Losses, Air Entrainment, Inlet Aeration

UNIT- IV

NON CONVENTIONAL ENERGY -

Biomass energy - Bio fuel classification – Examples of thermo chemical, Pyrolysis, biochemical and agrochemical systems – Energy farming – Direct combustion for heat – process heat and electricity – Ethanol production and use – Anaerobic digestion for biogas – Different digesters – Digester sizing – Applications of Biogas

Solar Energy - Availability - Solar radiation data and measurement - Estimation of average solar radiation - Solar water heater types - Heat balance – Flat plate collector efficiency – Efficiency of heat removal - Thermo siphon flow calculation - Forced circulation calculation - Evacuated collectors - Basics of solar concentrators Solar Energy Applications - Solar air heaters – Solar Chimney - Crop driers - Passive solar system - Active solar systems - Water desalination - Output from solar still – Principle of solar ponds.

UNIT- V

Wind Energy – Nature of wind – Characteristics – Variation with height and time – Power in wind –Aerodynamics of Wind turbine – Momentum theory – Basics of aerodynamics – Aerofoils and their characteristics – HAWT – Blade element theory – Prandtl's lifting line theory (prescribed wake analysis) VAWT aerodynamics – Wind turbine loads – Aerodynamic loads in steady operation – Yawed operation and tower shadow.

Wind Energy Conversion System – Siting – Rotor selection – Annual energy output – Horizontal axis wind turbine (HAWT) – Vertical axis wind turbine (VAWT) – Rotor design considerations – Number of blades – Solidity - Blade profile – Upwind/Downwind – Yaw system – Tower – Braking system - Synchronous and asynchronous generators and loads – Integration of wind energy converters to electrical networks – Inverters – Control system – Requirement and strategies – Noise – Applications of wind energy

Term Work - Assignment –

The term work shall consist of eight assignments, which should include minimum one assignment from each unit.

The term work shall include a visit report on Hydroelectric Power Station and Wind Farm.

References:

1. Water Power Engineering / M. M. Dandekar & K. N. Sharma
2. A text Book of Water Power Engineering / R.K.Sharma & T.K.Sharma
3. Renewable Energy Resources / John Twidell and Tony Weir / E & F.N.Spon
4. Solar Energy - Principles of thermal collection and storage/ S.P. Sukhatme / TMH
5. Solar Heating and Cooling / Kreith & Kreider

Wind Energy Handbook / Tony Burton, David Sharpe, Nick Jenkins and Ervin Bossanyi / WileyWind Electrical Systems / S.N.Bhadra, D.Kastha and S.Banerjee / Oxford

GEOGRAPHICAL INFORMATION SYSTEM (GIS)

Lectures : - 04 Hours/ Week | Theory paper :- 100 Marks
Practical : - 02 Hours / Week | Duration :- 3 Hours
Term Works: - 25 Marks

UNIT -I

Introduction to GIS – Definition, Sources & types of data, Concept of Space and Time, Spatial Information Theory, History of GIS, Objectives, Elements, Hardware & Software requirements and applications of GIS

Data Models of Spatial Information – Layers and Coverages, Conceptual model, Object based network and field model,

Representation of SDM in computer – Raster & Vector models, Comparision

Data Models of Non-Spatial Information – Database Management Systems, Hierarchical Structures, Network Structures, Relational Structures

UNIT- II

Digitizing Editing and Structuring of Map Data – Digitizing manual, semi-automatic

Editing – Error detection and correction

Tolerances – TIC Match, Fuzzy, Node Snap, Arc Snap, Weed, Grain Tolerance

Topology creation, Attribute Map Generation

Digital Elevation Model – Needs of DEM, Various Structures of DEM- Line, TIN, Grid, Products derived from DEM

UNIT- III

Spatial Data Analysis –

General – Attribute quarry, and spatial quarry, Single and Multi-layer operations, Spatial modeling, Network and surface analysis

Vector based spatial data analysis – Topographical overlays, logical operators, conditional operators, proximity operators.

Raster based spatial data analysis – Local functions, focal functions, zonal functions, global functions, area numbering, cost surface analysis, optimal path analysis, proximity search

UNIT- IV

Use of GIS for Water Resources and Management – Water Resources Potential Estimation, Analysis & Estimation of Sediment in Reservoirs, Water Supply Systems Planning and Management, Waste Water Planning and Management, Role of Remote Sensing and GIS in Ground Water exploration, Use of GIS for Watershed Planning and management

UNIT- V

LAND RESOURCES: Land evaluation and suitability studies by Remote Sensing and GIS. Techniques of Landuse/Land cover map preparation. Landuse/ Landcover mapping and planning.

Municipal GIS - Landuse - Statistics as a basis for Environmental Planning, Solid and Hazardous waste disposal site selection.

Use of GIS for Agricultural Practices and Management

List of Practical / Term work Assignments –

The term work shall consist of any six practical/ assignments.

1. Data quality and sources of errors
   i) Nature of sources of geographical data

ii) Sources of errors in GIS database

iii) Data quality parameters

2. Map scale and projections

   i) Information on various scales

   ii) Need of projection

   iii) Spherical co-ordinate system

   iv) Properties of map projections

3. Preparation of vector database and maps: manual method for point line and area entities.
4. Preparation of a raster database and map: manual method for point line and area entities.
5. Measurement of distance between two points for vector and raster data.
6. Measurement of area - vector and raster data.

   i) Image enhancement

   ii) Filtering - Low Frequency

   iii) Linear edge enhancement

   iv) Band rationing

   v) Ground truth data collection

7. GIS operations

   i) Overlay Analysis

   ii) Buffer Analysis

   iii) Map Algebra

   iv) Multicriteria and Querry Analysis

   v) GPS

Text / Reference Books -

1. Burroughs, P. A (1986): Principles of Geographical Information Systems for land Resources Assessment, Oxford University Press
2. Environmental Systems Research Institute (1993): Understanding GIS: The Arc Info method
3. Training Course for GIS for resource management and development planning: Lecture notes, V1: GIS Fundamentals and Techniques, Government of India
4. Bernhardsen, Tor (1999): Geographic Information Systems: An Introduction, John Wiley and Sons
5. Clarke, Keith C. (1999): Getting Started with Geographic Information Systems, Prentice Hall
6. Demers, Michael N. (2000): Fundamentals of Geographic Information Systems, John Wiley
7. Haywood, Ian (2000): Geographical Information Systems, Longman
8. Chang, Kang-taung (2002): Introduction to Geographic Information Systems, Tata McGraw-Hill
9. Williams, Jonathan (1995): Geographic Information from Space: Processing and Applications of Geocoded Satellite Images, John Wiley and Sons

10. Geographic information Systems by Jeffery star, John Esstes Prentice Hall 2004.
11. Fundamental of Geographic Information Systems -Demers 2001 Edition.
12. Geographic Information Systems: An Introduction, By Tor Bernhardsen, Jhon Wiley and Sons, 2005
13. Remote Sensing and Image Interpretation by T.M.Lillesand and R.W.Kiefer, John Wiley, Third Edition, 2005
14. GIS Applications for Water, Wastewater, and Stormwater Systems, U.M. Shamsi, A CRC Press Book, 2004

INDUSTRIAL WATER POLLUTION CONTROL

Lectures : - 04 Hours/ Week	Theory paper :- 100 Marks
Practical : - 02 Hours / Week	Duration :- 3 Hours
Term Works: - 25 Marks	

UNIT -I

Sources and Characteristics of Industrial water – Source and characteristics of waste water, Industrial waste survey, In-plant waste control and water reuse, Estimation of organic contents, Measurement of effluent toxicity.

Different water quality requirements of various industries for different pressure boiler feed waters, cooling water and process water. Waste generation and characterization from different industries like paper and pulp, breweries and distilleries, tanneries, textile, dairy, fertilizer, sugar mill, steel, oil refinery, petrochemical and pharmaceutical industries.

Pre & Primary Treatment – Equalization, Neutralization, Sedimentation, Oil separation, Sour water strippers, Floatation, Coagulation, Precipitation and Heavy Metal Removal

UNIT- II

Aeration and Mass Transfer – Mechanism, Equipment, Air Stripping of VOC.

Aerobic Biological Oxidation – Mechanism of Organic Removal,, Bio-oxidation mechanism, Sludge Quality Consideration, Soluble Microbial Product formation, Bio inhibition of ASP, Nitrification and De-nitrification, Development of Process Design Criteria

Biological WW Treatment Process – Lagoons and Stabilization basins, Aerated Lagoons, Activated Sludge Process, Tricking Filtration, Anaerobic Decomposition, Rotating Biological Contractor, Evaluation of Anaerobic Treatment

UNIT- III

Adsorption – Theory of Adsorption, Properties of activated carbon, The PACT process

Ion Exchange – Theory of Ion Exchange, Plating Waste Treatment

Chemical Oxidation – Introduction to stereochemistry and applicability, Hydro thermal process

Sludge Handling & Disposal – Characteristics of Sludge for disposal, Aerobic digestion, Gravity thickening, Floatation thickening, Gravity belt thickener, Centrifuge – Disk, Basket,

Filtration – Vacuum, Pressure

Sand Bed Drying, Land disposal of sludge, Incineration

UNIT- IV

Air Pollution – Definition of Air Pollution, Definition of Air Pollutants, Measurement of Air Pollution, Classification of Air Pollutants, Primary and Secondary Air Pollutants, Properties of major air pollutants,

Effects of Air Pollutants on Man, Vegetation, Animals and Materials

Meteorology and Plume Dispersion – Atmosphere, Zones of Atmosphere, Scale of Meteorology and different meteorological parameters affecting pollutnant's dispersion in atmosphere, Temperature Lapse Rate, Plume behavior, Gaussian Plume Model, Plume Rise in Atmosphere, Different formulae for estimation of stack height.

UNIT- V

Global Effects of Air Pollution – Green House Effect, Effects of Particulate on earth-atmosphere heat balance, Heat Islands, Acid rains and Ozone holes

Air Pollution Control – Atmospheric Cleansing Process, Approaches to Contaminant Control, Control Devices for Particulate Contaminants – Gravitational Settling Chambers, Centrifuge Collectors, Wet Collectors, Bag house filters & Electrostatic Precipitators Control Devices for Gaseous Contaminants – Adsorption, Absorption, Condensation, Combustion, Automotive Emission Control

Practical & Term Work - Assignment –
(Total 12 = 7 Experiments + 3 Assignments)

GROUP – A "Experiments" - (Minimum Seven Practical should be performed – (4 from Water Pollution Monitoring and 3 from Air Pollution Monitoring)

WATER POLLUTION MONITORING - Estimation of -

i) Hardness by EDTA Method
ii) Ammonia/Nitrogen
iii) Nitrite/Nitrogen
iv) Estimation of phosphates
v) Sulfate by Spectrophotmetric & Turbiditimetric Method
vi) Biological Oxygen Demand
vii) Chemical Oxygen Demand
viii) Fluorides by SPADNS Reagent
ix) Heavy metals by AAS
x) Pesticide Residue Estimation

AIR POLLUTION MONITORING : Estimation of -

i) NOx
ii) SOx
iii) Particulate matter
iv) Hydrocarbon

GROUP – B "Assignments" - (Minimum three assignments)

1. Determination of Concentration of Air Pollutants by using the Air Pollution Dispersion Models
2. Design of Height of Stacks
3. Design Problems on Air Pollution Control Equipments

References:

1. Pevy et al Environmental Engineering, McGraw Hill International, New Delhi, 2004,
2. W.Wesley Eckenfelder, Industrial Water Pollution Control, McGraw Hill International Edition, 2003
3. Sincero & Sincero, Environmental Engineering – A Design Approach, Prentice Hall India, 2002
4. Sewage Disposal and Air Pollution Engineering, Khanna Publisher, New Delhi, 2004
5. Goel PK, Water Pollution – Causes, Effects and Control, New Age Publications, New Delhi 2001
6. Waste Water Treatment , M.N.Rao and A.K. Dutta, 1987, Oxford & IBH Pub.Co.
7. Environmental Pollution Control, C.S.Rao, 1993, Wiley Eastern Ltd.
8. Industrial wastes their disposal and treatment W. Rudolfs 1997.
9. Industrial environment, assessment and strategies S.K. Agarwal 1996.

NORTH MAHARASHTRA UNIVERSITY JALGAON
B.E. (CIVIL)

W.E.F : 2008- 09

TERM - II
SITE VISIT / CASE STUDY

Teaching scheme:	**Examination scheme:**
NIL	**Term Work : 25 Marks**

EDUCATION TOUR / TECHNICAL VISITS / CASE STUDY AND ITS EVALUATION

1. During (B.E. First Term / Second Term) seventh and / or eighth terms or during vacation between (B.E. First Term / Second Term) seventh and eighth terms, every student; shall visit minimum two construction sites / industries arranged by college and accompanied by teachers. The colleges should obtain appropriate certificates of visit from the concerned organizations just after the visits.

2. Students should submit written report about the visits individually at the end of (B.E. Second Term) eighth term.

3. The report should contain information about the following points:

   (a) The organization - activities of organization and administrative setup technical personnel and their main duties.
   (b) The project / industry brief description with sketches and salient technical information.
   (c) The work / processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.
   (d) Suggestions (if any) for improvement in the working of those organizations.

4. The evaluation of the report of technical visits will be made by panel of two teachers appointed by principal.

NORTH MAHARASHTRA UNIVERSITY JALGAON
B.E. (CIVIL)

W.E.F : 2008- 09

TERM - II
PROJECT II

Teaching scheme:
Practicals: 4 hrs / week

Examination scheme:
Oral : 50 Marks
Term Work :100 Marks

1. The Project group in (B.E. first Term) seventh term will continue the project work in (B.E. Second Term) eighth term and complete project in all respect .
2. The guides should regularly monitor the progress of the project work.
3. The project work along with project report should be submitted as part of term work in (B.E. Second Term) eighth term on or before the last day of the (B.E. Second Term) eighth term
4. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

B) ASSESSMENT OF PROJECT II TERMWORK (B.E. SECOND TERM)

NAME OF THE PROJECT: ____

NAME OF THE GUIDE: ____

Sr. No	Exam. Seat No	Name Of Students	Assessment by guide (70%)						Assessment by department (30%)			Grand Total
			Fabrication /software / actual work	Execution of project	Project report	Scope/ Cost / Utility	Attendenece	Total	Evaluation (10%)	Presentaion (20%)	Total	
		Marks	20	10	20	10	10	70	10	20	30	100

Sign of Guide Sign. of Committee Members Sign. of H. O. D.

7. The guide should be internal examiner for oral examination.

8. The external examiner should be from the related area of the concerned project.

9. The evaluation at final oral examination should be done jointly by the internal and external examiners.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

STRUCTURE OF TEACHING & EVALUATION

S.E. (CHEMICAL ENGINEERING) W.E.F.2006-2007

First Term

Sr. No.	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Chemistry-I	04	02	03	100	25	50	--
2	Chemistry-II	04	02	03	100	25	50	--
3	Unit Operation-I (Fluid Mechanics)	04	02	03	100	25	--	25
4	Strength of Materials	04	02	03	100	25	--	--
5	Engineering Mathematics- III	04	--	03	100	--	--	--
6	Computer Applications	--	02	--	--	25	--	--
		20	10		500	125	100	25
	Grand Total	30			750			

Second Term

Sr. No.	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Chemical Processes-I	04	02	03	100	25	50	--
2	Chemistry-III	04	02	03	100	25	50	--
3	Unit Operation-II (Mechanical Operations)	04	04	03	100	50	--	25
4	Process Calculation	04	02	03	100	25	--	--
5	Industrial Economics & Management	04	--	03	100	--	--	--
		20	10		500	125	100	25
	Grand Total	30			750			

1. CHEMISTRY-I

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practicals : 2 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Practical: 50 Marks
Term Work : 25 Marks

UNIT- I:

<u>Kinetic theory of gases</u>: Gas Laws, Kinetic gas equation, Equation of state of ideal & real gases, principle of corresponding states, compressibility factor, estimation of molecular diameters, critical constants, mol. velocities, probability distribution of velocities, mean free path, collision diameter, collision no., diffusion, Graham's law of diffusion, liquefaction of gases, viscosity of gases & liquids.

Heat capacity of gases: C_p & C_v problems. (10 Hrs**,**20 Marks)

UNIT-II:

<u>Chemical kinetics:</u> Objective of chemical kinetics, rate of reaction, velocity constant of a reaction, elementary reaction steps & rate expressions, order & molecularity of reaction, factors influencing the reaction rates, integrated rate expressions for 1^{st}, 2^{nd} , 3^{rd} , & zero order reaction (with example), methods for determining order of reactions, experimental investigation of reaction kinetics.

Arrhenius equation, relationship between chemical kinetics & thermodynamics, problem based on above topics.

Photochemical reactions , Set up for study of Photochemical reactions (10 Hrs**,**20 Marks)

UNIT-III:

<u>Classical chemical thermodynamics:</u>

Objective & scope, definition of thermodynamic systems, state property etc.

Heat work reversibility, maximum work, isothermal & adiabatic process, first law of thermodynamics, thermo chemistry, thermo chemical law, standard heat of formation, second law of thermodynamics, entropy, entropy changes, enthalpy & free energy, Gibbs Helmholtz equation, Third law of thermodynamics. Problems based on above topics.

Criteria of chemical equilibrium, Le Chatelier's theorem, its application to some systems likes ammonia, sulphuric acid, and nitric acid. (10 Hrs**,**20 Marks)

UNIT-IV:

<u>Colligative properties:</u>

Colligative properties, lowering of vapour pressure, determination of molecular weights from vapour pressure, lowering, measurement of vapour pressure lowering,

Osmosis, osmotic pressure, measurement of osmotic pressure, the law of osmotic pressure, determination of molecular weight from osmotic pressure, osmosis & semipermeability, reverse osmosis.

Elevation in boiling point, determination of molecular weight from boiling point elevation, depression in freezing point, determination of molecular weight from freezing point depression, determination of freezing point depression.

Electrolytes: conductors and nonconductors, metallic conduction, electrolytic conductance, determination of conductance, migration of ions, transport, number, determination of transport number, Kohlrausch's law & its application. Arrhenius theory of dissociation. (10 Hrs**,**20 Marks)

UNIT-V:

Surface phenomenon:

Surface tension of liquids, adsorption, adsorption of gases by solids, adsorption isotherm, freundlich adsorption isotherm, the langmueirs adsorption isotherm, application of adsorption.

Colloids & emulsion:

Types, methods of preparation, determination of particle size, properties, solution of micro molecules, properties of micro molecular solutions. Determination of molecular weight by osmometry, molecular weight by light scattering , molecular weight from viscosity measurements.

(10 Hrs**,**20 Marks)

PRACTICALS:

Term Work Shall be based on any 08 experiments mentioned below.

1) Determination of molecular weight of substance by depression in freezing point method.
2) Determination of equivalent weight of metal by eudiometer.
3) Determination of heat of solution of KNO_3.
4) Determination of rate constant of hydrolysis of ethyl acetate by NaOH & show that the reaction is second order.
5) Determination of rate constant of hydrolysis of methyl acetate by dilute HCl & show that the reaction is first order.
6) Determination of surface tension liquids by Stalagmometer.
7) Determination of strength of acid by conductometric titration.
8) Determination of heat of neutralization of strong acid & strong base by calorimeter.
9) Determination of water equivalent of the calorimeter taking heat of neutralization of strong acid & strong base.
10) Preparation of colloidal solution of starch.

REFERENCES

1) G.M. Barrow, Physical Chemistry: Benjamin publishers.
2) Glasstone, Thermodynamics for chemist :McMillan India Ltd.
3) Maron-Prutton, Principles of Physical chemistry: Oxford & IBH publishing Co.Pvt.Ltd. New Delhi
4) S. Glasstone & Lewis, Elements of physical chemistry : McMillan India Ltd.
5) Puri & Sharma, A textbook of physical chemistry : S. Chand & Co. Delhi

2.CHEMISTRY-II

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practicals : 2 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Practical: 50 Marks
Term Work : 25 Marks

UNIT-I :

Basic Concept of organic chemistry.
Importance of organic chemistry.
Sources of Organic Compounds.
Purification of organic compounds by Crystallization, Distillation, Fractional distillation.
Tests of purity by Melting point & Boiling point.determination methods.
Determination of molecular Weight of organic compounds by Victor Mayor method.
Types of bonds: Ionic & Covalent bonds , Bond fission,
Types of intermediates: Structure & formation of Carbonium ion & Carbanion , Free radicals & their stability. Factors affecting electron availability : Inductive, Resonance, Hyperconjugation & Steric effects., Electrophiles & Nucleophiles,
Acidity & Basicity of Organic compounds. (10 Hrs**,**20 Marks)

UNIT-II :

Study of reactions with reference to the mechanism involved.
Aldol condensation, Cannizzaro& cross Cannizzaro reactions, Claisen ester condensation, Reimer Tiemann reaction, Chloromethylation & Formylation reactions.,Grignard reactions. SN^1 & SN^2 reactions, Role of solvent in SN^2 reaction.
Electrophilic substitution in aromatic rings: Nitration, Sulphonation, Halogenations , Fridel Crafts alkylation& acylations.
Elimination reactions:E_2 , E_1 mechanism.
Rearrangement reactions: Fries , Beckman , Claisen rearrangement reaction. (10 Hrs**,**20 Marks)

UNIT-III :

<u>Stereochemistry:</u>

Basic concept of stereochemistry , Structural Isomerism, Different methods of representation of three dimensional molecule on paper , Conformational isomerism: Conformations of Ethane & n-Butane & their relative stability.
Geometrical isomerism: Cis-Trans isomerism shown by alkenes.
Optical isomerism: Measurement of Optical activity by Polarimeter , Specific rotation, Enantiomerism , Necessary conditions of optical activity, Optical isomerism of Lactic acid & Tartaric acid., Distereoisomerism.
Baeyer's angle strain concept , Conformations of Cyclohexanes: Equatorial & axial bonds in cyclohexane. (10 Hrs**,**20 Marks)

UNIT-IV :

<u>Chemistry of heterocyclic compounds:</u>

Classification of heterocyclic compounds,Structure,Preparation,Properties,Reactions& Uses of five membered rings: Furan,Pyrrole,& Thiophene.
Six membered rings :Pyridine.
Fused rings of Quinoine & Isoquinoine.

<u>Aspects of oxidation & reduction:</u>

Basic concept of Oxidation & its mechanism , Applications of oxidizing agents such as $KMnO_4$, $K_2Cr_2O_7$, OsO_4

Baeyer Villiger oxidation , Oxidation of alcohol, Oxidation of alkenes.

Basic concept of Reduction & its mechanism, Applications of reducing agents such as $LiAl_4$, Zn, Fe with acid combination. Clemmensen & Wolff-Kishner reduction. (10 Hrs**,**20 Marks)

UNIT-V :

<u>Macromolecules:</u>

Polymer-Monomer basic concept., Classification of Polymers., Addition & Condensation polymerization & their mechanisms , Coordination polymerization , Bulk,Emulsion, Solution, Suspension techniques ,Copolymers., Tacticity of polymers.

Study of Industrially important polymers with respect to synthesis, properties & applications: Polystyrene, PolyVinyl Chloride, Teflon, Urea Formaldehyde , Phenol Formaldehyde , Styrene-Butadiene rubber, Epoxy resins, Polyethylene Terepthalate. (10 Hrs**,**20 Marks)

REFERENCES

1) Peter Sykes. A guide book to mechanism in organic chemistry: Orient Longman Ltd.
2) Pine, Organic Chemistry: McGraw Hill Int.Co.
3) Morrison & Boyd, Organic Chemistry: Allyn Bacon Inc.
4) L.Finar, Organic Chemistry: Vol.I&II ELBS with Longman.
5) Arun Bahl & B.S.Bahl, Textbook of organic chemistry: S.Chand & Co.Ltd. New Delhi.
6) V.R. Gowarikar, N.V.Vishwanathan, Jayadev Sreedhar, Polymer Science: Wiely Eastern Ltd., New Delhi

PRACTICALS:

List of Experiments

Term Work Shall be based on the following.

1. Identification of an Organic compound.(Any Four)
2. Estimation of selected organic compounds like Aniline, Acetone , Glucose, Glycerol. .(Any Two)
3. Preparations (Any Two)
   Preparation of p-nitro acetanilide by nitration.
   Preparation of Quinone.
   Preparation of Urea Formaldehyde resin
   Preparation of Nylon

REFERENCES FOR PRACTICALS

1) Kulkarni , A laboratory handbook of organic quantitative analysis & separation : Dastane Ramchandra & Co., Pune
2) S.K.Bhasin, Laboratory manual on engg. Chemistry: Dhanpat Rai Pub.New Delhi

3. UNIT OPERATION-I (FLUID MECHANICS)

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practicals : 2 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Oral: 25 Marks
Term Work : 25 Marks

UNIT-I:

Unit systems, conversion of units

Fluid properties- definition of fluid, viscosity concept, properties of fluid like mass density, specific weight, specific volume, vapour pressure, surface tension, capillarity Types of fluid- compressible and incompressible, Newtonian and non newtonian, laminar-turbulent, steady-unsteady, two and three dimensional flows.

Fluid pressure: at a point, Pascal's law, hydrostatic equilibrium, Atmospheric, Gauge, Absolute and vacuum pressure.

Velocity Concept, the continuity equation, Eulers equation of motion a long streamline, Bernoullis equations for different conditions. (10 Hrs**,**20 Marks)

UNIT-II:

Flow through pipeline system: Reynolds experiment, Laws of friction, Major and minor losses, friction factor chart, effect of heat transfer on friction factor, distribution of flowing fluids through branched pipes, hydraulic gradient line and total energy line.

Laminar flow: steady laminar flow in circular pipes (Hagen-Poiseuille equation), through annulus, parallel plates, around a sphere (Stokes law), relations between shear and pressure gradient, average velocity and maximum velocity, momentum correction factor.

Turbulent flow: velocity distribution in turbulent flow in pipes, velocity distribution equation in turbulent flow in terms of mean velocity for smooth and rough pipes, resistance to flow of liquid in smooth and rough pipes, variation of frictional factor for commercial pipes, types of problems in pipes designs. (10 Hrs**,**20 Marks)

UNIT-III:

Flow of compressible fluids:

Continuity equation, total energy balance, mechanical energy balance, ideal gas equations. Flow past immersed bodies, drag coefficient-friction in flow through bed of solids.

Boundary layer theory:

Simple concepts of boundary layer, boundary layer growth along a flat plate, thickness of boundary layer (definition and formulae only), separation of boundary, hydro dynamically smooth and rough boundaries. (10 Hrs**,**20 Marks)

UNIT-IV:

Dimensional analysis and model studies:

Dimensional analysis, Buckingham's PI theorem, dimensionless numbers, application to fluid flow problem.

Two phase co-current and counter current flow, liquid-liquid and gas-liquid systems, flow patterns (no mathematical treatment).

Flow and Pressure measurement:
Principle and types of manometers, the flow through nozzles orifice meter, Venturimeter, pilot tube, Rotameter, notches and weirs.
Other flow measuring devices such as ultrasonic flow meters, anemometers, electromagnetic flowmeter, Recording Rotameter, flowmeter using thermistors.

(10 Hrs,20 Marks)

UNIT-V:
Pumping of fluids:
Pumping equipments for liquid, the reciprocating pump, positive displacement pump, rotary pumps, centrifugal pumps, design & operating characteristics, NPSH calculations, airlift pumps, pumping equipments for gases:
Pumping equipment for gases:
Reciprocating piston compressors, rotary blowers & compressors, centrifugal blowers & compressors including turbocompressors, vacuum-producing equipment.
Power required for compression of gases, clearance volume, multistage compressor efficiency, the power requirement for pumping through pipeline for liquids & gases. (10 Hrs,20 Marks)

REFERENCES
1) W.L. McCabe & J.C. Smith, Unit operations in chemical engineering: McGraw Hill/Kogakusha Ltd.
2) I P. Chattopadhyay Unit operations of chemical engineering-volume I: Khanna Publication New Delhi, 2nd edition 1996.
3) Dr.R.K. Bansal,. Fluid Mechanics: Laxmi Publications, New Delhi
4) V.P. Gupta, Alam Singh and Manish Gupta Fluid Mechanics, Fluid mechanics and hydrostatics: CBS publishers New Delhi.

TW / Practicals :
Term Work Shall be based on any 08 experiments mentioned below.
List of the Experiments.
1. Determination of Viscosity
2. Study of Manometers
3. Verification of Bernoulli's theorem
4. To determine the coefficient of Venturimeter
5. To determine the coefficient of Orificemeter
6. To determine the coefficient of Nozzlemeter
7. Reynolds Experiment
8. Minor losses in pipe
9. To determine the fanning friction factor for given pipe
10. Notches & Weirs
11. To Study the Characteristics curves of Centrifugal Pump
12. Study of the different types of Fans ,Blowers & Compressors

REFERENCE FOR PRACTICALS
V.P. Gupta , Laboratory Manual of Fluid Mechanics :CBS Publications New Delhi.

4. STRENGTH OF MATERIAL

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practicals : 2 Hrs./ Week

Examination Scheme:
Παπερ: 100 Μαρκσ (3 Ηρσ)
Term Work : 25 Marks

UNIT-I:
Introduction : Concept of stress ,strain, elastic limit , stress –strain curve for steel, Hooke`s law. Relation between different elastic constant.
Stresses &strains in determinate axially loaded members,
Axial force Diagram , Stresses due to changes of temperature in simple & composite members
(10 Hrs**,**20 Marks)

UNIT-II:
Introduction to stresses in composites :
Shear force & bending moment diagrams, Bending stresses &Shear Stresses developed in determinate beam subjected to transverse loading .
Slope and Deflection of Beam (introduction and treatment only)
Double integration method , moment area method ./ Derivation of formula for slope and deflection for Standard cases. (10 Hrs**,**20 Marks)

UNIT-III:
Stresses under combined loading :
Stresses on inclined sections , Principal Stresses &strains (analytical &Mohr`s circle method)
Stresses & Strains in Determinate circular shafts Subjected to Twisting moment , Power Transmitted by shafts , Flanged coupling . Combined Torsion and Bending Moment (10 Hrs,20 Marks)

UNIT-IV:
Thin and Thick walled pressure vessel :Stresses ,Strain and Deformation in thin walled seamless cylinder and spherical vessels due to internal fluid , change in volume constants ,Effects of additional compressible or incompressible fluid under pressure.
Lame`formulae,Στραιν ενεργψ &ιμπαχτ :Τψπεσ οφ λοαδινγ ,Γραδυαλλψ λοαδ ,συδδενλψ λοα δ ανδ λοαδ
απλιεδ ωιτη Ιμπαχτ
(10 Ηρσ,20 Μαρ κσ)

UNIT-V:
Axially Loaded Column: Concept of Buckling of column, Derivation of Euler`s & Rankine`s formula.
Direct and Bending Stresses **:** concept of core of a section (10 Hrs,20 Marks)

TW / Practicals :
Term Work Shall be based on any 05 experiments mentioned below.
List of the Experiments.
1. Tension test on mild steel
2. Izod and Charpy test on mild steel, copper, brass, alluminium.
3. Bending test on Timber.
4. Different type of hardness tests on metals
5. Torsion test on mild steel and cast iron
6. Shear test: Single and double shear teston mild steel.

REFERENCES

1) Beer and Johnson, Mechanics of Material: McGraw Hill/Kogakusha Ltd.
2) Dr.Ramamrutham- Strength of Material Dhanpat rai & sons Publication New Delhi
3) Dr.R.K. Rajput , Strength of Material : S. Chand Publications New Delhi
4) Timoshenko & Young, Strength of Material : CBS Publishers and distributors New Delhi .
5) H Somayya, Strength of Material : Nirali Prakashan Pune.

5. ENGINEERING MATHEMATICS-III

Teaching Scheme: Examination Scheme:
Lectures: 4 Hrs./ Week Paper: 100 Marks (3 Hrs)

UNIT-I:
Liner Differential Equation:
Liner differential equation of order “n” with constant co-efficient , Method of variations, Homogeneous liner differential equation , Legendre’s LDE, Application to chemical engg. Problem involving batch reactor’s. (10 Hrs**,**20 Marks)

UNIT-II:
Simultaneous Linear Differential Equations of form :
1) f1(D)x + f2(D)y = (t)
(D)x + (D)y = (t)
Where, D=d/dt.
2) dx/P = dy/Q = dz/R.
Partial Differential Equations:
Solutions of (i) One dimensional heat flow equation.
(ii) Two dimensional heat equation (Laplace Equation)
(iii) Laplace Equation in Polar form.
Differential equation of first order & higher degree. (10 Hrs**,**20 Marks)

UNIT-III:
Laplace Transform :
Definition of Laplace Transform, Inverse Laplace transform, Properties & theorems, Laplace transforms of standard functions, Unit step functions, Ramp functions, Impulse functions, Error functions Jump functions, Laplace Inverse Transform.
Applications to the solutions of liquid systems, consisting of single tank & two tanks in series (Interacting & non-Interacting), Second order systems (Damped vibrator). (10 Hrs**,**20 Marks)

UNIT-IV:
Vector Integration :
(i) Line Integral, Surface Integral, Volume Integral.
(ii) Greens Lemma, Stoke’s Theorem, Gausse’s Divergence Theorem.
Finite Fourier Cosine & Sine transforms, Complex Fourier transforms , Infinite Fourier sine & Cosine transforms, Applications of Fourier transforms to boundary value problems such as one dimensional & two dimensional heat flow problems (10 Hrs**,**20 Marks)

UNIT-V:
Numerical Solution of Ordinary Differential Equations :
Taylor’s series method, Runga-Kutta method, Piccard’s method, Eulers method, Least square method
Numerical Integration :
Trapezoidal rule, Simpson’s 1/3rd rule, Simpson’s 3/8th rule, Weddle’s rule (10 Hrs**,**20 Marks)

REFERENCES

1) P .N. Wartikar & J.N. Wartikar, Engineering Mathematics III : Pune Vidyarthi Griha Prakashan, Pune
2) Dr. B.S.Grewal, Higher Engineering Mathematics : Khanna Publications ,New Delhi
3) Wylie & Barrott, Advanced Engineering Mathematics : Tata McGraw Hill Publications.
4) Erwin Kreegszig, Advanced Engineering Mathematics : New age International ,New Delhi
5) Dr.Gokhale & A.N. Singh , Engineering Mathematics III : Nirali Publications.
6) Coughnour Donald R , Process System analysis & control : McGraw Hill, 1991
.

6. COMPUTER APPLICATIONS

Teaching Scheme:
Practical: 2 Hrs./ Week

Examination Scheme:
Term Work : 25 Marks

The Term work should be based on following,

1. Introduction to computer.
2. Introduction to 'C' language.
3. Program for addition, subtraction of variables.
4. Program for multiplication, division of variables.
5. Program to find the greatest value.
6. Program to find odd and even numbers.
7. Program to print no. 1 to 10.
8. To calculate area of triangle by using function.
9. Use of 'if-else'.

1. CHEMICAL PROCESSES – I

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practicals : 2 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Practical: 50 Marks
Term Work : 25 Marks

UNIT-I:
Chemical Processing and work of chemical engineer.
Industrial Gases: Hydrogen, Oxygen, Nitrogen, Carbon Dioxide, Acetylene.
Ceramic Industries: Basic raw materials, Chemical Conversions, White wares
Manufacture of Cement (10 Hrs,20 Marks)

UNIT– II :
Structural clay products: Manufacture of Building bricks.
Refractories : Properties of refractories, manufacture of refractories,
Glass: Raw materials, Methods of manufacture, Manufacture of special glasses, Types & applications.
Fuel Cells: Principle& Efficiency of Fuel cells, Kinds of Fuel cells & advantages of Fuel cells.
Fuels and Fuel gases: Natural gas, Water gas, Producer gas, LPG.
(10 Hrs,20 Marks)

UNIT– III :
Salt and sodium compounds: Sodium chloride, Sodium sulphate and byproducts.
Chlor Alkali and electrolytic industries: Soda ash, caustic soda, Chlorine.
Bleaching powder, Sodium bicarbonate, Aluminum, Sodium, Chlorates and perchlorates.
(10 Hrs,20 Marks)

UNIT -IV :
Phosphate industries: Elemental phosphorous, Raw materials and process for phosphoric acid, Manufacturing of ammonium phosphate, Baking powder.
Potassium industries: Potassium, Potassium chloride, Potassium sulfate, Potassium nitrate.
(10 Hrs,20 Marks)

UNIT– V :
Nitrogen industries: Synthetic ammonia, Nitric acid, Ammonium nitrate, Urea.
Hydrochloric acid: Hydrochloric acid, Aluminum sulphate and alums.
Sulfur industries: Raw materials, Manufacture of sulfur, sulfuric acid. (10 Hrs,20 Marks)

TW / Practicals :

Term Work Shall be based on any 08 experiments mentioned below.
List of the Experiments.
1. Purification of common salt.
2. Analysis of fertilizers.
3. Determination of sodium hydroxide and sodium carbonate in the given alkali mixture solution.
4. Determination of sodium bicarbonate and sodium carbonate in the given alkali mixture solution.
5. To determine the loss per gram and the percentage purity of the given sample of sodium bicarbonate by heating.
6. Estimation of available chlorine in bleaching powder.

7. Flue gas analysis by Orsat's Apparatus.
8. Preparation of some compounds such as
   i. Ferrous ammonium sulphate
   ii. Sodium thiosulphate
   iii. Copper sulphate
9. Analysis of cement

REFERENCES

1) George T. Austin , Shreve's Chemical Process Industries : McGrawHill Book Company,1985. 5th edn.
2) G.N. Pandey, A Text book of Chemical Technology : Vol.I, Vikas Publishing House Pvt.Ltd., New Delhi
3) C.E. Dryden, Outlines of Chemical Technology : Affiliated East-West Press,1973.
4) D. Venkteshwaralu, Chemical Technology, I & III manuals of Chemical Technology : Chemical Engg. Ed. Dev. III Madras ,1977.
5) B.K.Sharma , Industrial Chemistry: Goel Publishing House Meerut
6) M.M.Uppal , Engineering Chemistry: Khanna Publications New Delhi

2. CHEMISTRY-III

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practicals : 2 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Practical: 50 Marks
Term Work : 25 Marks

UNIT-I :

Chemical Bonding:

Ionic bond : The ionic model, Lattice energy, The Born- Haber cycle, Applications of lattice energy.
Metallic bond: Electron sea model , explanation of metallic properties on the basis of electron sea model, Valence bond model.
Covalent bond: Polarity in covalent bonds ,important characteristics of covalent bond : Bond length, bond angle, bond strength, Atomic orbital overlap concept,Valence bond & Molecular Orbital treatment of covalent bond, VSEPR theory.
Hybridisation ,Resonance , Wander Wall's forces.
Hydrogen bond: Intramolecular & intermolecular hydrogen bonding. (10 Hrs,20 Marks)

UNIT-II :

The Main Group Elements:

Modern form of periodic table, General characteristics of S & P block elements,Position of Hydrogen in periodic table.
Study of first representative element of each group.
Position of Noble gases in periodic table.
Study of compounds of non transition metals such as diboranes, Borazine , Sillicones., Zeolites.
Oxides & Oxoacids of Nitrogen,Phosphorous,Sulphur,& Halogens , Xenon compounds.
(10 Hrs,20 Marks)

UNIT-III :

Transition metal Chemistry:

Introduction : Elements of first & second transition series., General charecturistics of d block elements.
Titanium: Occurrence, Extraction, Properties.
Preparation of TiO , $TiCl_2$, TiO_2 ,$TiCl_4$, Ziegler Natta catalyst.
Vanadium: Occurrence, Extraction, Properties & Uses.
Preparation of vanadium metal, V_2O_5 , Ferro vanadium alloy.
Chromium: Occurrence, Extraction, Properties, Industrial applications.
Preparation of CrO_3 , $K_2Cr_2O_7$
Nickel : Occurrence, Extraction, Preparation by Mond process,
Electrolytic process, Uses
Zirconium: Extraction, Properties & Uses.
Preparation of ZrO_2 , $ZrCl_4$
Molybdenum: Extraction, Properties, Uses, Interstitial compounds.
Silver: Occurrence, Extraction, Properties, Uses. Silver Plating.
Platinum: Occurrence, Extraction, Properties, Uses. (10 Hrs,20 Marks)

UNIT-IV :.

Principal & processes of metallurgy

Occurrence of metals, Mineral wealth of India, Ore dressing, Roasting, Calcination, Smelting, Fluxes, Slag, Types of Furnaces , Refining of metals.

Metallurgical Industries:

Iron & Steel Industries: Production of Pig Iron, Production of Steel
Aluminium Industries: Alumina production by purification of alumina from bauxite by Bayer process, Production of Aluminium by electrolytic reduction of alumina.
Copper: Occurrence, Extraction of copper , Electrolytic refining of blister copper, Uses of copper.
Lead: Occurrence, Extraction of lead from galena, Liquation process for refining of lead.
Zinc: Occurrence, Extraction, Electrolytic process for the extraction of zinc, refining of zinc.

(10 Hrs**,**20 Marks)

UNIT-V :

Phase rule: Definition of phase rule, definitions of terms used in phase rule, Derivation of phase rule, one component Water system, two component systems.
Phase diagrams: Definition, Usefulness of phase diagrams, Classification of phase diagram, Construction of phase diagrams.
Phase diagram of Steel, heat treatment of Steel, Phase diagram of brass, Cu-Ni. (10 Hrs**,**20 Marks)

REFERENCES

1) J. D. Lee ,Concise Inorganic Chemistry : D.Van Nostrand Co.
2) B. R. Puri , L. R. Sharma ,Principles of Inorganic Chemistry: S.Chand & Co.Delhi.
3) P.L.Soni ,Textbook of Inorganic Chemistry: S.Chand & Sons ,New Delhi.
4) Dryden's .Outlines of Chemical Technology, Editors Gopal Rao& Marshall Sitting : East West Press, New Delhi.
5) Jain & Jain, Engineering Chemistry :Dhanpat Rai & Sons, New Delhi.
6) M.M.Uppal , Engineering Chemistry :Khanna Publications, New Delhi.
7) V. Raghavan , Material Science & Engineering,Prentice Hall of india New Delhi.

PRACTICALS

Term Work Shall be based on the experiments mentioned below.
List of Experiments:

1. Acid base reaction titration of a mixture of (any one)
   (a)Hydrochloric & Acetic acid
   (b)Carbonate & Bicarbonate
2. Oxidation & reduction titration involving Permangnate, Dichromate, Potassium bromate.(any two)
3. Precipitation Titration: Mohr's method

4 Precipitation Titration :Volhard's titration.

5. ComplexImetric titration involving EDTA
6. Gravimetric determination of Fe as Fe_2O_3

7 Gravimetric determination Ni as Ni-DMG

REFERENCE FOR PRACTICALS

VOGEL. , Text book Quantitative Inorganic Analysis : ELBS with Longman.

3. UNIT OPERATION – II
(MECHANICAL OPERATIONS)

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practicals : 4 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Oral : 25 Marks
Term Work : 50 Marks

UNIT-I :
Size Reduction :
Properties of solids , Particle size ,Specific surface area of the Mixture , Average particle size.
Mechanism of size reduction , Energy utilization , crushing Efficiency , Energy for size reduction , Laws of crushing ,Types of equipment on the various stages of reduction such as Jaw crushers, Gyratory crusher, Hammer mill , Ball mill ,Tube mill , Ultra fine grinders etc., Power requirement , Problems based on above.
Screening :
Separation of solids by screening , Different types of screens , Capacity and efficiency of screen , Actual & ideal screens ,Screen analysis , Screening equipments such as Grizzly, Gyratory screens , Trommels , Shaking screens , Oscillating Screens. Material Balance over screen , Calculation of screen Effectiveness . Problems based on above . (10 Hrs**,**20 Marks)

UNIT-II :
Flow of solids through fluids :
Introduction , Drag force on spherical particle , terminal falling velocities of spherical particles , terminal falling velocities of non spherical particles , Equal settling velocities Free settling and hindered settling. Problems based on above.
Classification of solids:
Equipments for classification such as Gravity settling tank, Spitzkasten , Drag classifier , Elutriator , Cone classifier , Double cone classifier, Rake classifier, Cyclone separator, Magnetic separators, Electrostatic separator, Floatation Equipment , jigging , tabling etc Sedimentation , Laboratory batch sedimentation , Thickeners ,
Calculation of area & depth for continuous thickeners. (10 Hrs**,**20 Marks)

UNIT-III :
Filtration :
Equipments for filtration , constant pressure & constant rate filtration , filter calculations , Optimum time cycle , Handling of compressible cakes and use of filter aids , Washing of Cake .Problems based on above . Centrifugation , Centrifugation calculations, Filtration in a centrifuge , Equipments of centrifugal filtration .Problems on centrifugal Filtration. Comparison of sedimentation & centrifugation . (10 Hrs**,**20 Marks)

UNIT-IV :
Mixing And Agitation :
Introduction , Mixing equipments , Impellers , Turbine , Paddles , Draft tubes , Flow Patterns of mixing, Baffles, Impeller location, Standard turbine design, Equipments for Mixing of pastes and viscous materials, mixers for dry powder, Mixing in Liquid-Liquid, Liquid-solid and gas-solid.

Power requirement, Mixing index, mixing of solids, Degree of Mixing & rate of mixing, Mixing index in granular solids. Problems based on above. Type & selection of agitators. (10 Hrs**,**20 Marks)

UNIT-V :

Fluid Solid Systems:

Fluidization : Characteristics of fluidized systems, Effect of fluid velocity on pressure Gradient, Minimum fluidization velocity, types of fluidization, Fixed Bed systems and Spouted bed. Problems based on above.

Handling of solids :

Nature & characteristics of bulk solid, conveyor, Types of conveyor such as belt conveyor , Chain and flight conveyors, Screw conveyors and pneumatic conveyors, Design of belt & screw conveyors. Problems based on above.

(10 Hrs**,**20 Marks)

REFERENCES

1) R. S. Hiremath and A.P. Kulkarni , Unit operations of Chemical engg. (Mechanical operations Vol.-I): Everest publication
2) W.L. McCabe and J.C. Smith, Unit operations of Chemical engg. : Tata McGraw Hill
3) J. M. Coulson and R.F. Richardson, Chemical Engg. Vol. I & II : Butter worth & Heinemann.
4) I. P. Chattopadhyay, Unit Operations of Chemical Engg. Vol. I :Khanna Publications, Delhi.

TW / Practicals :

Term Work Shall be based on any 08 experiments mentioned below.

List of the Experiments.

1. To study the separation of solid by sedimentation
2. Sieve Shaker: To ascertain the fineness number and to study the differential & cumulative screen analysis of the sand
3. Ball Mill :To verify the laws of crushing & grinding
4. Jaw Crusher : To verify the laws of crushing & grinding
5. Plate & Frame Filter Press: To determine the rate of filtration ,specific cake resistance and filter medium resistance
6. Rotary Vacuum Filter: To find out the rate of filtration
7. Fluidization : To observe and study the behavior of the bed during fluidisation and to calculate minimum fluidization velocity
8. Sigma Kneader Mixer : To study the sigma Kneader Mixer
9. Vibrating Shifter : To find out the effectiveness of the Vibrating Shifter
10. Mini Pulveriser : To study the Mini Pulveriser
11. Cyclone Separator : To study the operating behaviour of cyclone separator and to find out its efficiency
12. Ribbon Blender : To study the Ribbon Blender & to find out the mixing index

4. PROCESS CALCULATION

Teaching Scheme:
Lectures: 4 Hrs./ Week
Term Work : 2 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Term Work : 25 Marks

UNIT-I :

Units & Dimensions:

Basic & derived units, dimensional analysis, dimensional & empirical equations. Different ways of expressing units of quantities & physical constants.

Properties Of Gases , Liquids & Solids:

Ideal & real gas laws, critical properties, properties of mixtures & solutions & plane equilibria, Kay's rule. (10 Hrs,20 Marks)

UNIT-II :

Basic Concept:

Humidity & saturation, Psychometric chart, solubility diagrams.

Thermo Physics:

Concept &calculations of involving energy, heat, work & enthalpy of reversible & irreversible process. (10 Hrs,20 Marks)

UNIT-III :

Material Balances:

Concept of limiting &excess reactants, Tie element, Recycle, Purging, Bypass etc. in batch, stagewise & continuous operations in systems with & without chemical reactions in unit operations. (10 Hrs,20 Marks)

UNIT-IV :

Thermo Chemistry:

Heat of formation, combustion, solution, dilution etc.& its effects of pressure & temperature on them. Temp. of reaction, Energy balance for system with & without chemical reaction. Process efficiency. (10 Hrs,20 Marks)

UNIT-V :

Unsteady material & energy balances, Energy balances for nuclear, electro chemical, photo chemical & bio chemical processes.

Combustion: Introduction, fuels, calorific value of fuels, air requirements. (10 Hrs,20 Marks)

Heat of formation, combustion, solution, dilution etc.& its effects of pressure & temperature on them. Temp. of reaction, Energy balance for system with & without chemical reaction. Process efficiency.

Term Work:

Term work shall consist study of & solutions to typical industrial problems:

1. Properties of solids/liquids/gases.
2. Humidity & Saturation.
3. Thermo physics.
4. Thermo chemistry.
5. Material balances.
6. Energy balances.
7. Nuclear, photo chemical & bio chemical & electro chemical processes.

8. Combustion.

REFERENCES:

1) Ηιμμελβλεαυ Δ Μ,Βασιχ πρινχιπλε & χαλχυλατιονσ ιν Χηεμιχαλ Ενγινεερινγ : Πρεντιχε ηαλλ.

2) Ηουγεν Ο Α, Ωατσον Κ Μ & Ραγατζ ΡΑ;Χηεμιχαλ Προχεσσ Πρινχιπλεσ, παρτ−1 :Ασια Πυβλισηινγ Ηουσε , Μυμβαι.

3) Χηεμιχαλ Ενγινεερινγ Εδυχατιον Δεϖελοπμεντ Χεντρε, ΙΙΤ Μαδρασ. Προχεσσ Χαλχυλατιονσ φορ Χηεμιχαλ Ενγινεερσ.

4) Bhat & Vora ,Stoichiometry :Tata McGraw Hill.

5) Durga Prasad Rao & DVS Murthy ,Process Calculations for Chemical Engineers :McMillan India, New Delhi .

6) K A Gavhane , Introduction to Stoichiometry : Nirali Prakashan.

7) Shekhar Pandharipande & Samir Mushrif, Process calculations :Pune Vidyarthi Griha Prakashan Pune

5. INDUSTRIAL ECONOMICS & MANAGMENT

Teaching Scheme: Examination Scheme:
Lectures: 4 Hrs./ Week Paper: 100 Marks (3 Hrs)

UNIT- I:
Nature & Scope of economics, usefullness to engineering organisations.
Economy : Types, Problems and Functioning, Basic Terms & Concepts
Economic system Socialism, Capitalism, Mixed Economy.
Demand & supply schedule- Equilibrium, Law of Diminishing& Equimarginal Utility, Laws of returns. (10 Hrs**,**20 Marks)

UNIT- II:
Factor of Production, Land, Labour, Capital & Organisation
Market & Market Forms, Price determinations: Perfect & Imperfect Competitions
National Income: Concept, Factors & Measurement, Keynesian Model, Types of banks & Role of Banks in economic development, Theories of Money (10 Hrs**,**20 Marks)

UNIT- III:
Industrial Economics, Prime Cost, Overhead Cost, Total Cost, Standard Cost & Variances
Forms of Business Organisations, Sources of Finance: Shares & Debentures & other Sources of Finance
Management Concept : Difference between Management, Administration, Organisation. Scientific Management : Contributions by Henri Fayol, Elton Mayo, Gilbreth, Gantt. Principles & Functional areas of Management. Management by Objectives.
Plant Maintenance. Material, Purchase and Stores Management (10 Hrs**,**20 Marks)

UNIT-IV :
Marketing Management, Concept, Sales Management, Function of sales Manager, Salemans quota, Marketing Research
Personnel Management: Manpower Planning, Recruitment, selection & Training, Job Evaluation Methods, merit rating Role of trade Unions in Industrial Relations, Settlement of Industrial Disputes (10 Hrs**,**20 Marks)

UNIT-V:
Leadership, Motivation, Communication, Human Relation Approach. Introduction to PERT & CPM, Professional & Business Ethics, Management Information Systems (10 Hrs**,**20 Marks)

REFERENCES
1. Banga & Sharma, Industrial Engineering Science & Management : Khanna Publishers New Delhi
2. Dewett & Varma, Elementary Economic Theory : S Chand & Company Ltd New Delhi

3. O.P.Khanna, Industrial Engineering & Management : Dhanpat Rai Publications (P) Ltd New Delhi

Faculty of Engineering & Technology

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

THIRD ENGINEERING (T.E.)

CHEMICAL ENGINEERING
TERM – I & II

W.E.F. 2007-2008

NORTH MAHARASHTRA UNIVERSITY, JALGAON
STRUCTURE OF TEACHING & EVALUATION
T.E. (CHEMICAL ENGINEERING)
W.E.F.2007-2008

First Term

Sr. No.	Subject	Teaching Scheme Hours/ Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Chemical Processes-II	04	02	03	100	25	50	--
2	Process Heat Transfer	04	02	03	100	25	--	25
3	Mass Transfer-I	04	04	03	100	25	50	--
4	Process Equipment Design and Drawing -I	04	04	04	100	50	--	--
5	Chemical Engineering Thermodynamics	04	--	03	100	--	--	--
		20	12		500	125	100	25
	Grand Total	**32**			**750**			

Second Term

Sr. No.	Subject	Teaching Scheme Hours/ Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Instrumentation and Instrumental Analysis	04	02	03	100	25	--	25
2	Chemical Reaction Engineering-I	04	02	03	100	25	--	25
3	Mass Transfer-II	04	04	03	100	25	50	--
4	Process Equipment Design and Drawing -II	04	04	04	100	50	--	--
5	Mathematical Methods in Chemical Engineering	04	--	03	100	--	--	--
6	Practical Training/Mini Project/Special Study	--	--	--	--	25	--	--
		20	12		500	150	50	50
	Grand Total	**32**			**750**			

T.E. (CHEMICAL ENGINEERING)
1. CHEMICAL PROCESSES-II

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs./ Week	Paper: 100 Marks (3 Hrs)
Practical: 2 Hrs./ Week	Practical: 50 Marks
	Term Work : 25 Marks

UNIT- I:
Food Industries: Types of food processing, preservation method, Food Products.
Sugar and Starch Industries: sugar and starches.
Fermentation Industries: Absolute alcohol, Beer, Wines and liquors, vinegar, citric acid lactic acid. (10 Hrs, 20 Marks)

UNIT- II:
Oil, Fat and Waxes: Vegetable oils, animal Fats and oils, Waxes.
Soaps and detergents.
Pulp and paper industries: Manufacturing of pulp, manufacturing of paper, and structural boards. (10 Hrs, 20 Marks)

UNIT- III:
Agrochemical Industries: Insecticides, pesticides, Herbicides, plant growth , Nutrients and regulators, compound fertilizers, Bio fertilizers, complex fertilizers, various grades of N.P.K. fertilizer.
Pharmaceuticals Industries: Classification of Pharmaceuticals products.
Manufacture of Antibiotics, Isolates from plant and animal, vitamins. (10 Hrs, 20 Marks)

UNIT- IV:
Explosives: Types of Explosives, Explosive characteristics, Industrial explosives, propellants, rockets, missiles, pyrotechnics, matches, toxic chemical weapons.
Plastic industries: Raw Materials, general polymerization processes, manufacturing processes, compounding and Moulding operation. (10 Hrs, 20 Marks)

UNIT- V:
Dyes: Classification and manufacturing of dyes.
Petroleum and Petrochemicals : Petroleum production and Refining , Manufacturing of Methanol , Formaldehyde , Ethylene and Acetylene , Ethylene dioxide, Isopropanol, Acetone , Isopropyl , Benzene ,Butadiene, Phenol styrene . (10 Hrs, 20 Marks)

REFERENCES

1) George T. Austin, “Shreeve’s Chemical Process Industries”, 5th Edition , Mc Graw Hill Book Company.
2) C.E. Dryden, Outline of Chemical Technology, Affiliated East WestPress.1973.
3) S.D.Shukla, G.N.Pandey, A text book of Chemical technology, 3rd Edition.

PRACTICAL and TERM WORK :

Practical and Term Work Shall be based on any 08 experiments mentioned below.

1) Estimation of sugar / glucose
2) Determination of saponification value of an oil
3) Determination of acid value of an oil
4) Determination of iodine value of an oil
5) Preparation of azo dye
6) Preparation of soap
7) Preparation of green pigment
8) Preparation of yellow pigment
9) Preparation of blue pigment
10) Preparation of drug aspirin

2. PROCESS HEAT TRANSFER

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs. / Week	Paper: 100 Marks (3 Hrs)
Practical: 2 Hrs. / Week	Oral: 25 Marks
	Term Work: 25 Marks

UNIT- I:

Heat transfer by conduction in solids;

Fourier’s law of heat conduction ,steady state heat conduction through walls (single and multilayer), heat flow through cylinder ,unsteady state heat conduction ,Derivation of Fourier’s heat conduction equation in three dimensions , equation for one dimensional conduction , heat conduction through a semi infinite slab , lumped capacity method of unsteady state conduction . Principles of heat flow in fluids. (10 Hrs, 20 Marks)

UNIT-II:

Typical heat exchange equipment ,counter current and parallel flows, energy balances, overall heat transfer coefficient , log mean temperature difference, individual heat transfer coefficient, calculation of overall coefficient from individual coefficients , transfer units in heat exchangers. Heat transfer to fluids without phase change.
(10 Hrs, 20 Marks)

UNIT- III:

Regimes of heat transfer in fluids, heat transfer by forced convection in laminar and turbulent flow, dimensional analysis method, use of imperials equations heat transfer by forced convection outside tubes, natural convection.

Heat transfer to fluids with phase change.

Dropwise and film type condensation, coefficient for film type condensation, practical use of Nusselt's equations, application to petroleum industries (10 Hrs, 20 Marks)

UNIT- IV:

Heat transfer to boiling liquids:

Boiling of saturated liquids maximum flux and critical temperature drop, maximum Flux and film boiling.

Radiation heat transfer:

Fundamental of radiation, black body radiation, Kirchoff's law, radiant heat exchange between non black surfaces. Combined heat transfer by conduction, convection, radiation. (10 Hrs, 20 Marks)

UNIT- V:

Heat exchange equipments:

Heat exchanger single pass 1-1 exchanger, 1-2 shell and tube heat exchanger, correction for LMTD for cross flow, design calculation (Kern Method) in heat exchanger.

Evaporation:

Liquid characteristics and types of evaporator, single effect evaporator calculation, pattern of liquor flow in multiple effect evaporators. (10 Hrs, 20 Marks)

REFERENCES

1) W.L.McCabe and J.C.Smith , Unit operations in chemical engg. McGraw Hill/Kogakusha Ltd.
2) Coulson & Richardson , Chemical engg. – Volume. I , Pergamon Press
3) Kern D.Q. Process Heat Transfer, McGraw Hill Book 1NC New York, 1950
4) D.S.Kumar, Process Heat Transfer, S.K.Kataria and Sons Publisher, New Delhi

PRACTICALS

Term Work Shall be based on any 08 experiments mentioned below.

1) Conductivity of metals and / or insulator.
2) Experiment on Pin fins.
3) Experiment on forced convection apparatus.
4) Experiment on natural convection apparatus.
5) Determination of emmisivity of test plate.
6) Stefan Boltzman apparatus .
7) Parallel / counter flow heat exchanger.
8) Study of pool boiling phenomenon and critical heat flux.
9) Study of heat transfer in evaporator .
10) Temperature profile in a rod .
11) Study of evaporators .
12) Dropwise and filmwise condensation .

3. MASS TRANSFER-I

Teaching Scheme:
Lectures: 4 Hrs. / Week
Practical: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Practical: 50 Marks
Term Work: 25 Marks

UNIT- I:
Introduction to mass transfer operations, Steady state molecular diffusion in fluid at rest, Multicomponent mixture diffusion, Maxwell's law of diffusion
Diffusion in solids, Unsteady state diffusion (10 Hrs, 20 Marks)

UNIT- II:
Eddy (turbulent) diffusion: Relation between mass transfer coefficients.
Mass transfer coefficient in laminar and turbulent flow
Theories of mass transfer
Equipments for gas liquid operation (10 Hrs, 20 Marks)

UNIT- III:
Equilibrium for mass transfer process.: Local two phase mass transfer
Local overall mass transfer coefficient, Use of local overall coefficient.
Material balances for steady state co current, countercurrent, cross flow cascade, counter flow cascade.
Application of mass transfer processes (10 Hrs, 20 Marks)

UNIT- IV:
Introduction to Gas Absorption Operation: Equilibrium solubility of gases in liquids
Material balance for one component transferred in countercurrent flow and co current flow
Countercurrent multistage operation, one component transferred
Continuous contact equipment
Introduction to multi component system
Absorption with chemical reaction
Different absorption operation equipments (plate tower, packed tower, venturiscrubber)
Operational difficulties like coning weeping, dumping, priming ,flooding in plate and packed tower. (10 Hrs, 20 Marks)

UNIT- V:
Introduction to Humidification: Vapour liquid equilibrium, Humidification terms
Determination of humidity, Humidification and dehumidification
Water cooling operation equipment
Introduction to Drying operation: Rate of drying, Mechanism of moisture movement during drying, Drying equipments, Different methods of drying (10 Hrs, 20 Marks)

PRACTICALS

Term Work Shall be based on experiments mentioned below.

1) Diffusion In Still Air: To estimate mass transfer coefficient for given system at room temperature.
2) Liquid – Liquid Diffusion: To determine diffusion coefficient for given system as function of concentration.
3) Solid – Liquid Diffusion: To determine mass transfer coefficient for dissolution of benzoic acid without chemical reaction.
4) Wetted Wall Column: To determine mass transfer coefficient for air – water system.
5) Absorption in Packed Column: To find mass transfer coefficient of given system.
6) Cooling Tower: To determine volumetric mass transfer coefficient for air – water system.
7) Natural Drying (Batch): To obtain drying curve for batch drying operation.
8) Fluidized Bed Dryer: To determine the rate of drying and to obtain mass transfer coefficient for the given material.

REFERENCES

1) R.E.Treybal , Mass transfer operation ,McGraw Hill Publication
2) Coulson & Richardson Chemical Engineering (Vol. I and II), Pergamon Press
3) Christie J.Geankoplis ,Transport Processes & Unit Operations ,Prentice Hall inc
4) P. Chattopadhayay ,Unit operation in Chemical Engg. (Vol. I and II), Khanna Publications Delhi

4. PROCESS EQUIPMENT DESIGN & DRAWING –I

Teaching Scheme:
Lectures: 4 Hrs./ Week
Term Work: 4 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Term Work: 50 Marks

UNIT- I:

Design Considerations: Design codes, Maximum working pressure, Design pressure, Design Temperature, Design stress, Factors of safety, Selection of factor of safety, Design wall thickness, Corrosion ratio, Poisson ratio, Criteria of failure, Elastic stability.
Materials of construction : Mechanical properties, Materials, Corrosion, Protective coating, Corrosion prevention, Choice of materials (10 Hrs, 20 Marks)

UNIT- II:

Keys: Introduction, Types of keys, Strength of sunk key, Effect of key ways, Design of keys
Design of Heads: Introduction, Analysis and design of conical head, Flat cover head, Standard dished heads.
Gaskets & Flanges: Introduction, Types of Gaskets & Flanges. (10 Hrs, 20 Marks)

UNIT- III:

Pipe joints: Standard pipe flanges for steam, Hydraulic pipe joints for high pressure, Introduction to gaskets and flanges, Design of circular flange pipe joints.
Welded Joints
Riveted joints
Storage vessels: Introduction, Design fixed conical roof cylindrical tank, Storage of gases in Spherical vessels
Supports for vessels: Introduction, Bracket or Lug supports, Leg Supports, Skirt Supports
(10 Hrs, 20 Marks)

UNIT- IV:

Design of Cylindrical Vessels under internal Pressure: Introduction, Thin wall vessels, Design Equations.
Design of process vessels and pipes under external pressure: Introduction, Determination of safe pressure against elastic failure, Determination safe external pressure against plastic deformation, Circumferential stiffness, Pipes and tubes under external pressure.
(10 Hrs, 20 Marks)

UNIT- V:

Process Hazards and Safety Measures in Equipment Design: Introduction, Hazards in Process Industries, Hazards Analysis, Safety Measures, Safety Measures in Equipment Design, Pressure relief Devices
Design of packed absorption tower: Introduction, Design of circular & diameter of Packed Absorption Tower (10 Hrs, 20 Marks)

TERM WORK:

The term work shall consist of drawing of at least 8 half imperial size sheets from the following

1) Standard equipment symbols

2) Standard instrumentation symbols

3) Pipe fittings

4) Heads and closures

5) Keys and couplings

6) Pressure relief devices

7) Supports for vessels-Bracket Support

8) Supports for vessels-Leg Support

9) Supports for vessels-Skirt Support

10) Design and drawing of packed absorption tower

11) Riveted joints

12) Welded joints

REFERENCES:

1. B.C. Bhattacharya, Introduction to Chemical Equipment Design (Mechanical Aspects), CBS Publisher and Distributors, New Delhi.
2. M.V.Joshi, V.V. Mahajan, Process Equipment Design, 3rd Edition, Macmillan India Ltd.
3. Coulson & Richardson, Chemical Engineering (Vol. VI), Pergamon Press
4. R. S. Khurmi, J.M. Gupta, A Text Book of Machine Design, S. Chand & Company Ltd, New Delhi.
5. S.D. Dawande, Process Design of Equipments (Vol. I),Central Techno Publications, Nagpur.

5. CHEMICAL ENGINEERING THERMODYNAMICS

Teaching Scheme: Examination Scheme:
Lectures: 4 Hrs./ Week Paper: 100 Marks (3 Hrs)

UNIT- I :
Fundamental Concepts : Introduction to the subject, The laws of Thermodynamics, Cyclic rule, Coefficient of Thermal Expansion, Compressibility Coefficient
First Law of Thermodynamics : Basic Laws, Law of corresponding state, Heat Capacities, Variation of energy with Temperature and Volume, Enthalpy as a function of Temperature & Pressure, Joule-Thomson Coefficient Relation between Cp and Cv, Thermodynamic relations, Generalized Equation of State, Redlich-kwong equation of state, Soave-Redlich-Kwong equation of state. (10 Hrs, 20 Marks)

UNIT- II :
The Second Law of Thermodynamics: Introduction, Mathematical Treatment of Entropy Concept, Combined form of First and Second Law of Thermodynamics, Thermodynamic Relations based on Second Law of Thermodynamics, Calculations of Entropy Changes, Third Law of Thermodynamics. (10 Hrs, 20 Marks)

UNIT- III :
Multicomponent Mixture: Partial Molar Quantities: General Aspects, Determination of Partial Molar Volume, Determination of Partial Molar Enthalpy, Fugacity and Fugacity Coefficient, Fugacity coefficient through equation of state, Fugacity coefficient through virial coefficient correlation.
Properties of Solutions: Ideal solution: General Aspects, Phase equilibrium: General Aspects, Gibbs-Duhem Equation, Gibbs-Duhem-Margules Equation, Application of Gibbs-Duhem Equation, Application of Gibbs-Duhem-Margules Equation. (10 Hrs, 20 Marks)

UNIT- IV :
Vapour-Liquid Equilibria (VLE) : Basic equations for VLE, Reduction of VLE data, VLE at low to moderate pressure, Excess Gibbs free energy Model, Margules Equation & Van Laar Equation, Thermodynamic consistency test of VLE data
Phase Equilibria for Single Component System: Gibbs-Helmholtz Equation, The Clapeyron Equation, Clausious-Clapeyron Equation, Application of Clapeyron Equation.
(10 Hrs, 20 Marks)

UNIT- V:
Chemical Reaction Equilibria: The criteria for chemical equilibrium, Equilibrium constant, Law of chemical equilibrium, Thermodynamic treatment of the law of mass action, Van't Hoff reaction isotherm, Relations between equilibrium constant, Homogeneous gaseous equilibria, Temperature dependence of the equilibrium constant (The Van't Hoff Equation), Integrated form of the Van't Hoff equation, Pressure dependence of the equilibrium constant.
Applications of Phase Equilibrium in Ideal Solutions: To construct pressure-composition and boiling point diagrams. (10 Hrs, 20 Marks)

REFERENCES:

1 Y.V.C. Rao, Chemical Engineering Thermodynamics, University Press (INDIA) Ltd., Orient Longman Ltd., Hyderabad.
2 K.V. Narayanan, A Text book of Chemical Engineering Thermodynamic, Prentice Hall India Pvt. Ltd., New Delhi.
3 R.R.Rastogi and R.R.Mishra, An Introduction to Chemical Thermodynamics, Vikas Publishing House Pvt.Ltd, New Delhi.
4 D.Shrinivasan, Chemical Engineering Thermodynamics, New Age International Publisher New Delhi.
5 G.N. Pandey and J.C.Chaudhari, Chemical Engineering Thermodynamics, Khanna Publishers, Delhi.
6 J.M.Smith, H.C.Vanness, M.M.Abbott Introduction to Chemical Engineering Thermodynamics, 5th edition, McGraw Hill International Editions.
6 B.G.Kyle, Chemical and Process Thermodynamics, Prentice Hall India Pvt. Ltd., New Delhi.

1. INSTRUMENTATION & INSTRUMENTAL ANALYSIS

Teaching Scheme:
Lectures: 4 Hrs. / Week
Practical: 2 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Oral: 25 Marks
Term Work: 25 Marks

UNIT- I :
Qualities of Measurement: The meaning of measurement, The elements of instruments, Static Characteristics, Dynamic characteristic.
Expansion Thermometers: Introduction, Temperature scales, Constant volume gas Thermometer, Bimetallic Thermometer, Industrial pressure spring thermometer, Response of Thermometer. (10 Hrs, 20 Marks)

UNIT- II :
Thermoelectric Temperature Measurement: Introduction, Simple thermocouple circuit, Industrial thermocouples, Thermocouple lead wires, thermal wells, response of thermocouples.
Resistance Thermometer : Introduction, Industrial resistance-thermometer bulbs, Resistance thermometer element, Resistance thermometer circuit, RTD. (10 Hrs, 20 Marks)

UNIT- III:
Radiation Temperature Measurement: Introduction, Black body conditions, Black body devices, Radiation receiving elements, Thermopile, Vacuum thermocouples, Radiation pyrometers , Lens type thermal radiation receiver , Photoelectric pyrometers, Photoelectric radiation receiver, Optical pyrometer.
Pressure and Vacuum Measurement: Introduction, Indicating pressure gage, Bellows pressure element, Useful ranges of absolute pressure measuring gages, Mclead vacuum gage.
Measurement of Pressure’s in Corrosion Fluids: The steam gage siphon, Diaphragm seal in Pressure measurement, Liquid seal in pressure measurement, Response of mechanical pressure gages. (10 Hrs, 20 Marks)

UNIT- IV:
Measurement of Level: Float and tape liquid level gage, Float & shaft liquid level unit, Level measurement in pressure vessels, Gamma ray method, Ultrasonic method & resistive method.
Introduction, Theory, Instrumentation, advantages, and Application of: pH measurement, Refractrometry, Potentiometry, colourometry and Flame photometry.(10 Hrs, 20 Marks)

UNIT- V:
Introduction, Theory, Instrumentation, Advantages and Application of: Gas chromatography, Thin layer chromatography, Amerometric titration, Infrared spectrography, Atomic absorption spectrography.
Introduction to turbidimetry, Karl-Fischer titrimetry, Conductometric titrations and HPLC.
(10 Hrs, 20 Marks)

PRACTICAL and TERM WORK:

Practical and Term work shall consist of minimum eight experiments given below.
1) To study the response of bimetallic thermometer.
2) Calibration of thermocouple.
3) To measure the PH of given solution.
4) To measure the conductance of given solution.
5) To determine concentration of given solution by colorimeter
6) Flame photometry
7) Thin layer chromatography
8) Paper chromatography
9) Abbey's refractometer

REFERENCE:

1. D.P.Eckman, Industrial Instrumentation, Willey Eastern Ltd., New Delhi.
2. Fatranabis D. Industrial Instrumentation, Tata – Mcgraw Hill Publications, New Delhi.
3. Gurdeep Chatwal and sham Anand, Instrumental methods of Chemical analysis, Himalaya publication House, Mumbai.
4. V.P. Kudesia and S.S. Sawhaney, Instrumental methods of chemical analysis Pragati Prakashan, P.O.Box No. 62, Begum Bridge,Meerut250001,U.P.
5. Nakra B.C. and K.K. Chaudhary, Instrumentation Measurement & Analysis, Tata – McGraw Hill, New Delhi.
6. Dr. B.K.sharma.Goel, Instrumentation methods of chemical analysis, Publishing House,11,Shivaji Road, Meerut-250001,U.P.

2. CHEMICAL REACTION ENGINEERING-I

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Oral: 25 Marks
Term Work : 25 Marks

UNIT-I :
Introduction to chemical reaction engineering: Review of chemical reaction equilibrium, Classification of chemical reaction, rate of reaction, order and molecularity of reaction, rate constant, Temperature dependent term of rate equation, comparison of theories, Activation energy and temperature dependency, rate of reaction predicted by theories, Reaction mechanism. **(10 Hrs, 20 Marks)**

UNIT- II :
Collection & interpretation of kinetic data, Constant volume batch reactor, integral and differential method of analysis of data, Variable volume batch reactor , integral and differential method of analysis of data, The search for rate equation. **(10 Hrs, 20 Marks)**

UNIT- III :
Ideal batch reactor ,mixed flow reactor ,plug flow reactor, space time and space velocity, holding time and space time for batch , mixed and plug flow reactors, comparison in mixed and plug flow reactors, Combined flow system, Recycle reactor, Autocatalytic reaction.
(10 Hrs, 20 Marks)

UNIT- IV :
Introduction to multiple reactions: Reaction in parallel, Reaction in series, Series parallel reaction. Optimum temperature progression for single reaction, Isothermal, adiabatic, non adiabatic operation. Product distribution and temperature for multiple reactions.
(10 Hrs, 20 Marks)

UNIT- V :
Residence time distribution of fluid in vessel, Conversion directly from tracer information, Models for non-ideal flow, Dispersion models, Tank in series model, Concept of micro and macro mixing. **(10 Hrs, 20 Marks)**

PRACTICAL and TERM WORK:
Practical and Term work shall consist of minimum eight experiments from list given below.

1) To determine the reaction rate constant {k} for given reaction.(CSTR / BATCH / SEMIBATCH / PFR)
2) To determine the effect of temperature on reaction rate constant. .(CSTR / BATCH / SEMIBATCH / PFR)
3) To determine the activation energy {E} for the given reaction. .(CSTR / BATCH / SEMIBATCH / PFR)

4) To draw C [t], E [t] & F [t] curve and to calculate the mean residence time {tm} variance { σ^2} and skew ness { S^3} for plug flow reactor.
5) To draw C [t], E [t] and F [t] curve and to calculate the mean residence time {tm} variance { σ^2} and skew ness { S^3} for packed Bed reactor.
6) To study the cascaded CSTR
7) To draw C [t], E [t] and F [t] curve and to calculate the mean residence time {tm} variance { σ^2} and skew ness {S^3} for Annular reactor.
8) To study the kinetic in tubular flow reactor [coiled tube] for the given reaction.

REFERENCE:

1. Octave Levenspiel, Chemical reaction engineering, John Wiley and sons.
2. J.M. Smith, Chemical engineering kinetics, McGraw Hill
3. S.D. Dawande, Principles of reaction engineering, Central Techno publication, Nagpur.
4. H.Scott Fogler, Elements of chemical reaction engineering, Prentice Hall New Jersy
5. Lanny D. Schimdt , Chemical reaction engineering, Oxford University Press.

3. MASS TRANSFER-II

Teaching Scheme:
Lectures: 4 Hrs. / Week
Practical: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Practical: 50 Marks
Term Work: 25 Marks

UNIT- I :
Introduction to distillation process, Vapor liquid equilibrium, The methods of distillation (Binary mixture), The fractionating column, Condition for varying overflow in non- ideal system(Binary), Batch distillation, Multi component mixture, Azeotropic, extractive and steam distillation, Introduction to distillation equipments. (10 Hrs, 20 Marks)

UNIT- II :
Introduction to extraction process, Liquid equilibria, Material balances for stage wise contact methods, Extraction with reflux, Fractional extraction, Stage contact and continuous contact type extractors. (10 Hrs, 20 Marks)

UNIT- III:
Introduction to crystallization, Growth and properties of crystals, Effect of impurities in crystallization, Effect of temp. on solubility, Fractional crystallization, Caking & yield of crystals, Different type of crystallizes. (10 Hrs, 20 Marks)

UNIT- IV:
Introduction to adsorption operation, Type of adsorption operation, Nature of adsorbents, Adsorption equilibria, Adsorption of vapor, gas mixture and liquids, Material balances for stage wise for operation, Continues contact process for adsorption, Unsteady state fixed bed adsorbed, Principle of ion exchange operation, Equilibria for ion exchange operation, Rate of ion exchange operation, Application of ion exchange operation. (10 Hrs, 20 Marks)

UNIT- V:
Introduction to leaching operation, Mass Transfer in leaching operation, Calculation of of stages for diff. Processes, Graphical method for calculation of no. of stages counter current washing process, Equipments for leaching operation, Introduction to membrane separation process, Different Types of membrane separation process, (Ultrafiltreation , Reverse Osmosis, Dialysis, Electro Dialysis, Pervaporation), General membrane equation, Liquid membrane (10 Hrs, 20 Marks)

TERM WORK:
Any eight experiments based on the above syllabus.

1. Simple Distillation: To verify Rayleigh’s equation for simple distillation
2. Ternary Diagram: To construct ternary diagram for acetic acid –water – benzene
3. Tie Lines
4. Liquid – Liquid Extraction: To study and determine the efficiency of cross current liquid- liquid extraction.

5. Leaching
6. Crystallization
7. Adsorption: To study adsorption of acidic acid on activated charcoal
8. Determination of HTU, HETP and NTU
9. Spray Column
10. Ion Exchange
11. Bubble Cap Distillation
12. Study Of Mass Transfer Equipments

REFERENCES:

1) Coulson and Richardson, Chemical Engineering (Vol. II), Pergamon Press
2) RE. Tryebal, Mass Transfer Operation, McGraw hill.
3) Christie J. Geankoplis ,Transport Processes and Unit Operations ,Prentice Hall inc
4) P. Chattopadhyay, Unit operations in Chemical Engg. Vol. I and II, Khanna Publication, New Delhi.

4. PROCESS EQUIPMENT DESIGN & DRAWING –II

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs./ Week	Paper: 100 Marks (3 Hrs)
Term Work : 4 Hrs./ Week	Term Work: 50 Marks

UNIT- I:

Process Design of Heat Exchanger: Introduction, Types Of Heat Exchanger, Process Design of Shell and Tube Heat Exchanger.

Process Design of Evaporator: Introduction, Types of Evaporators, Methods of Feeding of Evaporators, Design of Evaporator **(10 Hrs, 20 Marks)**

UNIT- II:

Process Design of Reaction Vessels: Introduction, Materials of Construction, Agitation, Classification of Reaction Vessels, Heating Systems, Design of Reaction Vessels.

Crystallizer Design: Introduction, Types of Crystallizers, Design of crystallizers.

(10 Hrs, 20 Marks)

UNIT- III:

Process Design of Rotary Dryer: Introduction, Types Dryers, Design of Rotary Dryer.

Design of Tall Vessels :Introduction, The Axial Stresses Due To Dead Loads, The Axial Stresses Due To Pressure, Longitudinal Bending Stresses due to Dynamic Loads, Design Of Distillation (Tall) Column (Tower). **(10 Hrs, 20 Marks)**

UNIT- IV:

Design of Sieve Tray for Distillation Column

Design of Thick Walled High Pressure Vessel **(10 Hrs, 20 Marks)**

UNIT- V:

Design of Bubble Cap Tray For Distillation Operation

Agitators : Introduction, Types Of Agitators, Baffling, Power Requirements, Design Of Turbine Agitator. **(10 Hrs, 20 Marks)**

TERM WORK:

The Term Work shall consist of process design and drawing of equipments on at least five half imperial sized sheets. Based on the above syllabus.

REFERENCES:

1) B. C. Bhattacharya, Introduction to Chemical Equipment Design (Mechanical Aspects) CBS Publisher & Distributors, New Delhi.
2) M.V.Joshi, V.V. Mahajan, Process Equipment Design, 3rd Edition, Macmillan India Ltd.
3) Coulson & Richardson, Chemical Engineering (Vol VI), Pergamon Press.
4) R.E.Treybal, Mass Transfer Operations, McGraw Hill, New Delhi.
5) S.D. Dawande, Process Design of Equipments (Vol. 1& 2) Central Techno Publications, Nagpur.
6) G.K.Roy, Solved Problems In Chemical Engg., Khanna Publications, NewDelhi.
7) J.H.Perry, Chemical Engineer’s Hand Book, McGrawhill, New Delhi.

5. MATHEMATICAL METHODS IN CHEMICAL ENGINEERING

Teaching Scheme: Examination Scheme:
Lectures: 4 Hrs./ Week Paper: 100 Marks (3 Hrs)

UNIT- I:
Root Finding Methods : Bisection Method, Regula-falsi Method, Newton-Raphson Method, Direct Integration Method, Muller's Method.
Solution Of Simultaneous Linear Equation: Gauss Elimination Method, Matrix Inversion Method, Gauss Jordan Method, Jacobi's Iteration Method, Gauss Seidal Method
(10 Hrs, 20 Marks)

UNIT- II:
Interpolation & Extrapolation: Newtons-Gregory Forward Interpolation Formula, Newtons-Gregory Backward Interpolation Formula, Stirling's Formula, Central Difference Interpolation Formula, Choice of an Interpolation Formula.
Linear Programming (L.P.) : Introduction To L.P., Formulation Of L.P. Problems (L.P.P)/L.P. Models. Solution Of L.P.P. by Analytical Method (containing two variables), Solution Of L.P.P. By Graphical Method (10 Hrs, 20 Marks)

UNIT- III :
Chemical Engineering Optimization-I : The Optimum Diameter To height ratio for Large Oil Storage Vessel for Cost Minimization, Optimization of diameter and length of heat exchanger, Optimization of dimensions of an open rectangular Tank, Optimum thickness of insulation, Optimization of outlet temperature for counter-current arrangement in heat exchanger (10 Hrs, 20 Marks)

UNIT- IV:
Solution of L.P.P. with application of simplex technique.
Chemical engineering optimization-II : Optimum (economical) pumping temperature for pumping of oil, Optimization of dimension of rotary dryer, Optimum dimensions and optimum outlet temperature of air preheater, Optimization of kinetics of consecutive reactions (10 Hrs, 20 Marks)

UNIT- V:
Chemical engineering optimization-III : Optimum residence time for maximum yield in ideal isothermal batch reactor, optimization in refinery blending operation, optimization to get max. yield with respect to reactor volume, optimization of dimensions of straight rectangular Fin, optimization of performance of batch reactor with two consecutive reactions (by considering optimum Steam flow rate), optimum temperature approach and optimum Velocity (by considering process heat transfer approach), optimum proportions of a pressure vessel, optimum size of pressure vessels. (10 Hrs, 20 Marks)

REFERENCE:

1. T.F.Edgar and B.M.Himellblau optimization of chemical processes, International Edn.1989 McGraw hill
2. B.S.Grewal, Higher engineering mathematic, Khanna Publisher,Newdelhi
3. P.K.Gupta and D.S.Hira, Operation research 1st edition reprint 1997, S.Chand& com. NewDelhi.
4. S.S.Sastry; Introduction To methods Of Numerical Analysis, Prentice Hall.
5. B.S. Grewal Numerical Methods In Engg. & Science, Khanna Publications; Delhi
6. G.K.Roy, Solved Problems In Chemical Engg., Khanna Publications, NewDelhi.

6. PRACTICAL TRAINING / MINI PROJECT / SPECIAL STUDY

Examination Scheme:
Term Work: 25 Marks

- Every student has to undergo industrial/practical training for a minimum period of two weeks during summer vacation between (S.E Second Term) fourth and (T.E. First Term) fifth term or during winter vacation between fifth and sixth term (T.E. First Term and Second Term).
- The industry in which practical training is taken should be a medium or large scale industry.
- The paper bound report on training must be submitted by every student in the beginning of (T.E. Second Term) sixth term along with a certificate from the company where the student took training.
- The report on training should be detailed one.
- Maximum number of students allowed to take training in company should be five. Every student should write the report separately.
- In case if a student is not able to undergo practical training , then such students should be asked to prepare special study report on a recent topic from reported literature

  Or

  a mini project related to the Chemical Engineering.

  1. Preparation of Chemical Compound and study of its properties.
  2. Kinetics of different types of reactions.
  3. Analysis of Natural Products, Chemical Products etc.

  Project report should be detail be detail of work, carried out by student.
- The practical training/special study/ mini project shall carry a term work of 25 marks. Every student shall be required to present a seminar in the respective class in the presence of two teachers. These teachers (fixed by the head of department in consultation with the Principal) shall award marks based on the following :

(a)	Report	10 marks
(b)	Seminar presentation	10 marks
(c)	Viva-voce at the time of Seminar presentation	05 marks

	Total	25 marks

============XXXXX==========

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

FINAL YEAR ENGINEERING (B.E.)

CHEMICAL ENGINEERING

TERM – I & II

W.E.F. 2008-2009

NORTH MAHARASHTRA UNIVERSITY, JALGAON

STRUCTURE OF TEACHING & EVALUATION

B.E. (CHEMICAL ENGINEERING) W.E.F.2008-2009

First Term

Sr. No.	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Process Dynamics & Control	04	02	03	100	25	--	25
2	Transport Phenomenon	04	--	03	100	--	--	--
3	Chemical Reaction Engineering-II	04	04	03	100	50	--	25
4	Elective –I	04	--	03	100	--	--	--
5	Energy Engineering	04	02	03	100	25	--	25
6	Project –I	--	02	--	--	25	--	25
7	Seminar	--	02	--	--	25	--	--
		20	12		500	150	--	100
	Grand Total	32			750			

Second Term

Sr. No.	Subject	Teaching Scheme Hours/Week		Examination Scheme				
		Lectures	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Computer Aided Process Equipment Design Modeling & Simulation	04	04	03	100	50	25	--
2	Process Engineering Economics & Costing	04	02	03	100	25	--	25
3	Chemical Plant Design & Project Engineering	04	04	03	100	25	--	25
4	Elective –II	04	--	03	100	--	--	--
6	Project –II	--	04	--	--	100	--	50
7	Industrial Visit / Case Study	--	--	--	--	25	--	--
		16	14		400	225	25	100
	Grand Total	30			750			

Subjects:

Elective-I
1. Biochemical Engineering
2. Polymer Engineering
3. Advance Catalysis

Elective-II
1. Industrial Pollution & Control
2. Advance Separation Techniques
3. Petrochemicals

1. PROCESS DYNAMICS & CONTROL

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Oral : 25 Marks
Term Work: 25 Marks

UNIT- I
Characteristics of Chemical Process Control, Mathematical Modeling of Chemical Processes, State Variables and State Equation for Chemical Processes.
Input –Output Model, Linearization of non linear systems, Solution of Linear differential equation using Laplace Transform.
First order system and their transfer functions.
(10 Hrs, 20 Marks)

UNIT- II
Dynamic behavior of first order system , Pure capacity process, First order system with variable time constant and gain, Response of first order system in series :Interacting and Non-interacting.
Second order system and their transfer function.
(10 Hrs, 20 Marks)

UNIT- III
Dynamic behavior of second order system: under damped and over damped and critically damped systems, Transportation lag.
Higher order systems.
Introduction to feedback control, Controllers and final control elements.
Control action block diagram of chemical reactant control systems.
(10 Hrs, 20 Marks)

UNIT- IV
Dynamic behavior of feedback control processes: P, PD, PI, and PID.
Design of feedback controller: Performance criteria, selection of type of controller, Tuning of feedback controller.
Stability analysis by Routh criteria, Root Locus Diagram
(10 Hrs, 20 Marks)

UNIT-V
Frequency response analysis of linear processes: Bode's diagram, Nyquist plots.
Design of feedback control system using frequency response technique: Bode's stability criteria, gain and phase margin.
Ziegler – Nichols tuning technique. Nyquist stability criteria,
Control Systems with Multiple Loops: Feed forward control, Cascade control, Ratio control, selective control, split range control, Adaptive and Inferential control. Multi Variable Control
(10 Hrs, 20 Marks)

PRACTICAL and TERM WORK:
Practical and Term work shall consist of minimum eight experiments from list given below.
Dynamic behavior of first order system
1. Mercury Thermometer
2. Single tank system.
3. C.S.T.R.

Dynamic behavior of first order system in series
4. Two tank non-interacting system.

5. Two tank interacting system.

Dynamic behavior of second order system

6. Mercury Manometer

Dynamic behavior of final control Element

7. Pneumatic control valve.

Study of Pneumatic controllers.

8. Proportional Controller
9. Proportional Derivative Controller
10. Proportional Integral Controller
11. Proportional Integral Derivative Controller

Control Systems

12. Study of closed loop control system.

REFERENCES

1. George Stephanpolous, Chemical Process Control, Prentice Hall of India.
2. D.R. Coughnour, Process System Analysis and Control, McGraw-Hill.
3. R.P.Vyas, Process Control & Instrumentation {2nd edition}. Central Techno publication, Nagpur.
4. K. Krishnaswamy, Process Control, New age International.

2. TRANSPORT PHENOMENON

Teaching Scheme: Examination Scheme:
Lectures: 4 Hrs./ Week Paper: 100 Marks (3 Hrs)

UNIT-I

Introduction. Transport phenomenon and Unit Operation.

Equilibrium and Rate Processes. Fundamental variables and Unit The role of Intermolecular forces.

Simple Balance: Material and Energy.

Molecular transport Mechanism:

The Analogy. The Case of Heat Transfer. The Case of Mass Transfer. The Case of Momentum Transfer. The Analogues forms. Heat, Mass, Momentum Diffusivities. Thermal Conductivity. Diffusion Coefficient. Viscosity.

(10 Hrs, 20 Marks)

UNIT-II

Viscosity and Mechanism of Momentum Transport.

Velocity Distribution in Laminar Flow.

(10 Hrs, 20 Marks)

UNIT-III

Thermal Conductivity and The Mechanism of Energy Transport.

Temperature Distribution in Solids and in laminar Flow.

(10 Hrs, 20 Marks)

UNIT-IV

Diffusivity and Mechanism of mass Transport.

Concentration Distribution in Solids and in Laminar Flow.

(10 Hrs, 20 Marks)

UNIT-V

The Equation of Change for Isothermal System.

The Equation of Change for Non-Isothermal System.

(10 Hrs, 20 Marks)

REFERENCES
1. R.B.Bird; W.E.stewart; E.N.Lightfoot, Transport Phenomenon, John Wiley & Sons1994; Singapore
2. R.S.Brodsky & H.C.Hershey, Transport Phenomenon ,McGraw-Hill{International edition}
3. C.O.Bennett & J.E.yers; Momentum, Heat & Mass Transfer; McGraw-Hill1982.
4. James R. Welly, Charles E. Wicks & Robert E.Wilson; Fundamentals of Momentum, Heat & Mass Transfer{3rd edition}. John Wiley & Sons; Singapore

3. CHEMICAL REACTION ENGINEERING – II

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs. / Week	Paper: 100 Marks (3 Hrs)
Practical: 4 Hrs. / Week	Oral : 25 Marks
	Term Work: 50 Marks

UNIT-I
Introduction – Rate equations for heterogeneous systems , Contacting patterns in Two –Phase system ,Introduction to fluid particle reaction non-catalytic reactions, unreacted core model for Spherical particle of unchanging size, Rate of reaction for shrinking spherical particles , Determination of rate controlling step , Various contacting patterns in fluid solid reactors for fluid-particle non-catalytic reactions

(10 Hrs, 20 Marks)

UNIT-II
Introduction to fluid-fluid system (without catalyst), Rate equation for Instantaneous, Fast, Intermediate and slow reaction, Slurry Reaction kinetics, Rate equation for infinitely slow reaction Film conversion parameter , Reactors for gas-liquid reactions and their comparative evaluations on the basis of holdups .
Gas liquid reaction modeling on the basis of simultaneous absorption reaction model.
Aerobic fermentation, Tower for fast and slow reaction, Mixer settler and semi-batch contacting pattern .
Reactive distillation and extractive reaction.

(10 Hrs, 20 Marks)

UNIT-III
Introduction , Classification , Characteristics , Preparation and Deactivation of catalyst , Promoters and inhibitors , Determination of surface area and Pore volume of catalyst , Adsorption process and its classification , Types of adsorption isotherm .

(10 Hrs, 20 Marks)

UNIT-IV
Introduction to solid catalyzed reactor , Rate equation for adsorption , desorption and surface reaction, Diffusion and reaction in spherical catalyst pellets , Internal effectiveness factor, Over all effectiveness factor, Estimation of diffusion and reaction limited regimes, Mass transfer and reaction in a packed bed, The determination of limiting situation from reaction data, chemical vapor deposition reactors.

(10 Hrs, 20 Marks)

UNIT-V
Introduction to heterogeneous catalytic reactors,
Design, Mechanical construction and applications of: Moving bed reactors, Fluidized bed Reactors, Slurry bed reactors, Trickle bed reactors, Isothermal and Adiabatic fixed bed reactor.

(10 Hrs, 20 Marks)

REFERENCES

1. Octave Levenspiel , Chemical Reaction Engg" 3rd edition (1999)
2. H Scott Fogler, Elements of Chemical Reaction Engineering, Prentice Hall of India , 2nd edition (1997)
3. J M Smith, Chemical Engg Kinetics 3rd edition , New York , McGraw Hill (1981)
4. Lanny D Schmidt , The Engineering of Chemical Reactions ,Oxford University Press (1998)
5. Froment and Bischoff , Chemical Reactor Analysis and Design, Wiley Publications , New   York (1979)
6. Hiroo Tominaga and Masakazu Tamaki, Chemical reactions & reactor design Ed Wiley and Maruzene Publications(1997)

PRACTICAL and TERM WORK:

Practical and Term work shall consist of eight experiments from list given below.

1. To study the reaction of solid liquid system for an instantaneous reaction for benzoic acid NaOH and calculate the enhancement factor.
2. To study the isothermal decomposition of ethyl alcohol in tubular reactor packed with activated alumina catalyst.
3. To improve the % purity of commercially used ethanol using reactive distillation.
4. To improve the % purity of commercially used ethanol using extractive distillation.
5. To carry out the catalytic reaction to convert the nitrobenzene to aniline in presence of iron filling/HCl catalyst in the reactor.
6. To study the reaction of liquid liquid system for butyl acetate NaOH and to calculate the enhancement factor.
7. Absorption – to study the reaction of liquid gas system for NaOH – CO_2 to determine rate of absorption.
8. Adsorption- to study the adsorption of Acetic acid on charcoal
9. Preparation of Butyl Acetate by Reactive Esterification

4. ELECTIVE – I
1. BIOCHEMICAL ENGINEERING

Teaching Scheme: Examination Scheme:

Lectures: 4 Hrs./ Week Paper: 100 Marks (3 Hrs)

UNIT-I:

Characteristics of Biological material. Types of microorganisms; general physical properties of cells and chemical composition of cells; requirement for growth of cells and formulation of media; reproduction cycles in microorganisms; changes in composition of cells with age and with growth rate; effect of substrate limiting growth on the composition of cells; strain breeding; Maintenance of pure cultures.

Material Balances in bioprocesses, Application of material balances to bioprocesses; material balance with recycle, by-pass and purge streams. Stoichiometry of growth and product formation. Thermodynamics of microbial growth. Energy balances in bioprocesses, Heat of reaction for processes with biomass production. Unsteady state energy and material balances in bioprocesses.

(10 Hrs, 20 Marks)

UNIT-II:

Enzymes. History. Enzyme nomenclature and classification. Properties of enzymes. Applications of enzymes. Enzyme substrate complex and enzyme action. Effect of Temperature and pH on enzyme activity.

Kinetics of enzyme catalyzed reaction; simple enzyme kinetics with one and two substrates; Michaelis Menten kinetics. Evaluation of parameters of Michaelis Menten equation. Kinetics of reversible enzyme catalyzed reaction. Enzyme inhibition. Types of enzyme inhibition. Kinetics of competitive, uncompetitive and noncompetitive enzyme inhibition. Substrate activation and inhibition. Multiple substrates reacting on a single enzyme. Immobilization of enzymes and their applications. Kinetics of immobilized enzyme system.

(10 Hrs, 20 Marks)

UNIT-III:

Microbial Kinetics: Monod's growth kinetics. Environmental effects on growth kinetics. Balanced growth kinetics, Transient growth kinetics, Unstructured batch growth model, Growth of filamentous organisms, Structured kinetic model, Product formation kinetics. Unstructured model. Chemically structured kinetic model, Product formation kinetics by filamentous organisms.

Reactor Cofigurations: Enzyme reactors, Batch growth of microorganisms, Continuous culture of microorganisms, Stirred tank reactor with recycle of biomass, Continuous stirred tank fermenters in series, plug flow fermenter, fed batch fermenter, CSTR cell reactors with recycle and wall growth, multiphase reactors such as packed bed reactors, bubble column reactors, fluidized bed reactors and trickle bed reactors.

(10 Hrs, 20 Marks)

UNIT-IV:

Sterilization: Importance of Sterilization. Batch Sterilization of liquids, continuous sterilization of liquids, filter sterilization of liquids, sterilization of air, thermal death kinetics of cells and sports.

Aeration and Agitation: Mass transfer and Microbial respiration, bubble aeration and mechanical agitation, correlation between oxygen transfer coefficient and operating variables, effect of temperature, organic substances, surface active agents, mycelium and types of sparger on oxygen transfer coefficient. Measurement of oxygen transfer coefficient, Scale up.

(10 Hrs, 20 Marks)

UNIT-V:

Recovery of fermentation products, principle of mechanical separation; hindered settling in gravitation and centrifugal fields, filtration, pretreatment of cells to alleviated filtration resistance; Disruption of cells, mechanical methods, ultrasonic vibrations, grinding and mechanical shear, shearing by pressure, induction by lysis(physical methods, lytic agents, dessication, increasing the fragility of cells, Extraction preliminary fractionation procedures(removal of nucleic acids precipitation),high resolution techniques(ultra filtration, Chromatography, counter current distribution methods and other means).

Instrumentation and Control: Introduction, methods of measuring process variables; temperature measurement and control, pressure measurement and control ,foam sensing and control, weight of fermenter and estimation of microbial biomass, dissolved oxygen measurement and control, inlet and exit gas analysis, pH measurement and control, online analysis of other chemical factors and computer applications in fermentation technology, bioprocess economics.

(10 Hrs, 20 Marks)

REFERENCES

1. Shuichi Aiba, Arthur E.H. & Nancy F.M.,Biochemical Engineering; University of Tokyo Press.

2. James E.Bailey & David F.Ollis, Biochemical Engineering. Fundamentals; McGraw Hill Publication.
3. P.F.Stanbury, A.Whitaker & S,J.Hall, Principles of Fermentation Technology; Aditya Books Ltd; New Delhi.
4. Doran Pauline M. Bioprocess Engineering Principles, Academic Press. An Imprint of Elsevier.
5. Shular Michael L.and Kargi Fikret. Bioprocess Engineering Basic Concepts, Prentice Hall of India.
6. Editors: J.F. Richardson, D.G. Peacock, Coulson's & Richardson's Chemical Engineering, (Vol-III) Asian Books Pvt. Ltd. New Delhi
7. J.H. Backhurst& J.H.Harker, Coulson's & Richardson's Chemical Engineering(Vol-V) Asian Books Pvt. Ltd. New Delhi

4. ELECTIVE – I
2. POLYMER ENGINEERING

Teaching Scheme: Examination Scheme:
Lectures: 4 Hrs./ Week Paper: 100 Marks (3 Hrs)

UNIT-I:
Introduction to polymer and their classification. Types of polymerization. Addition Polymerization and Condensation Polymerization. Mechanism of polymerization.
Bulk, solution, suspension and emulsion polymerization techniques; merits, demerits and applications of these techniques.

(10 Hrs, 20 Marks)

UNIT-II:
Kinetics of polymerization: Kinetics of free-radical chain polymerization via initiation; propagation and Termination. Degree of polymerization and chain transfer reactions. Kinetics of catalyzed and uncatalyzed polycondensation reactions. Molecular Weight distribution; extent of reaction and degree of polymerization of polycondensation reactions.

(10 Hrs, 20 Marks)

UNIT-III:
Introduction to average molecular weight and Molecular Weight distribution in polymers, measurements of number, average by cryoscopy; Ebwiometry ; membrane osmometry ; vapor pressure osmometry and end group analysis. Measurement of viscosity, average molecular weight by viscometry.

(10 Hrs, 20 Marks)

UNIT-IV:
Thermal analysis of polymer by differential scattering calorimeter; TGA, TMA and HDT. Mechanical properties like tensile strength, Young's Modulus, hardness, etc.

(10 Hrs, 20 Marks)

UNIT-V:
Properties, applications and manufacturing techniques of polyethylene, PVC, Phenol formaldehyde, Urea formaldehyde resins, styrene-butadiene rubber (SBR), Nylon6, cellulose fiber (Rayon Yarn), PET.

(10 Hrs, 20 Marks)

REFERENCES

1. V. R. Gowarikar, N. V. Vishwanathan, Polymer science; Wiley Eastern Publication, Delhi
2. B. K. Sharma, Polymer Science, Goel Publishing House; Meerut
3. Fried W. Billmeyar, Text book of polymer science, John Willey and Sons
4. M. Gopalarao, Dryden's Outlines of Chemical Technology; 3rd edn; East West Press.

4. ELECTIVE – I
3. ADVANCE CATALYSIS

Teaching Scheme: Lectures: 4 Hrs./ Week

Examination Scheme: Paper: 100 Marks (3 Hrs)

UNIT-I:

Catalysis: Introduction, History.

Homogeneous Catalysis: Introduction, Characterization of solution Processes, Examples of solution catalysis: Acid – base catalysis, Organometallic Catalysis.

Heterogeneous Catalysis: Introduction, Characterization of Surface Processes, Properties of Solid Catalysts, Influence of Mass Transport on Catalyst Performance.

Catalyst Components: Catalytically active species, Supports, Binders, Promoters.

Catalyst treatment: Activation, Deactivation, Regeneration, Redispersion, Reclamation, Disposal and Toxicity

Catalysis by Metals, Metal Oxides and zeolites, Metal Sulphides.

(10 Hrs, 20 Marks)

UNIT-II:

Supported Catalysts: Introduction, Definition of Supported Catalysts.

Advantages of Supported Catalysts: Separability, Cost, Catalyst activity, Catalyst Selectivity.

Support Materials for the Catalyst, Composition, Size and Shape, Surface Area., Porosity and Pore size. Attrition Loss, Density, Cost and quality.

Design and Development of Supported Catalysts: Preparation and Manufacture, Catalyst Preparation Methods, Catalysts from Physical Mixtures, Impregnated Catalysts, Ion exchange Catalysts. Testing and evaluation of Supported Catalysts, Application of Supported Catalysts.

(10 Hrs, 20 Marks)

UNIT-III:

Regeneration of Catalysts

Fluid Catalytic Cracking Unit: Process Description, Heat Balance, Coke formation, Coke burning, CO Combustion, Environmental aspects. Regenerator Operating Parameters. Influence of Regenerator design on Catalyst Fluidization, Equipment/Unit Operation in Cracking Units.

Noble and Base Metal Catalysis: Noble Metal Catalysis, Deactivation, Regeneration, Regeneration Processes such as continuous Catalyst Regeneration, Fixed Bed Semi Regenerative Process, Cyclic or swing, Reactor regeneration.

Base Metal Catalysis: Process and Catalyst Description.

(10 Hrs, 20 Marks)

UNIT-IV:

Catalysis in Petroleum and Petrochemical Industries:

Applications of zeolites in Petrochemical Refining. Improving quality of Petroleum fuels through Catalysis. O-xylene isomerization over Nickel containg SAPO-5 molecular sieves. Pd-sulfonated Polysiloxane catalyst for etherification of FCC light gasoline. Oxidation of Ethylbenzene catalyzed by Soluble Cobalt (III) complexes. Comparative evaluation of various catalysts used for removal of NOx from air streams.

(10 Hrs, 20 Marks)

UNIT-V:

Biocatalysts: Introduction and importance of biocatalysts. Type of biocatalysts.

Enzymes: Definition, Sources of Enzymes, production of Enzymes. Formation of enzyme substrate complex. Applications.

Simple enzyme kinetics. Derivation of Michaelis Menten equation. Evaluation of parameters of Michaelis Menten equation. Effect of Temperature and pH on enzyme Kinetics.

Microbial Cell: Classification of cells. Requirement for the growth of cells and growth Media. Microbial Kinetics. Monods Equation. Parameters affecting the growth kinetics of cells. Immobilization of enzymes and cells. Methods and Techniques of immobilization. Application of immobilized enzymes and cells.

(10 Hrs, 20 Marks)

REFERENCES

1. Kirk Othmer, Encyclopedia of Chemical Technology, 4th edition, Volume-V. John wiley and sons New York.
2. Editors: Bhattacharya KG and Talukdar A K, Catalysis in Petroleum and Petrochemical Industries. Narosa Publishing House, New Delhi.
3. Editors: Richardson J.F. and Peacock D.G.Richardson and Coulson's , Chemical Engineering , Volume-III, Asian Books Pvt. Ltd., New Delhi.
4. James E. Bailey and David F.Ollis, Biochemical Engineering. Fundamentals; McGraw Hill Publication.

5. ENERGY ENGINEERING

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Oral : 25 Marks
Term Work: 25 Marks

UNIT-I:

Introduction to energy engineering. Energy resources and forms of energy. Energy demand. Changing energy consumption trends. National energy strategies. National energy plan. Energy power management and Energy planning in India. Energy Audit. Energy Conservation and recycling.

(10 Hrs, 20 Marks)

UNIT-II:

Conventional Energy Sources

Coal : Type of coal, classification of Indian coal. Important Properties of coal. Exploration, Storage and Transportation of coal. Coal gasification, coal liquefication. Carbonization of coal, Production of coke and coal gas, By-products.

Petroleum, Natural gas and Refinery Products: Introduction to Petroleum and Natural gas and Naphtha. Energy routs of petroleum. Exploration of petroleum. Production of crude oil and Natural gas. Transportation of crude oil and Natural gas. Refining of crude oil and Natural gas. Liquefaction of Natural gas. Petroleum and Natural gas in India.

(10 Hrs, 20 Marks)

UNIT-III:
Chemical Energy Sources:
Fuel cells: Introduction, Design and operation of a Fuel cell. Classification of fuel cells, Types of fuel cells, Advantages and disadvantages of fuel cells, Conversion efficiency of fuel cells, Work out put and EMF of fuel cell, Applications of fuel cells.
Hydrogen: Introduction, Applications of Hydrogen, Production of Hydrogen, Storage and transportation safety and management, Hydrogen technology development in India.
Methanol: Production of methanol, Applications of methanol as fuel.
Nuclear Energy: Nuclear energy and application compared with coal, Fuels for Nuclear Fission Reactor. Nuclear fuel cycle, Storage and Transportation. Energy from nuclear fission reaction. Uranium Enrichment Process. Nuclear Waste management.

(10 Hrs, 20 Marks)

UNIT-IV:
Solar Energy: Solar radiation and its measurement. Solar energy collectors, solar energy storage, Applications of Solar energy.
Wind energy: Basic Principles of wind energy conversion. Site Selection Considerations Classification of wind energy conversion system, Advantages and disadvantages of wind energy conversion systems, Storage and Applications of wind energy.
Geothermal Energy: Geothermal energy resources, utilization of geothermal energy, Applications of geothermal energy.
Tidal Energy: Tidal energy conversation, Tidal power, Tidal energy resources in India.
Bioenergy: Biomass energy resources, Biomass conversion processes, direct combustion of biomass, Thermo chemical conversion of biomass, Biochemical conversion, Ethanol from biomass, Applications.

(10 Hrs, 20 Marks)

UNIT-V:
Energy conversion technologies and Electrical power plants: Energy conversion processes and devices, Power plants with conventional energy sources, Coal fired steam thermal power plants, Hydro electric power plants, Nuclear fission reaction power plants, Gas-turbine power plants, Combined cycle power plants, Integrated coal gasification combined cycle power plants, Diesel electric power plants, Geothermal electrical power plants. Plant factors and reserves.

(10 Hrs, 20 Marks)

REFERENCES

1. S. Rao and Dr. B.B. Parulekar, “Energy Technology” Non Conventional, Renewable and Conventional, Khanna Publishers, Delhi.
2. G.D. Rai “Non conventional Energy Sources”, Khanna Publishers Delhi
3. S.B. Pandya, “Conventional Energy Technology” Fuels and Chemical Energy Tata McGraw-Hill Publishing Company Ltd, New Delhi
4. S.P. Sukhatme, “Solar Energy”, Principals of thermal collection and Storage. Tata McGraw-Hill Publishing Company Ltd, New Delhi

TERM WORK:
Term Work shall consist of any eight assignments given below.
1. Energy power management and Energy planning in India
2. Energy Audit, Energy Conservation and recycling.

3. Conventional Energy Sources: Coal
4. Petroleum, Natural gas and Refinery Products
5. Chemical Energy Sources
6. Nuclear Energy and Power plant
7. Solar Energy
8. Wind Energy, Geothermal Energy, Tidal Energy and Bioenergy
9. Energy conversion technologies and power plants

6. PROJECT-I

Teaching Scheme:
Practical: 2 Hrs./ Week

Examination Scheme:
Oral : 25 Marks
Term Work: 25 Marks

The project topic shall consists of either some investigation work or design problem or experimental set up of some development work or prototype equipment or dissertation related to field of chemical engineering.

Project shall be taken in the beginning of the seventh term in consultation with concerned guide and must be completed in eighth term. The project proposal must be submitted in the beginning of the seventh term by every student or a group of students (not more than five students in a group).

The students shall submit the report to the corresponding guide, present their work in due time based on following points,

• Introduction.
• Literature survey.
• Physical / chemical properties etc.
• Experimental setup and procedure.
• Extent of project completed.

Presentation can be performed with OHP slides / LCD.

The progress of the project shall be evaluated by a committee of internal teachers which shall include concerned guide also and shall award the term work marks.

The oral examination of the project shall be conducted by concerned guide and external examiner jointly.

7. SEMINAR

Teaching Scheme:
Practical: 2 Hrs./ Week

Examination Scheme:
Term Work: 25 Marks

During seventh term, every student individually will study a topic assigned to him and submit a report in a typed form and shall deliver a short lecture / seminar on the topic at the time of seminar oral examination .The topic assigned will be related to the field of chemical engineering.

The students shall deliver the seminar (10 to 15 minutes) and submit the seminar report to the staff member on different technical subjects during the semester. The assessment of the term-work shall be based on the: -

1. Attendance to the seminar
2. Performance of the seminar delivery
3. Seminar reports and
4. Viva voce during the seminar.

The staff member/members shall guide the students in:

1. Selecting the seminar topic.

2. Information retrieval (literature survey)
    a) Source of Information i.e. names of the journals, reports, books etc.
    b) Searching for the information i.e. referring to chemical abstracts etc.
3. Preparing the seminar report
4. Delivering the seminar

The oral examination shall be conducted by a committee of teachers internally which shall include the concerned guide also and shall award the oral marks (in the seventh term / at the end of seventh term).

1. COMPUTER AIDED PROCESS EQUIPMENT DESIGN MODELING & SIMULATION

Teaching Scheme:
Lectures: 4 Hrs. / Week
Practical: 4 Hrs. / Week

Examination Scheme:
Paper: 100 Marks (3 Hrs)
Practical: 25 Marks
Term Work: 50 Marks

UNIT-I:
Computer Aided Design:
Shell and Tube Heat Exchanger.
Reactor

(10 Hrs, 20 Marks)

UNIT-II:
Computer Aided Design:
Single Effect Evaporator.
Distillation Column.

(10 Hrs, 20 Marks)

UNIT-III:
Computer Aided Design:
Absorption Column.
Rotary Dryer.

(10 Hrs, 20 Marks)

UNIT-IV:
Introduction to Lumped Parameter Model.
Comparison of Model with Real Situation.
Modeling of An Activated Sludge Process as a continuous Operation by Recycling Biological Sludge
Modeling Difficulties in C.S.T.R.
Modeling of Constant Hold up Three CSTR's in Series.
Modeling of Batch Reactor With First Order Consecutive Reaction Takes Place as Time Proceed for Study of Optimal Batch Time.
Modeling for Maximizing the Yield of the Intermediate (Desirable) Product.
Modeling for Evaluation of the Adiabatic Equilibrium Temperature.
Modeling for Catalyst Decay in a CSTR.
Modeling for Evaluation of Conversion with Catalyst Decay in Batch Reactor.

(10 Hrs, 20 Marks)

UNIT-V:
Introduction of the Chemical Engineering Simulation.
Simulation Language.
When to Use Simulation?
Steps of Simulation Process.
Chemical Engineering Application of Simulation Techniques.
Advantage and Limitation of Simulation Technique.
Simulation of Ammonia Production System.
Simulation of Catalyst Temperature by Newton-Raphson Method.
Simulation of CSTR By Euler's Method.

Simulation of CSTR with Second Order Irreversible Exothermic Reaction Using Runga-Kutta Method.

(10 Hrs, 20 Marks)

Practical and Term Work shall consist of following experiments.

1. Computer aided design of shell & tube heat exchanger.
2. Computer aided design of single effect evaporator.
3. Computer aided design of rotary dryer.
4. Simulation of ammonia production system.
5. Simulation of catalyst temperature by Newton Raphson method.
6. Simulation of Reactor Design.
7. Computer control heat exchanger.
8. Computer Aided Design of absorber.

REFERENCES

1. W. L. Luyben , Process Modeling Simulation and Control for Chemical Engineers; 1988 McGraw Hill.
2. B.C. Bhattacharya & C. M. Narayan, Computer Aided Design of Chemical Process Equipment : 1st Edition, 1992, NCBA, Calcutta

Note: Students Can Utilize FORTRAN -77 And / Or C And/Or C++ Programming Language for the Above Syllabus.

2. PROCESS ENGINEERING ECONOMICS & COSTING

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs./ Week	Paper: 100 Marks (3 Hrs)
Practical: 2 Hrs./ Week	Oral : 25 Marks
	Term Work : 25 Marks

UNIT-I:

Scales of Production, Selection of Plant Capacity, Plant Location. Availability of Raw Materials, Energy Gestation Period. Expansion, Diversification and Obsolescence. Scope for Standardization in Design and Production .Economics of Research and Development .Indian Chemical Industry , Current Status and Trends .

(10 Hrs, 20 Marks)

UNIT-II:

Cost Estimation: Factors Affecting Investment and Production Cost .Capital Investment , Fixed Investment and Working Capital .Estimating Equipment Cost By 6 /10 Factor Rule .Method of Estimating Capital Investment .Different Costs Involved in Total Product Cost .Computer Automization in Costing.

(10 Hrs, 20 Marks)

UNIT-III:

Interest and Investment Cost , Simple and Compound Interest , Nominal and Effective Rates of Interest , Continuous Interest , Ordinary Annuity ,Perpetuities and Capital Costs . Taxes and Insurances: Types of Taxes and Tax Returns. Types of Insurance and Legal Responsibility.

(10 Hrs, 20 Marks)

UNIT-IV:
Depreciation: Types of Depreciation, Service Life, Salvage Value, Present Value. Methods of Determining Depreciation, Single Unit and Group Depreciation .Causes of Obsolescence and Inadequacy.

(10 Hrs, 20 Marks)

UNIT-V:
Profitability, Alternative Investment and Replacement, Mathematical Methods of Profitability Evaluation, Cash Flow Diagram. Break Even Analyses, Balance Sheet, Pricing Issue Method and Income Statement.

(10 Hrs, 20 Marks)

TERM WORK:
Term Work shall be based on the following.
1. Location of a chemical plant
2. Indian Chemical industry
3. Cost Estimation
4. Interest and Investment costs
5. Taxes and Insurance
6. Depreciation
7. Profitability and Replacement
8. Break Even Analysis

REFERENCES

1. Peter M.S. Timmerhaus K.D. Plant Design and Economics for Chemical Engineers. McGraw Hill.
2. Vilbrandt F.C. and C.E. Dryden , Chemical Plant Design. McGraw Hill
3. T.R. Banga and S.C.Sharma, Industrial Organization & Engineering Economics, Khanna Publications, New Delhi.
4. O.P.Khanna Industrial Engineering & Management, Dhanpat Rai Publications Pvt. Ltd. New Delhi.
5. Dewett & Varma, Elementary Economic Theory : S Chand & Company Ltd New Delhi

3. CHEMICAL PLANT DESIGN & PROJECT ENGINEERING

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs./ Week	Paper: 100 Marks (3 Hrs)
Practical: 4 Hrs./ Week	Oral : 25 Marks
	Term Work: 25 Marks

UNIT-I:
Introduction to Chemical Engineering Plant Design and Project Engineering.
The role of Chemical Engineer in Chemical Plant Design. Chemical Engineering Design, need for Plant Design, Process Design.
Development of the project: Evaluation of a process, process research, research evaluation, process development, preliminary engineering studies, pilot plant, semi-commercial plant, commercial plant and commercial plant design factors.
Technical factors, economic factor, safety considerations, legal phases, sources of information.

(10 Hrs, 20 Marks)

UNIT-II:

Process Design: Choice of process continuous Vs. Batch processing.

Process Equipments and Materials: Selection of Materials, Plan for Selection of Materials. Selection of Process Equipments, Equipment selection procedures, standard Vs. special equipment. Scale up method, types of flow sheet, development of process flow sheet from process information.

(10 Hrs, 20 Marks)

UNIT-III:

Plant Layout : Introduction planning-layout, factors in planning-layout methods of layout planning area concept, two dimensional layouts, scale models, principles of plant layout, safety, utilities & material handling equipments , railroads and roads, etc.Plant layout for Benzene Hexachloride process.

Locating the Chemical Plant: Introduction, summary of factors in plant location.

Economics location, plant location factors, raw material supply, market and transportation, power and fuel, water supply , temperature, plant measures for conservation of water, legal restriction, federal pollution act, climate, labour, community and site characteristics and waste disposal.

(10 Hrs, 20 Marks)

UNIT-IV:

Site preparations and Structures : Introduction, Site Preparation, Surface Evaluation, Foundation and Shape of Foundation, Machinery and Equipment Foundations, Supports, Outdoor Plants, Selection Building types, Building design principles, Flooring , walls, Roof, safety and higher protection conditioning , heating and ventilation. Cost Consideration for Plant Sites and Structures New Development in Management techniques. (PERT & CPM).

(10 Hrs, 20 Marks)

UNIT-V:

Process Auxiliaries : Introduction, Piping, Explanation of CODES, Selection of Piping, Pipe strength, Wall thickness, Nominal Pipe Size (NPS), Criteria for Selection of Materials, Pipe sizing by ID, Choosing the final pipe size, Process steam piping, piping layout, piping insulation, methods of providing flexibility for piping.

(10 Hrs, 20 Marks)

TERM WORK:

Term Work shall consist of minimum 5 (five) half imperial size sheets based on above syllabus.

1. Process flow diagram of Manufacturing of Benzene Hexa Chloride (BHC)
2. Process flow diagram of Manufacturing of Nitric Acid
3. Plant Layout for Manufacturing of Benzene Hexa Chloride (BHC)
4. Plant Layout for Manufacturing of Nitric Acid
5. Piping diagram for Manufacturing of Nitric Acid
6. Piping diagram for Manufacturing of Benzene Hexa Chloride (BHC)
7. Network Analysis Numerical : PERT & CPM

REFERENCES

1. F.C. Vilbrandt and C.E. Dryden, Chemical Engineering Plant Design McGraw Hill, New Delhi.
2. Peter M. S. and K.D. Timmerhaus, Plant Design and Economics for Chemical Engineers. McGraw Hill.
3. Modes J. and Philips, Rheinhold, Project Engineering with CPM and PERT :
4. Perry’s Chemical Engineer’s handbook.

4. ELECTIVE – II
1. INDUSTRIAL POLLUTION & CONTROL

Teaching Scheme: Examination Scheme:
Lectures: 4 Hrs./ Week Paper: 100 Marks (3 Hrs)

UNIT-I:
Introduction: Types of Pollution. Introduction: Pollution control aspects. Environmental Legislation: Water (Prevention and Control of Pollution) Act,197, Air (Prevention and control of Pollution) Act, 1981. Industrial Waste Water Analysis. Industrial Gaseous Effluent Analysis. General Instrument for Gaseous Pollutants.

(10 Hrs, 20 Marks)

UNIT-II:
Removal of BOD. Introduction to removal of BOD Biological oxidation units: Activated Sludge Process; Trickling /Biological Filters; Waste Stabilisation Ponds. Anaerobic Treatment. Numerical Examples based on removal of BOD.
Removal of Chromium. Introduction to removal of Chromium. Control Methods, Reduction precipitation, Ion Exchange, Reverse Osmosis, Lime coagulation and adsorption.

(10 Hrs, 20 Marks)

UNIT-III:
Removal of Mercury: Introduction of removal of mercury, Measurement of Mercury, Ventron mercury removal process.
Removal of ammonia/urea: Introduction to removal of ammonia/urea, Methods for removal of nitrogen, Physico-chemical processes, Biological methods.

(10 Hrs, 20 Marks)

UNIT-IV:
Treatment of Phenolic Effluents: Introduction to Treatments of Phenolic Effluents, Sources of phenols.
Treatments/Removal Methods: Steam Gas Stripping. Adsorption/Ion Exchange; Extraction of phenols using Phenosolvants Biological Methods of Treatment.
Removal of particulate matter: Introduction to removal of particulate matter, Gravity settling chamber, solid traps, cyclone separators, fibre filters, fabric filters, liquid scrubbers and ESP.
Numerical Examples based on settling chamber, cyclone separators, fiber filter, liquids scrubber and ESP.

(10 Hrs, 20 Marks)

UNIT-V:
Pollution control in process industries:
Introduction to pollution control,
Pollution control aspects of fertilizer industry: Introduction to pollution control in fertilizer industry.
Removal of carbon in ammonia plant effluents by scrubbing with liquids using vacuum filtration,
Removal of oil in ammonia plant effluents, Removal of hydrogen sulphide in ammonia plant effluents
Pollution control in petroleum and petrochemical units: Introduction
Refinery Liquid based treatment methods: Oxidation pond treatment, disposal of sludges.
Treatment of liquid effluents from petrochemical industries, Removal of hydrogen sulphide gas from sour gas by stripping, Removal of ammonia from gases.
Alcohol industry: Treatment method by recovery of potash from distillery spent-wash.

(10 Hrs, 20 Marks)

REFERENCES

1. S. P. Mahajan, Pollution control in process industries, Tata McGraw-Hill Publication
2. M. N. Rao & A K. Datta, Waste Water Treatment: IBH Pub., Delhi

4. ELECTIVE – II
2. ADVANCE SEPARATION TECHNIQUES

Teaching Scheme: Examination Scheme:
Lectures: 4 Hrs./ Week Paper: 100 Marks (3 Hrs)

UNIT-I:
Separation Processes: Industrial Chemical Processes, Mechanism of Separation
Separation by phase addition or creation. Separation by barrier. Separation by solid agent. Separation by external field or gradient. Component Recoveries and product purities. Separation power. Selection of feasible separation processes.
Crystallization from the melt: Introduction.
Progressive freezing: component Separation by progressive freezing, Pertient variables in progressive freezing. Applications.
Zone melting: component separation by zone melting, pertient variables in zone melting, Application.
Melt crystallization from the bulk: Investigations, commercial equipment and application.
Falling-film crystallization: Principles of operation, commercial equipment and applications.
(10 Hrs, 20 Marks)

UNIT-II:
Enhanced distillation: Introduction. Azeotropism.
Azeotropic distillation: Introduction, exploitation of homogeneous azeotropes, exploitation of pressure sensitivity, exploitation of boundary curvature, Exploitation of azeotropy and liquid Extractive distillation: Introduction, solevent effect in extractive distillation, extractive distillation design and optimization, solvent screening and selection extractive distillation by salt effects. Reactive distillation: Introduction, simulation, modeling and design feasibility, Mechanical design and implementation issues, process applications.
(10 Hrs, 20 Marks)

UNIT-III:
Supercritical fluid separation processes: Introduction. Physical properties of pure supercritical fluids; thermodynamic properties and transport properties. Process concept in super critical fluid extraction. Phase equilibria: Liquid- Fluid equilibria, Solid- Fluid equilibria, Polymer- Fluid equilibria and the Glass Transition, Cosolvents and surfactants, phase equilibria models. Mass Transfer.
Applications: Food and Pharmaceutical applications, Temperature controlled residuum Oil super critical extraction [ROSE], Extraction from aqueous solution, Adsorption and desorption, Polymer de volatilization and fractionation, Drying and Aerogel formation, Clearing, Crystallization, Reactive separations.
(10 Hrs, 20 Marks)

UNIT-IV:

Membrane separation processes: Introduction. Advantages of membrane separations, Basic equations, Basic concept, Membrane types, Economics.

Electro dialysis: Process description, examples, membranes, membrane efficiency, process description and configuration, Energy requirements, Equipment and economics.

Reverse osmosis and Nano filterization: Processes description, examples Basic principles of operations, RO and NF membranes, process limitations and configuration. Economics.

Ultra filtration: Process description, UF membranes, membrane characterization, process limitations, process configurations, Energy requirements, Design and economics.

Microfiltrations: process description, Examples, MF membranes, membrane characterization , process limitations, Equipments configurations, process Applications and Economics.

Gas- Separations membranes: Process descriptions, examples, Basic principles of operations, selectivity and permeability, Gas- Separation membranes, membrane system design features, energy requirements and economics.

Pervaporization: Process description, definition, operational factors, vapor feed, examples, pervaporation membranes, modules.

(10 Hrs, 20 Marks)

UNIT-V:

Biochemical separation processes: Introduction.

Initial product harvest and concentration: centrifugation, Filtration, Selection of cell separation Unit operation, Cell disruption, protein refolding.

Initial purification: Precipitation, Extraction, Adsorption, Membrane processes.

Final Purification and product formulation.: Chromatography, Lyophilization and drying. Integration of fermentation and downstream processing operations.

(10 Hrs, 20 Marks)

REFERENCES

1. Perry Robert H. and Green Don W. Perry’s chemical Engineers Handbook 7th edition. McGraw Hill Publication, New York.
2. Seader J. D. and Henley Ernest J, Separation Process Principles. John Wiley and Sons, Inc, New York
3. Ladisch Michael R., Bioseparations Engineering, Principles, Practice and Economics, Wiley Interscience, John Wiley and Sons, Inc. Publications New York
4. Long Robert B. Separation Process in Waste Minimization .Marcel Dekker, Inc, New York

4. ELECTIVE – II
3. PETROCHEMICALS

Teaching Scheme: Examination Scheme:
Lectures: 4 Hrs./ Week Paper: 100 Marks (3 Hrs)

UNIT-I

Petrochemical Industry in India. Feed stocks for petrochemicals, separation of aromatics

Chemicals from methane: Manufacture of methanol, formaldehyde, acetic acid, ethylene glycol, CS_2, liquid fuels from methanol, manufacture of ethanol.

(10 Hrs, 20 Marks)

UNIT-II

Chemicals from ethane- ethylene-Acetylene.

Ethane: Occurrence, halides of ethane, Nitroethane and oxidation of ethane.

Ethylene production, production of ethylene derivatives like vinyl acetate monomer, ethylene oxide, ethylene diamine, ethanol and acetaldehyde.
Chemicals from acetylene: acrylic acid, vinyl chloride, vinyl acetate and Acetonitrile.
(10 Hrs, 20 Marks)

UNIT-III
Chemicals from C_3, C_4 and higher carbon atoms:
Products from propane. Dehydrogenation of propane and higher paraffins.
Chemicals from propylene: Isopropyl alcohol, acetone, propylene glycol, acrylic acid and ester, Phenol.
Dehydrogenation of butanes. Production of Iso and n- butanol. Production of methyl –tert-butyl ether [MTBE], Adipic acid. Derivatives from hydrocarbons higher than butane.
(10 Hrs, 20 Marks)

UNIT-IV
Synthesis gas and chemicals:
Synthesis gas. Steam reforming of hydrocarbons. Production of synthesis gas. Chemicals from synthesis gas. Oxo synthesis, vinyl acetate, acetic acid.
Fischor- Tropsch synthesis: catalysts and the products.
LPG: sources, properties grades of LPG. Supply of LPG to consumers, the storage and use of LPG, LPG piping system, safety consideration and emerging action. Emergency controls and action.
(10 Hrs, 20 Marks)

UNIT-V
Petroleum aromatics: Production of BTX.
Benzene derivatives like Aniline, phenol, alkylation of benzene.
Products from toluene: Chloro toluenes, O- Cresols, Dinitro toluenes, Benzaldehyde, caprolactum, Terephthalic acid.
Chemicals from xylene: o-xylene, m-xylene, p-xylene, Naphthalene
(10 Hrs, 20 Marks)

REFERENCES

1. Bhaskararao B.K. “A Text on petrochemicals”, Khanna Publishers, New Delhi
2. Sarkar G.N. “Advanced Petrochemicals” Khanna Publishers, New Delhi
3. Maiti Sukumar [editor],”Introduction to Petrochemicals”, Oxford and IBH Publishing co. Pvt. Ltd. New Delhi

6. PROJECT-II

Teaching Scheme:
Practical: 4 Hrs./ Week

Examination Scheme:
Oral : 50 Marks
Term Work: 100 Marks

The students are required to carry out one of the following projects.
1. Process based Project: Manufacture of product.
2. Equipment based Project: Detailed design and fabrication of the equipment for a given capacity.
3. Experimental based Project: Experimental investigation of basic or applied research problem.
4. Industrial Problems: Any problem or project directly related to existing plants for modification of process or equipment or regarding pollution control and energy conservation under the guidance of a staff member and /or staff members and submit a typed report in duplicate.

The Project Work consists of collection of literature, study of the various processes selection of the process, computation of material and energy balances, process design of important equipments, detailed design of one of the main equipment, plant location and layout, cost Estimation,
economic analysis, details of experimental set up, analysis of data, pollution control, safety, marketing, conclusions and recommendations, bibliography, etc., as applicable to the individual problem.

The object of the project is to make use of the knowledge gained by the student at various stages of the degree course. This helps to judge the level of proficiency, originality and capacity for application of the knowledge attained by the student at the end of the course.

Each group should consist of maximum 5 students. For term-work (Internal) of 100 marks, the assessment should be by conducting frequent written tests, seminars during the year and an oral examination at the end of the year conducted by all the staff members of the department. The Head of the Department should see that the assessment procedure should be the same for all the students of the class. For external 50 marks, the project work shall be assessed by an oral examination by at least two examiners, one internal and one must by external at the end of the year.

The object of the VIVA VOCE examination (Internal and External Orals) is to determine whether the objectives of the project work have been met by the student as well as to assess the originality and initiative of the student as demonstrated in the project work.

7. INDUSTRIAL VISIT / CASE STUDY

Examination Scheme:
Term Work: 25 Marks

During seventh term, every student shall visit minimum three industries or organization pertaining to the Chemical Engineering arranged by College and accompanied by departmental teachers as per AICTE and University norms. The report of technical visit shall be submitted by every student at the end of eight term which shall be evaluated by the concerned teachers through internal Viva Voce.

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TERM – I

ANALOG ELECTRONICS

Teaching Scheme:
Lecturers: 4 Hrs / Week
Practical: 2 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term work: 25 Marks
Practical: 25 Marks

Unit – I

Basic Definition, ideal and practical voltage and current sources, dependent and independent voltage and current sources, network theorems (AC and DC), with numerical.
Loop Analysis, node analysis super position, Thevenin and Norton equivalent circuits, maximum power transfer theorem, principle of duality, RC, RL, RCL, driven and un-driven with initial conditions. (10 Hrs, 20 Marks)

Unit – II

Transistor at low frequencies: Analysis of single stage Transistor amplifier using hybrid- model (h-model), calculating A_{VS}, A_{IS}, R_{IN}, R_{OUT}, calculation of lower cut-off frequency of. Miller's theorem.
Transistor at high frequencies: Equivalent Π-model of transistor, analysis of transistor at high frequency using Π-model and calculating higher cut-of frequency. (10 Hrs, 20 Marks)

Unit – III

Multistage amplifier: Analysis of cascade amplifier CE-CE, CE-CB, CE-CC using h-model, Darlington amplifier, Bootstrapping circuit, Emitter coupled differential amplifier(calculating A_V and CMRR)
Large signal amplifier: Classification of amplifier, Distortion in amplifier, Step and Square wave response, Class-A, Transformer coupled amplifier, Push-Pull amplifier. (10 Hrs, 20 Marks)

Unit – IV

Field Effect Transistor: Biasing of JFET and MOSFET, low frequency analysis of JFET and MOSFET
Feedback amplifier: Concept of negative and positive feedback, Negative feedback topology, analysis of feedback amplifier (all topology)
Oscillator: Barkhausain criteria, Phase shift oscillator, Wein bridge oscillator, Collpits oscillator, Hartley oscillator, Clap and Crystal oscillator. (10 Hrs, 20 Marks)

Unit – V

Operation amplifier application: Comparator, Instrumentation amplifier, Zero crossing detector, Schmitt trigger, wave form generator, Multivibrator
Power supply:
Unregulated power supply: Half wave and full wave rectifier using diode (load and line regulation calculation)

Regulated power supply: Zener, series regulator, protection circuit (load and line regulation calculation), Block diagram and working of Switch Mode Power Supply, Uninterrupted power supply. (10 Hrs, 20 Marks)

Reference Books -

- R S Shedha " Electronic Devices and circuits ", S Chand Publications
- Salivahanan " Electronic Devices and circuits ", TMH
- Ramakant A. Gaikwad "Op-Amp and Linear Integrated circuits". 3rd" Edition PHI
- M.E.Van Valkenberg, "Network Analysis", PHI

List of experiments -

- Study of Maximum Power transfer theorem
- Square wave testing of an amplifier.
- To plot the frequency response of single stage CE amplifier.
- To measure mid-band voltage gain of CE from transistor stage followed by CC stage.
- Find CMRR of Emitter coupled differential amplifier.
- Push Pull class B power amplifier calculation of efficiency.
- To calculate the mid-band voltage gain of single stage FET amplifier.
- Study of phase shift RC Oscillator using transistor verification of theoretical and practical frequency.
- Study of zero crossing detectors using op-amp.
- Study of square / triangle wave generation using op-amp verification of theoretical and practical value of frequency and duty cycle.
- To find line regulation load regulation for full wave bridge rectifier
- Study of SMPS

Term work should be include minimum of 8 (eight) experiments

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TERM – I

DISCRETE STRUCTURE AND GRAPH THEORY

Teaching Scheme:
Lecturers: 4 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)

Unit - I

Sets, Logic and Proofs
Propositions, proposition and logical operations, Conditional Statements, Propositional Calculus, Quantifiers: universal and existential quantifiers, methods of proofs, Set Theory: Set, Combinations of Sets, Finite and Infinite sets, uncountably infinite sets, Mathematical Induction, Principle of inclusion and Exclusion.
Discrete Probability, Information and Mutual information (10 Hrs, 20 Marks)

Unit - II

Relations, functions, Recurrence Relations
Definitions, properties of Binary relations, Equivalence Relations and partitions, Partial ordering relations and lattice, chains and antichains, Transitive Closure and Warshall's Algorithm.
Functions Definitions, Pigeonhole principle.
Recurrence Relation, Linear Recurrence Relations with constant Coefficients, Homogeneous Solutions, Particular Solutions, total solutions, Solution by the method of generating functions.
(10 Hrs, 20 Marks)

Unit - III

Graphs
Basic terminology, multigraphs and weighted graph , paths and circuits , shortest path algorithms, Euler and Hamiltonian Paths and circuits , factors of a graph, Planer graph and Kuratowski theorem, graph coloring.
Trees
Trees, rooted trees, path length in rooted trees, prefix code, binary search trees, spanning trees and cut set, minimum spanning trees, kruskal's and prim's algorithms for minimum spanning tree.
(10 Hrs, 20 Marks)

Unit - IV

Analysis of Algorithm and Algebraic systems - Time Complexity of algorithms, shortest path algorithms, complexity of problems, tractable and intractable problem.
Algebraic system - Groups, subgroups, Isomorphisms and Automorphisms, Homomorphisms and Normal subgroup, Rings, Integral domains and fields. (10 Hrs, 20 Marks)

Unit - V

Boolean algebra - Lattice and Algebraic systems, Principle of duality, basic properties of lattice defined by lattices, distributive and complemented lattices, Boolean lattices and Boolean algebras, Boolean functions and Boolean Expressions.
Binary Number systems- binary, octal, hex conversion. Application of Boolean algebra.
(10 Hrs, 20 Marks)

Text and Reference Books

- C.L. Liu , " Elements of Discrete Mathematics", 2nd edition, Tata McGraw-Hill, 2002
- Kenneth H. Rosen, Discrete Mathematices and its Application, 5th edition, TMH
- Lipschutz, lipson, " Discrete Mathematics", 2nd edition, Tata McGraw- Hill, 1999.
- V. K. Balakrishnan, " Graph Theory", Tata McGraw- Hill
- B. Kolman , R. Busby and S. Ross, "Discrete Mathematical Structures" 4th edition, Pearson education,2002
- J. Treamblay , R. Manohar ," Discrete Mathematical structures with application to computer science" , Tata McGraw-Hill, 2002

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TERM – I

DIGITAL SYSTEMS AND MICROPROCESSOR

Teaching Scheme:
Lecturers: 4 Hrs / Week
Practical: 2 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term work: 50 Marks
Practical: 25 Marks

Unit – I

Review of fundamental concepts: Basic gates, universal gates & Exclusive gates. Digital Signal, Positive & Negative logic,
Boolean Algebra: Boolean postulate and Theorems, Examples of realization of Boolean functions using Boolean algebra.
Introduction to digital logic families: DTL, TTL & CMOS (10 Hrs, 20 Marks)

Unit – II

Combination logic design: Standard representation of logical function, K map representation of logical function, simplification of logical function using K map, for 2, 3 & 4 variables. K map with Don't care condition. Introduction to five and six variable K map with don't care condition. Design of half adder, full adder, half sub tractor, full sub tractor (10 Hrs, 20 Marks)

Unit – III

Combination logic design examples: Various Example of combinations logic circuit (truth table – K map – circuit diagram) with the help of K map and their implementation with the help of Basic/Universal gates.
Design of multiplexer & Demultiplexer: Design of comparator circuits using logic gates. Design of parity generator & checker circuit using logic gates
Introduction to sequential logic circuit: function of one bit memory cell, Truth table and excitation tables of S – R, JK, D & T Flip – Flop. (10 Hrs, 20 Marks)

Unit – IV

8085 Microprocessor
Introduction to 8085 Microprocessor - Architecture, functional pin diagram, register model , programming model , Bus architecture
Instruction Set of 8085 - Instruction cycle, fetch operation, execute operation machine timing diagram for op code fetch cycle, memory read, I/O read, memory write, I/O write, various addressing modes, various instruction set such as data transfer group, arithmetic group, logical group, branch group, stack, input, output and machine control group, instruction format, various addressing modes (10 Hrs, 20 Marks)

Unit – V

8085 assembly programming - Assembly Language, comparison of high level language and assembly language , role of assembler, Assembly language programming of 8085: addition and subtraction of 8 and 16 bit numbers, one's and two's complements of 8 and 16 bit numbers, multiplication and division of 8 and 16 bit numbers, largest and smallest number using array, sorting of numbers using array, finding square from look up table, square root of number, program related to shift and masking operation of 8 and 16 bit numbers.

(10 Hrs, 20 Marks)

Reference Books

- Modern Digital Electronics by R.P. Jain, 3rd Edition, TMH.
- Digital Logic and Computer Design by M. Morris Mano, PHI.
- Fundamentals of Digital Circuits by A Anandkumar, PHI.
- Microprocessor and Interfacing , 2nd edition ,Douglas V Hall
- Advanced Microprocessors and Interfacing , B Ram, TMH
- Microprocessor architecture,programming and applications , 2nd ed , Ramesh Gaonkar
- Introduction to Switching Theory and Logic Design, Hill and Peterson , John Wiley and Sons.
- Digital system, James E Palmer, David E Parlman, McGraw Hill.

Laboratory Assignment

Group A

- Verity the truth table of logic gates and verification of DeMorgance theorem.
- Construction on of basic gates using universal gate (NAND / NOR)
- Construction of half adder & full adder circuit. Also implement full adder with the help of two half adder circuit & one OR gate.
- Construction of Half subtractor & full subtractor Circuit.
- Gray to Binary and Binary to gray code converter.
- Verification of truth table of multiplexes & flip flops.

Group B

- Addition and subtraction of 8 and 16 bit numbers
- Determining maximum and minimum elements in array
- Look up table for BCD to 7 Segment conversions
- HEX To BCD and BCD to HEX conversion
- Arranging the numbers in ascending and descending order
- Shift and mask off operation of 8 bit number

The term work should include minimum of four experiments from Group A and minimum of four experiments from Group B.

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TERM – I

INDUSTRIAL MANAGEMENT AND ECONOMICS

Teaching Scheme:
Lecturers: 4 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)

Unit - I

History of Management, Scientific Management, & its Principles, Administration Management, Neo – Classical Theory, Gilberth's contribution, Modern management Theories, Relation between Administration and organization, Levels of managements, Function of Management.

(10 Hrs, 20 Marks)

Unit – II

Organizational structures: Line, functional, Line staff forms of Business ownerships: Proprietorship, partnership Joint stock Co - Pvt. Ltd. Co., public Ltd Co., Co-operative organizations, public sector, joint ventures, Their meanings, formation, Advantage, Limitations & Applications.

(10 Hrs, 20 Marks)

Unit – III

Engineering Economics. Wants, Utility, Demand, Supply, Elasticity of demand & supply. Capital: Fixed, Working capital, sources of finance Credit, shares, Debentures, ploughing Back, Loans from banks, Trade Public Deposits, financial Institution, foreign capital. Cost Estimating, Cost Accounting, Fixed costs, veriable costs selling price. (No Numericals)

(10 Hrs, 20 Marks)

Unit – IV

Manpower planning, factors affecting manpower planning sources of Recruitment, Need, objectives & benefits of Training, Method of Training workers, supervisors and Executives. Job Evaluation & Merit rating (Concept Only) Selling & Marketing Concept, Sales promotion, Advertising.

(10 Hrs, 20 Marks)

Unit – V

Quality (International Standard Organization of standards) ISO certificate Intellectual property rights (IPR), patents, Trademarks, copyrights, Management information system (MIS), Definition, Need & objectives of MIS, MIS & Computer, Designing of MIS, Application of MIS.

(10 Hrs, 20 Marks)

Reference Books –

- Industrial Engineering & Production Management by M. Mahajan.
- Industrial Organization and Management by O.P. Khanna, TMH
- Management Information system by Jawdekar, THM

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TERM – I

ENGINEERING MATHEMATICS - III

Teaching Scheme:	**Examination Scheme:**
Lecturers: 4 Hrs / Week	Theory Paper: 100 Marks (3 Hrs)
Tutorial: 1 Hr / Week	Term work: 25 Marks

Unit – I

Linear Differential Equation – Linear differential equation of order n, solution of LDE with constant coefficient, method of variation of parameters, equation reducible to linear form with constant coefficients, Cauchy's linear equation, Legendre's linear equation, Solution of simultaneous and symmetric simultaneous differential equation, applications to electric circuits.

(10 Hrs, 20 Marks)

Unit – II

Fourier and Z-transforms –
Fourier Transform (FT) – Fourier integral theorem, sine and cosine integrals, Fourier transform, Fourier cosine transform, Fourier sine transform and their inverses, Problems on wave equation.
Z-Transform – definitions, standard properties (without proofs), ZT of standard sequences and inverse, Solution of simple differential equations, Applications of Z-transform to discrete system analysis.

(10 Hrs, 20 Marks)

Unit – III

Laplace Transform (LT) – definition of LT, inverse LT, properties and theorems, LT of standard functions, LT of some special functions, (1^{st} order Bessel's periodic, unit step, unit impulses and ramp), Problems on finding LT and inverse LT, initial and final value theorems, applications of LT for network analysis.

(10 Hrs, 20 Marks)

Unit – IV

Vector integration – Line integral, surface and volume integrals, Guass's Stocke's and Green's theorem (without proofs), applications to problems in electromagnetic fields.

(10 Hrs, 20 Marks)

Unit – V

Number theory – Congruence's and Residue classes, Euler's Phi function, Theorems on Fermat, Euler and Lagrange, Quadratic residues – Quadratic residuosity, Legendre-Jacobi symbols.
Square root modulo Integer – Computing square root modula prime, computing square root modula composite.
Blum Integers.

(10 Hrs, 20 Marks)

Text Books –

- Advanced Engineering Mathematics – Erwin Kreyszig (Wiley Eastern Ltd)
- Advanced Engineering Mathematics – H K Dass (S Chand)
- Modern Cryptography – Theorems and Practice – Wenbo Mao – Pearson Education (low price edition)

Reference Books –

- Advanced Engineering Mathematics – Wylie C R and Barrett, McGraw Hill
- Higher Engineering Mathematics – B S Grewal, Kanna Publication
- Engineering Mathematics – B V Raman, Tata McGraw Hill
- Applied Mathematics Vol 1 and 2 – P N Wartikar and J N Wartikar (Pune Vidharthi Griha Prakashan Pune)
- Advanced Engineering Mathematics with MatLab, 2^{nd} Edition – Thomas L Harman, James Dabney and Norman Richert , Thomson Learning
- Engineering Mathematics – III – Dr. Gokhale, Dr. Chaudhary and Dr. Singh

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TERM – I

PROGRAMMING LABORATORY - I

Teaching Scheme:
Lecturers: 3 Hrs / Week
Practical: 4 Hrs / Week

Examination Scheme:
Term work: 50 Marks
Practical: 50 Marks

Unit –I

Introduction to C - C Fundamentals, data types , constants , variables, Statements, operators, expressional, control statements.
Arrays - Representation and declaration of array one dimensional array, two dimensional array, multidimensional array.
Strings - Representation, array of string, operation on sitting.
Pointers - Fundaments, declaration, advantage, pointers to different data types , array and pointers, array to pointers, operations on pointers
Functions - Need function definition, prototype, function, parameter, recursion, scope of Variables in the function, library functions, passing array to function, pointer to function

Unit – II

Structure - Definition, declaration, array to structures, structures within structures, structures, and function, structures and pointers, self referential structures user defined data types – typedef .
Union - Need definition, operation, bit fields, difference between structure and union.
File Handling - Structure of file, file types, file operations
Macros - Substitution, File inclusion, complier, controlled directives.

Unit – III

Inter-conversion – Inter-conversion of Number system: decimal, binary, octal, hexadecimal.
System of liner equation - Gauss Elimination, Gauss Jordan, Jacobi or Gauss Siedel.
System of differential Equation - Taylor, Heun’s method, Euler’s modified method.

Unit – IV

Root of equations, Methods - Newton-Raphson, Raquel, faisi, Bolzano.
Interpolation - Newton backward, forward difference, table, divided difference.
Integration - Trapezoidal, Simpson’s 1/3, 3/8 rule.

Unit – V

Permutation, Combination, powerset, Sorting - Insertion, Quick, Merge, Bubble, study of algorithms and implementation, analysis of sorting methods.
Searching - Linear search, binary search.

Reference Books -

- M.K.Jain lyanger “Numerical Method of Scientific and Engineering Computer” 3rd edition, New age publications.
- E. Balaguruswami “ programming in ANSI C” Tata McGraw Hill.
- H. Schildt, “ C The complete Reference” Tata McGraw Hill
- Venugopal, K.R. and Prasad Sudeep R, “Programming With C” Tata McGraw Hill.
- V. Rajaraman “ Computer Oriented Numerical Methods” 3rd Edition Prentice Hall of India, Eastern Economy Edition.
- E. Balaguruswami, “Object Oriented Programming with C++” Tata McGraw Hill.
- Shah Y.L. & M.H.Thaker , “Programming in C++ ISTE Learning Material Center.
- Venugopal K.R. Ravishankar T.& Raj Kumar “Mastering C++, Tata McGraw Hill.
- Steven Chapra “Numerical Methods for Engineers” Tata McGraw Hill.
- Ellis Horowitz and Sahani “ Fundamentals of Data Structure” Tata McGraw Hill.
- Kanetkar Y, “Let us C” BPB Publications.

List of Laboratory Assignments -

- Matrix Operation (Addition, Multiplication, Inverse)
- Swapping of numbers using single pointer.
- Processing student records using structure.
- File manipulation opening closing, input and output operation files.
- Program for macros.
- Nesting of macro.
- Macro with arguments
- Inter conversion of number system.
- To find value of unknown using Guass Elimination.
- To find value of unknown using Guass Siedal.
- To find root of equation using Newton Raphson.
- To find root of equation using Regula-Falsi.
- Find interpolating values using interpolation methods.
- Find integral values using Simpson’s 1/3, 3/8 rules.
- Generation of Permutation for given list.
- Generation of Combination for given list.
- Generation of Power set.
- String Operations.
- Sorting using Bubble Sort.
- Sorting using Quick Sort
- Searching of given element using Linear search.
- Searching of given element using Binary search.

The term work should include minimum of 15 experiments from the above list.

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TERM – II

MICROPROCESSOR - I

Teaching Scheme:	**Examination Scheme:**
Lecturers: 4 Hrs / Week	Theory Paper: 100 Marks (3 Hrs)
Practical: 2 Hrs / Week	Term work: 25 Marks

Practical: 25 Marks

Unit – I

8086/ 8088 CPU architecture programming model Segmentation, Addressing modes, Instruction sets, Assembly language programming BIOS and DOS interrupts. (10 Hrs, 20 Marks)

Unit - II

BIOS AND DOS Interrupts:, Introduction to DOS, Assembly language Programming in MSDOS using BIOS and DOS Interrupts, programming Technique, Time delay loop, produce and macros.
(10 Hrs, 20 Marks)

Unit – III

8086 Configuration:, Basic 8086 configuration, maximum and minimum modes, System bus timing, Interrupt priority management, programmable interrupt controller (PIC) 8259A 8089 (IOP)
(10 Hrs, 20 Marks)

Unit – IV

Main memory design: 8086 CPU Read/ Write timing SRAM and ROM interfacing requirement, address decoding technique full partial block PROM, Troubleshooting the memory module. DMA: Basic DMA operation, 8237 DMA Controller
(10 Hrs, 20 Marks)

Unit – V

Multiprocessor Configuration: Queue status and block facility 8086 based multiprocessor system, co-processor configuration, closely coupled configuration Overview of loosely coupled configuration, 8087 NDP, 8087 Data types and processor architecture, 8087 programming.
(10 Hrs, 20 Marks)

Reference Book:

- John E. Uffenteck , “The 8086/ 8088 Family: Design, Programming and Interfacing, “ Prentice- Hall of India.
- S.P. Dandomudi,“ Introduction to Assembly Language Programming – From 8086 to Pentium Processor” Springer.
- Yu – Cheng Liu and Gleen A Gibson, “Microcomputer systems; The 8086 / 8088 Family Architecture, Programming and Design” 2nd Edition, Practice Hall of India.
- Allen Wyatt, “Assembly Language Programming” QUE.
- Peter Abel, “IBM PC Assembly Language and Programming” Practice – Hall Of India.
- Douglas V. Hall “Microprocessor and Interfacing” Programming and Hardware” Prentice Hall of India.
- Barre B Brey “The Intel Microprocessor: 8085/ 8088, 80186/ 80286, 80386, 80186, Pentium, and Pentium Pro Processor- Architecture Programming and Interfacing” 4th Edition, Prentice Hall of India.
- A.K.Rai and K.M.Bhurchandi, “Advance Microprocessors and Principles- Architecture Programming and Interfacing” Tata McGraw Hill.
- B.Ram “Advanced Microprocessors and Interfacing”, Tata McGraw Hill.

Laboratory Assignments -

Assembly language programming of 8086:

- Study of BIOS and DOS interrupts
- Study of MASM directives
- Program for string manipulation
- Program for password
- HEX- BCD conversion
- BCD- HEX conversion
- BCD Addition
- Program using MACRO
- Program using NEAR procedure
- Program using FAR procedure
- Program to display Date and Time
- Program using structures
- Program using 8087 instruction set
- Program using 8087 instruction set

The term work should include a minimum of 12 experiments. Program based on 8087 are compulsory.

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TERM – II

DATA STRUCTURES AND FILES

Teaching Scheme:
Lecturers: 4 Hrs / Week
Practical: 4 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term work: 50 Marks
Practical: 50 Marks

Unit – I

Introduction: Concept of data, data types, data objects, structure, abstract data type, (ADT) and study .Implementation of data structure.
Stack and Queues:- Fundamental of stacks and queues, Data Structure of stack and queues, Basic operations on stacks and queues, Disadvantages and applications of stacks and queues, Concept of circular queues, basic operation on stacks and queues, Multi-stack and queues, priority queues.
Applications of Stacks:- Polish notation (infix, postfix, prefix) Evaluation of prefix and postfix expression , inter conversion of infix, prefix and postfix expression. Use of stack by function call and recursive function call, Multi-stack machines, Parenthesis matching, Towers of Hanoi, Queue application. (10 Hrs, 20 Marks)

Unit – II

Linked list: Concept of Linked list, Basic Operations on a single linked list (Creation, insertion, deletion, traversing, concatenating, inverting and length finding) Linked stack and Queues, circular linked list, advantages of circular linked list, erasing circular linked list, Double linked list with basic operations like copy, storing polynomial using linked list, polynomial addition, and

Generalized list, operations like copy, and equal depth on generalized list, Data representation for strings, pattern matching in string.
Storage Pool :- Initializing Storage Pool, allocating and (GETNODE) and deal locating (RET) a node Dynamic storage Management Procedure for allocation and freeing of blocks, First Fit, Best fit and Worst fit memory allocation Strategies. (10 Hrs, 20 Marks)

Unit – III

Binary Tree: Basic terminology, Data structure and representation of binary tree, Binary tree traversal, and recursive and non recursive procedure for tree traversal, basic operations on binary tree, (Creation, insertion, deletion, printing, copy, equal and depth finding) Threaded binary tree, insertion in order threaded binary tree, In order traversal of in order threaded binary tree, Concept of binary search tree, Static tree labels, Huffman, Algorithms, Constructions, of optimal binary search tree, Dynamic tree tables, Basic Operation on it-insertion, deletion, height balanced binary tree, LL, LR, RL, RR Rotations (10 Hrs, 20 Marks)

Unit – IV

Sorting and Searching - Searching strategies:- liner and binary search algorithm, Algorithm for bubble sort, Insertion sort, Quick sort, selection sort, shell sort, merge sort, Heap sort, Radix sort, Radix exchange sort, Best average and worst case time complexity of each of the sorting and searching Algorithm
Hashing: Hashing function, overflow handling, collision, linear probing deletion, clustering re-hashing bucket and chaining selection of good hash function (10 Hrs, 20 Marks)

Unit – V

File Handing - Sequential and Relative Files: Description and organization, primitive operations on sequential and relative file.
Direct access file - Description and organization, primitive operations on direct access files
Indexed Sequential files and Indexes:-Description and organization, primitive operations on indexed sequential files, Indexed concept, linear indexes, tree indexes, algorithm for B-tree.
Multi Indexed files:- Description and organization of Inverted files, Multi list files, and algorithms for addition and deletion of records from the files. (10 Hrs, 20 Marks)

Reference Books -

- Ellis Horowitz and Sahani, “Fundamentals of data Structure” Galgotra.
- Thomas R. Harborn, “ File system and Algorithms”, Prentice- Hall International
- Seymour Lipschutz, “ Theory and Problems of data Structures” Schum’s Outline Series, McGraw Hill.
- Trembaly and Sorenson “An Introduction to Data structures with Applications” Tata McGraw Hill.
- Tannenbaum, “Data Structure C and C++ Prentice Hall of India.
- Sahani, “Data Structures, Algorithms and Applications in C++ McGraw Hill.

Laboratory Assignments -

List of programming assignments to be developed in C/C++ with emphasis on developing debugging abilities

- Implementation of stack using array or linked list
- Implementation of Queue using array or linked list
- Implementation of circular Queue using array or linked list
- Conversion of Infix expression to postfix expression
- Conversion of postfix expression to infix expression

- Addition of two single variable polynomial using linked list
- Implementation of double linked list and perform insertion, deletion and searching
- Creation of binary tree and perform all non-recursive traversals.
- Creation of binary search tree and perform insertion, deletion printing and in a tree shape.
- Implementation of pattern matching in starting using linked listed.
- Create a hash table and handle the collisions using liner probing with or without replacement.
- Implementation of simple index file.
- Insertion and deletion of a record from a direct access file using changing with and without replacement.
- Insertion and deletion of a record from a sequential file.
- Insertion and deletion of a record from a relative file
- Insertion and deletion of a record from a multi list file

Term work should be minimum of 12 experiments from the above list.

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TERM – II

COMPUTER ORGANIZATION

Teaching Scheme:
Lecturers: 4 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)

Unit – I

Introduction to system concepts: Functional Units, Basic operational concepts, instruction formats for machines, fixed and expanding opcodes, zero, two and three address schemes, concept of stack processor. General Addressing Modes.
Processor Organization: Instruction set design. 68000 architecture – Register structure and addressing modes, normal and exceptional processing. Bus structures. (10 Hrs, 20 Marks)

Unit – II

Information representation, Big-endian and little-endian, data types, fixed and floating point representation, IEEE format for floating point and decimal algorithm, Booths algorithm, bit pairing methods, Restoring and non-restoring division algorithm. Floating point operations, guard bits and rounding (10 Hrs, 20 Marks)

Unit – III

Control unit design, design levels, one / two / three bus CPU, hardwired control design methods and implementations, Microprogrammed control unit concepts and control unit design considerations, Wilkes design, Nano programmed computers, bit-slice architecture, 2900 family CPU designs, emulation. (10 Hrs, 20 Marks)

Unit – IV

Memory Organization: Memory hierarchies, memory interleaving, cache memories organization, virtual memory and organization, performance considerations, content addressable memories, memory management in 68000 family and cache designs, Introduction to SRAM, DRAM, RDRAM, Flash memory. (10 Hrs, 20 Marks)

Unit – V

System Organization: Buses, interconnection system bus, CPU and IO bus-bus operation, UNIBUS, multibus and IEEE 488 I/O addressing, data transfer, synchronization, serial and parallel ports, I/O interfaces, I/O channel, PCI bus, SCSI bus, Universal Serial Bus. RISC architecture, concepts, CISC versus RISC, advantages of RISC (10 Hrs, 20 Marks)

Reference Books –

- Hamacher, Vransic, Zaky, “Computer Organization”, 5th Ed., McGraw Hill international.
- J. P. Hayes, “Computer Architecture and Organization”, 3rd Ed. McGraw Hill international.
- Tanenbaum, “Structured Computer Organization”, PHI.
- William Stallings, “Computer Organization And Architecture”, 6th ed., PHI.

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TERM – II

DIGITAL SYSTSEM DESIGN

Teaching Scheme:
Lecturers: 4 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)

Unit – I

Combinational Logic Design: Using MSI circuits, BCD Adder, BCD subtractor, BCD to 7 segment decoder . Adder / Subtractor using IC 7483.
Design of code Converter circuits: BCD to Binary, Binary to BCD, BCD to Gray, Gray to BCD, BCD to Ex-3, Etc.
Design of counter and shift register using IC 7493 & IC 7495. (10 Hrs, 20 Marks)

Unit – II

Design of ROM, PLA, PAL: Basic structure of ROM, size of Rom, Design of ROM, Structure of PLA, PAL, and their designs. Introductions to complex programmable Logic devices (CPLDs) & Field – Programmable Gate Array, (FPGA) (10 Hrs, 20 Marks)

Unit – III

Sequential Logic Design:- Review of excitation table of S-R, J-K, D & T flip flops. Analysis of clocked sequential circuit state table, state diagram, next stat equations, state reduction, state assignment. Design of register, shift resistor ripple counter, synchronous counters, sequence generator & detector. (10 Hrs, 20 Marks)

Unit – IV

Asynchronous sequential circuit : Asynchronous verses Synchronous sequential circuit, Application of Asynchronous sequential circuit.
Asynchronous sequential Machine modes, Analysis of Asynchronous sequential Machine, Design of Asynchronous Sequential circuit (10 Hrs, 20 Marks)

Unit – V

Algorithmic state Machines.
ASM chart, definition, standard symbols for ASM chart Method of implementation ASM chart by 'D' Flip Flop, Mux – Controller, Rom Controller, One hot controller.
Generation of ASM chart for different waveforms, Miscellaneous problem of ASM chart, e.g. Traffic light, Washing machine, Wending machine etc.
Introduction to VHDL : Entity, Architecture, configuration Declaration Generic, Data objects example of VHDL codes. (10 Hrs, 20 Marks)

Reference Books –

- "Modern Digital Electronics" by R.P. Jain, 3rd Edition, TMH.
- "Digital Logic and Microprocessor" by F.J. Hill, John Willy & sons.
- "Digital Electronic circuit and system" by V.K.Puri, TMH.
- "Digital Design" by M. Morris Mano, PHI.

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TERM – II

DATA COMMUNICATION

Teaching Scheme:
Lecturers: 4 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)

Unit – I

Introduction to data communication and networks –
Data communication – Components, data representation, direction of flow
Networks – network criteria, network hardware, network software, protocol hierarchy, design issues for the layer, ISO OSI reference model
Signals – Analog signals, digital signal, analog verses digital signal, data rate limits, transmission impairment, throughput, propagation speed, propagation time, wavelength etc.
(10 Hrs, 20 Marks)

Unit – II

Digital transmission and analog transmission –
Digital transmission – line coding, characteristics, schemes. Block coding, transformation and common block codes. Sampling – PAM, PCM, Nyquist's theorem, bit rate, transmission modes.

Analog transmission – Analog modulation, AM, FM, PM. Digital modulation, ASK, FSK, PSK, QAM. Bit/baud comparison.
Telephone modems – Modem standards, traditional modems, 56K modems etc.
(10 Hrs, 20 Marks)

Unit – III

Multiplexing – FDM – Multiplexing process, de-multiplexing process, applications of FDM, WDM, TDM – Time slots, frames, interleaving, synchronization, bit padding, DSS, T-Lines, inverse TDM, Applications of TDM.
Transmission media – Guided media, twisted pair, coaxial cable, fiber optics, unguided media, radio waves, microwaves, infrared.
Switching – Circuit switching, packet switching and message switching. Telephone networks – components, LATAs, making conections, analog services and digital services.
(10 Hrs, 20 Marks)

Unit – IV

Error detection and correction –
Types of errors, single bit burst errors. Detections – redundancy, parity, CRC, checksum. Error correction – Correction by retransmission, FEC, Burst error correction.
Flow control and error control – stop and wait ARQ, Go-back-N ARQ, selective repeat ARQ.
(10 Hrs, 20 Marks)

Unit – V

Ethernet – Traditional Ethernet, fast Ethernet, gigabit Ethernet.
Multiple access – random access, MA, CSMA, CSMA/CD, CSMA/CA, control access, FDMA, TDMA, and CDMA.
IEEE 802.3, 802.4, 802.5, X.21, X.25, SDLC/HDLC protocol standards.
Introduction to network connecting devices – repeater, bridge, router, gateway, hub etc.
(10 Hrs, 20 Marks)

Reference Books –

- “Computer Networks” A S Tanenbaum 4th edition PHI
- “Data Communication and Networking” B Forouzan, 3rd edition, TMH
- “Data Communication and Networking” Achyut Godbole, TMH

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TERM – II

PROGRAMMING LABORATORY - II

Teaching Scheme:	**Examination Scheme:**
Lecturers: 2 Hrs / Week	Term work: 50 Marks
Practical: 4 Hrs / Week	Practical: 50 Marks

Unit – I

Introduction to Object Oriented Programming - Need of Object Oriented Programming: A look at Procedure Oriented Programming, Object Oriented Programming Paradigm Basic Concept of OOP - Objects, classes, Data Abstraction, Encapsulation, Inheritance, Polymorphism, Data hiding ,Message Passing. Benefits of OOP, Application of OOP

Beginning with C++ : What is C++, Structure of C++ Program, A simple C++ program, comments, output using Cout, input using Cin, declaration of variables, Reference variables, Token, Keywords, Identifier, Constant, Basic data types, Derived data types.

Unit – II

Control structures , Classes and Objects - Control Structures: If statement, switch statement, Do while statement, while statement and For statement.
Classes and objects: Specifying a Class, Defining Member function, A C++ program with class, Nesting of member function, Private member function, Array within a class, memory allocation for objects, Static Data member, Static member function, Array of Objects, Objects as function argument, Friendly function, Returning objects.
Constructor and destructor - Constructor Parameterized Constructor ,Multiple Constructor in a class, Constructor with default argument, Dynamic Initialization of Objects,
Copy Constructor, Destructor

Unit – III

Functions and Operator overloading - Function in C++: The main function, Function prototype, Call by value, Call by reference, Return by reference, Inline Function, Default Argument, Function Overloading,
Operator - Operator in C++, Scope Resolution Operator, Operator Precedence
Operator Overloading - Defining Operator overloading, Overloading Unary Operator, Overloading Binary operator, Overloading binary operator using friend, Rules for operator overloading
Type conversion

Unit – IV

Inheritance and Pointer, Virtual function and Polymorphism, Inheritance: Introduction, Defining Derived classes, Single inheritance, Making a Private member inheritable, Multilevel Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid inheritance, Virtual base classes, Abstract classes, Constructor in derived class.
Pointer, Virtual Function and Polymorphism: Introduction, Pointer to Object, this pointer, Pointer to Derived classes, Virtual function.

Unit – V

Managing Console I/O operation and File Operation - Managing Console I/O operation: C++ Stream, C++ Stream Classes, Unformatted I/O Operation, Formatted Console I/O operation, Managing Output with manipulators
Working with files: Classes for File Stream Operations, Opening and Closing a File, Detecting End Of File ,More about Open() : File Modes, File Pointer and their manipulator, Sequential Input and Output Operations, Updating a File: Random Access. Error handling during file operation,
Template: Function template, Class Template

Reference Books –

- E. Balgurusamy ," Object Oriented Programming with C++ ", III Edition TATA McGraw – Hill Publication

- Kanetkar Y. , “ Let Us C++” , BPB Publication
- Schildt , “ C++ The Complete Reference “ ,Tata McGraw Hill Publication.

Laboratory Assignment: -

- One Simple C++ Program
- C++ Simple Program using Control Structure.
- Program to create array of Object.
- Program that illustrate use of various types of constructor
- Program for String Manipulation
- Program for Unary Operator Overloading.
- Program for Binary Operator Overloading
- Program for Function Overloading
- Program for Multilevel inheritance
- Program for Run time polymorphism using Virtual Function
- Program to format output using manipulator
- Program for File Handling
- Program using Template
- Mini project in C++ (e.g. Banking system, Railway reservation system etc.)
- Program for stack operations using class
- Program for Queue operations using class

Term work should be minimum of 12 experiments from the above list.

North Maharashtra University, Jalgaon
New Syllabus with effect from Year 2006-07
TE Computer Term I

Sr. No	Subject	Teaching Scheme per Week			Examination Scheme				
		L	T	P	Paper Hr.	Paper	TW	PR	OR
1	Microprocessor II	4	-	2	3	100	25	25	-
2	Theory of Computer Science *	4	-	-	3	100	-	-	-
3	Computer Network *	4	-	2	3	100	25	-	25
4	Computer Graphics *	4	-	2	3	100	25	-	-
5	Systems Programming *	4	-	2	3	100	50	-	25
6	Advanced Development Tools Laboratory *	-	-	4	-	-	50	-	-
	Total	20	0	12		500	175	25	50
	Grand Total	**32**			**750**				

TE Computer Term II

Sr. No	Subject	Teaching Scheme per Week			Examination Scheme				
		L	T	P	Paper Hr.	Paper	TW	PR	OR
1	Microprocessor III	4	-	2	3	100	25	-	-
2	Operating Systems *	4	-	2	3	100	25	-	25
3	Software Engineering *	4	-	2	3	100	25	-	50
4	Database Management System *	4	-	2	3	100	25	25	-
5	Analysis and Design of Algorithms	4	-	2	3	100	25	-	-
6	Practical Training/Mini Project/Special Study		-		-	-	25	-	-
	Total	20	0	10		500	150	25	75
	Grand Total	**30**			**750**				

* Common subject with TE IT

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TERM – I

MICROPROCESSOR II

Teaching Scheme:
Lectures: 4 Hrs / Week
Practical: 2 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term work: 25 Marks
Practical: 25 Marks

Unit – I

Dos: File System, boot record, FAT, Device Drivers, Installable device drivers. Structure of device drivers, .com and .exe files.
Basic I/O Interface: Introduction. I/O Port Address decoding, 8255: Programmable Peripheral Interface.8254: Programmable Interval Timer.

(10 Hrs, 20 Marks)

Unit – II

Basic I/O Interface: 8251: Programmable Communication Interface. The Parallel Printer Interface (LPT). Interfacing 7-segment display, Stepper motor interfacing, Interfacing ADC & DAC. Disk Reading Method- FM,MFM. Introduction to CD recording. TSR programs: Concepts and implementation.

(10 Hrs, 20 Marks)

Unit – III

Hardware Organization of PC: Motherboard Component Logic.I/O Channels. Memory Map. Interrupts. DMA Channels. Reset Logic, CPU nucleus logic,DMA logic, NMI logic, RAM,ROM logic. RTC ,PC cards. Keyboard Interface block diagram.
CRT Controller 8275, PC Display Adapters-CGA.EGA.VGA.SVGA. Principles of AGP

(10 Hrs, 20 Marks)

Unit – IV

Bus Interface: The ISA Bus, the Extended ISA(EISA) and VESA Local Buses. The Peripheral Component Interconnect (PCI) bus, the Universal Serial Bus(USB). Floppy Disk Controller 8272,FDC system Interface, Overall operation of Floppy disk Subsystem. Overview of Hard Disk Controller Organization.HDC Commands.

(10 Hrs, 20 Marks)

Unit – V

Microcontrollers: Different Types of microcontrollers. 8051 microcontroller Architecture. 8051 hardware Feature. Input/output pins. Ports and Circuits.External memory. Counters and Timers. Serial dada I/O.Interrupts . 8051 programming.Addressing Modes.

(10 Hrs, 20 Marks)

Reference Books -

1. B.Govindarajalu, "IBM PC and Clones" Tata McGrawHill
2. Mazidi," The 8051 Microcontroller & Embedded Systems , " Pearson LPE
3. Jeff Duntemann,"Assembly Language Progg. For IBM PC Family, 3rd edition,Dreamtech (Wiley India)
4. Antonakos, " An Introduction to the Intel Family of Microprocessors," – Pearson LPE

5. Douglas Hall, "Microprocessor and Interfacing", Tata McGrawHill, revised 2nd Ed.
6. Ray Duncan. "Advanced MS-DOS" BPB.
7. Peter Abel, Niyaz Nizamuddin, "IBM PC Assembly language and Programming", Pearson
8. Ray and Bhurchandi. "Advanced Microprocessors and Peripherals" Tata McGraw Hill, 2nd Ed.
9. Barry B Bray. "The Intel Microprocessors-Architecture.Programming and Interfacing". Pearson LPE/PHI, 7th Ed.
10. Kenneth J.Ayala. "8051 Microcontroller"Penram Internationals", Penram International, 2nd Ed
11. Manoharan, Kannan, "Microcontroller based System Design", Scitech
12. Badri Ram."Advanced Microprocessors and interfacing".Tata McGraw Hill.
13. Myke Predko."Programming and Customizing 8051 Micocontroller" Tata McGraw Hill
14. Korneev n kiselev,"ModernMicroprocessors",3rdedition,Dreamtech Press(WileyIndia)

List of experiments -

Group A:
1. Interfacing ADC with 8086.
2. Interfacing DAC with 8086.
3. Centronics parallel Printer interface.
4. PC to PC Communication using serial port in 8086.
5. Write a Device Driver Program.
6. Interfacing Stepper motor with 8086.
7. Reading partition table from Hard Disk.

Group B:
1. Read/Write/Format sector/Track of floppy.
2. Mouse Interfacing.
3. TSR Routine.
4. Program for Rolling Display using 8051.
5. Design of graphic editor.
6. Waveform generation using 8051.
7. Program for Generating Speaker tones by using PC.

The term work should include minimum of 10 Assignment.(5 from each group).Assignment no.5 from group A is compulsory.

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TERM – I

Theory of Computer Science

Teaching Scheme:
Lectures: 4 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)

Unit – I
Mathematical Preliminaries: Alphabets, Strings, Languages, States, Graphs and trees, Concept of basic machine.
Finite State Machines: State tables, Transition graph, Adjacency matrix, Moore and Mealy FSM's, Deterministic and Non-deterministic FSM's, Equivalence of DFA and NFA, FSM with Epsilon moves, Minimization of FSM

(10 Hrs, 20 Marks)

Unit – II

Regular Expressions: Definition, Building RE, Converting DFA's to RE, Conversion of RE to NFA. Properties of Regular Sets: Pumping lemma for regular sets, Applications of Pumping lemma, Closure properties of Regular sets, and Decision algorithms for regular sets.

(10 Hrs, 20 Marks)

Unit – III

Grammars: Definition, Production rules, Formalization, Derivation trees, Ambiguous grammar, Removal of ambiguity, Reduced form grammar – Removal of unit productions, Epsilon productions, Useless symbols, Chomsky hierarchy.

Context Free Grammars: Definition, Simplification of CFG, Regular Grammar – Definition, Left linear and right linear regular grammar, Inter-conversion between left linear and right linear grammar, Reduced Forms – CNF and GNF, Reduction to CNF and GNF, Construction of regular grammar from DFA, Construction of FA from regular grammar.

Context Free Languages: Definition, Properties, Pumping lemma for CFL's, Decision algorithms for CFL's, CYK algorithm

(10 Hrs, 20 Marks)

Unit – IV

Pushdown Stack Memory Machines: Definition, PDM examples, Power of PDM, Deterministic and Non-deterministic PDM, PDA and CFL, Construction of PDA from CFG, Construction of CFG from PDA.

Production Systems: Definition, Post canonical system, PMT systems, Acceptors and Generators, Markov algorithm

(10 Hrs, 20 Marks)

Unit – V

Turing Machine: Definition, Notations, Transition diagram, Power of TM over FSM, PDM and PM, Design of TM, Universal TM, Church's Turing Hypothesis, Multi-stack TMs, TM limitations, Halting problem, Undecidability, Tractable and intractable problems

(10 Hrs, 20 Marks)

Reference Books -

1. E V Krishnamurthy, 'Theory of Computer Science', EWP.
2. Hopcroft, Ullman, 'Introduction to Automata Theory' Narosa.
3. K.L.P.Mishra, 'Theory of Computer Science', PHI.
4. Daniel Cohen, 'Introduction to computer Theory', Wiley India
5. John Martin, 'Introduction to Language and Theory of Computations', TMH.

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TERM – I

Computer Network

Teaching Scheme:
Lectures: 4 Hrs / Week
Practical: 2 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term Work: 25

Oral: 25

Unit – I
Review of Data Communication and Introduction to computer networks.
Data Link layer: Data Link layer design issues, Elementary data link layer protocols, Sliding window protocols, Data Link Layer switching, Bridges 802.x to 802.y, Local inter-networking, Spanning tree and remote bridges.
Review of network connecting devices and multiple access protocols.

(10 Hrs, 20 Marks)

Unit – II
Network Layer: Logical Addressing - IPv4 addresses- Address space, notations, Classful addressing, Classless Addressing, Network Address Translation.IPv6 addresses- Structure and address space
Internet Protocols: Internetworking- Need of network layer, datagram network, connectionless network
IPv4- Datagram, Fragmentation, Checksum, Options
IPv6- Advantages, packet formats, extension headers
Transition from IPv4 to IPv6: Dual stack, Tunneling, Header Translation

(10 Hrs, 20 Marks)

Unit – III
Network Layer: Address Mapping - ARP, RARP, BOOTP and DHCP
ICMP: Types of messages, message formats, error reporting, query, debugging tools
IGMP: Group Management, messages, message format, IGMP operations, Encapsulation, Netstart utility.
ICMPv6: Error reporting and queries
Delivery: Direct versus Indirect delivery
Forwarding: Techniques, process, routing tables

(10 Hrs, 20 Marks)

Unit – IV
Unicast Routing Protocols: Optimization, Intra and Inter domain routing, distance vector routing, link state routing, path vector routing
Multicast Routing Protocols: Unicast, Multicast and Broadcast, applications, routing protocols
Transport Layer: Process to process delivery, UDP

(10 Hrs, 20 Marks)

Unit – V
TCP/IP Protocol Suite: Addressing
TCP: Services, features, segments, connections, flow control, error control, congestion control
Congestion control: Data Traffic, open- loop, closed- loop congestion control, congestion control in TCP and frame relay
Quality of Service: Flow characteristics and classes, techniques to improve QOS such as Scheduling, Traffic shaping, resource reservation, admission control
Integrated Services: Signaling, flow specification, admission, Service Classes, RSVP, problems with Integrated Services

(10 Hrs, 20 Marks)

Reference Books -

1. Andrew S. Tanenbaum, “Computer Networks”, 4th edition, Pearson LPE /PHI.
2. Behrouz Forouzan, “Data Communications and Networking”, TMH, 4th Ed.
3. Irvine,”Data Communication and Networks:An Engg. Approach” Wiley India
4. S. Keshav, “An Engineering Approach to Computer Networking”, Pearson Education, 5th Ed
5. Irvine Olifer,”Computer Networks:Principles,Technologies and Protocols” Wiley India

List of experiments -

1. Study of network resources and various components.
2. TCP/IP Socket Programming.
3. Implementation of Data link layer protocol.
4. Implementation of Network routing algorithm.

5. Implementation of data compression and decompression algorithm (Huffman Algorithm).
6. Implementation of Network security algorithm (Encryption and Decryption Algorithm).
7. Program using FTP to exchange files between computers,
8. Study of proxy server/DNS Server/mail server/NFS server.

1 to 6 assignments are compulsory.

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TERM – I

Computer Graphics

Teaching Scheme:
Lectures: 4 Hrs / Week
Practical: 2 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term Work: 25

Unit – I
Basic Concepts: Introduction to computer graphics, Types of Computer Graphics, Application of Computer Graphics, Graphics Standards, Graphics file formats such as BMP, TIFF, PCX and GIF

Interactive Computer Graphics: Working of Interactive Computer Graphics, Graphics Hardware, CRT, display and controller, Interlaced and non interlaced display, Vector and raster scan display, Random scan display, Frame buffers, Display adapters, VGA, SVGA, Bios video support, Various input devices, Graphics device drivers, Graphics software, Co-ordinates representations, Graphical functions, Plotters, Scanners, Digitizers and Light Pen.

Linear and Circle Generation: Line generation – DDA and Bresenhams /algorithm Thick line generation, Antialiasing, Circle Generation – DDA and Bresenham's Algorithm, Character Generation – Stroke principal, Starburst principle, Bitmap method.

(10 Hrs, 20 Marks)

Unit – II
Polygons: Types, representations, entering polygon, Polygon filling: Fance fill, Edge flag, Seed fill, Edge fill, Scan conversion algorithm. Scan conversion algorithm. Scan conversion: Real time scan conversion, Solid area scan conversion, Run length encoding, Cell encoding.
Segments: Concepts, Segment table, Segment creation, Deletion, Renaming, Image Transformation.

(10 Hrs, 20 Marks)

Unit – III
2D & 3D Geometry: 2D transformation primitives and concepts Translation, Rotation, Rotation about an arbitrary point, Scaling and Shearing, 3 D transformations, Rotation about an arbitrary axis, 3D viewing transformation , Concept of parallel perspective projections, Viewing parameters.
Clipping Fundamentals, Types of clipping.

(10 Hrs, 20 Marks)

Unit – IV
Windowing and Clipping: Viewing transformation, 2 D clipping and 3D clipping, Sutherland Cohen line clipping algorithm, Mid-point subdivision algorithm, Generalized clipping, Cyrus-Beck Algorithm, Interior and Exterior clipping, Polygon Clipping, Sutherland-Hodgman algorithm.
Hidden Surfaces and Lines: Back face removal algorithm, Hidden line methods, Z-buffer, Warnock and Painter algorithm, Floating horizon.

(10 Hrs, 20 Marks)

Unit – V

Light, Color and Shading: Diffused Illumination, Point source illumination, Shading algorithm, Color Models – RGB, HVS, CYM etc Elimination back faces, Transparency, polygons, B-Splines and corner, Bezier Curves, Fractals, Fractal Surfaces and lines

Graphical User Interface: Concepts of X-Windows, Concept of client/server model, Protocols, Message passing (only GUI related) Motif – widget, gadget structure (Only GUI concept) Concept of MS Windows, Open GL, Why 3D? Why Open GL? OpenGL and Animation

Graphics Standard: Introduction to graphics kernel system with basic primitives

Graphics Applications: Scientific and engineering applications, Business applications, Application concept in Animation and concept in Animation and Simulation

(10 Hrs, 20 Marks)

Reference Books -

1. David F. Rogers, "Procedural Elements for Computer Graphics:, Tata McGraw Hill, 2nd Ed
2. Steven Harringtom, "Computer graphics A Programming Approach", MGH
3. Hill, "Computer Graphics using OpenGL", Pearson LPE/PHI, 2nd Ed
4. Foley, Vandam, Feiner, Hughes, "Computer Graphics Pricipals & Practice", Pearson, 2nd Ed
5. Donald Hearn and Pauline Baker," Computer Graphics", Pearson LPE, 2nd Ed
6. Rao and Prasad," Graphics user interface with X windows and MOTIF", New Age
7. ISRD, "Computer Graphics", Tata McGraw Hill
8. Mukherjee, "Fundamentals of Computer Graphics and Multimedia", PHI

List of experiments -

1. Study of various Graphics Commands
2. Line generation using DDA
3. Different Line Style using Bresenhams Algorithm
4. Circle Generation using Bresenhams Algorithm
5. Program for Polygon Filling
6. Program for 2D Transformations (Translation, Rotation and Scaling)
7. Program for Segmentation
8. Program for line clipping
9. Program for Polygon clipping
10. Program for 3D rotation
11. Program for Parallel Projections
12. Program for Perspective Projection
13. Program for Animation
14. Program for Bezier Curve
15. Mini Project: Developing some Graphics application
16. Study assignment on any latest GUI application or mini-project.

The term work should include a minimum of ten assignments.

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TERM – I

Systems Programming

Teaching Scheme:
Lectures: 4 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)

Practical: 2 Hrs / Week | Term Work: 50
Oral: 25

Unit – I
Introduction: Introduction to system programming, Types of s/w and application software, System programming and system programs, Need of system software, Assemblers, Loaders, Compilers, Interpreters, Macros, Operating system and formula system, Translators and its types.

Assemblers: Structure of assembler, Basic function, Machine dependent and machine independent features of assembler, Types of assemblers – single pass, multi-pass, cross assembler, General design procedure of assembler, Design of Pass-I and Pass-II assembler (with reference to 8086 assembler), Single pass assembler for IBM PC, Implementation examples – MASM example.

(10 Hrs, 20 Marks)

Unit – II
Macros and Macro Processors: Definition and function of Macro Processor, Features of macro facility, Macro expansion, Nested macros, Design of macro processor – single pass and two pass macro processor, Detailed design of two pass macro processor.

Loaders and Linkage Editors: Basic loader functions, Relocation and linking concepts, Various loader schemes with their advantages and disadvantages, Other loader schemes – binders, Linking loaders, Overlays, Dynamic binders, Design of direct linking loaders, Specification of problem, Specification of data structures, Format of databases.

(10 Hrs, 20 Marks)

Unit – III
Design of a linker, A linker for MS DOS, Linking for overlays
Grammar and scanner, Overview of compilation process, Programming language grammar, Derivation, Reduction and syntax tree, Ambiguity, Regular grammar and regular expression, Basic functions of complier, Machine dependent and machine independent features of compiler, Types of compilers – single pass, multi-pass, cross compiler and pseudo code compiler, Phases of compiler

(10 Hrs, 20 Marks)

Unit – IV
Design of lexical analyser, Software tools for program development YACC and LEX.

Functions of parser, Parsing techniques, Top-down and Bottom-up parsing, Limitations of top-down parsing, Shift reduce and recursive descent parser, Operator precedence parser, Predictive parser, L-R parser, Syntax directed translation (design of parser not expected)

(10 Hrs, 20 Marks)

Unit – V
Symbol table organization and memory allocation, Elementary symbol table organization, Hash tables, Linked list and tree structure symbol tables, Memory allocation – static and dynamic memory allocation.

Dynamic linking in Windows (only introduction and concepts only) – concept of clipboard, OLE terminology and technology, Dynamic Data Exchange, Dynamic Link Libraries (DLL)

(10 Hrs, 20 Marks)

Reference Books -

1. John J. Donovan “System Programming”, TMH
2. Dhamdhere “System Programming & Operating System”, TMH, 2nd Ed
3. L. Beck “System Software”, Pearson, 3rd Ed
4. Aho, Ulman “Compiler Construction” – Pearson LPE
5. J P Bennett, “Compiling Techniques”, TMH
6. Dick Grune,”Modern Compiler Design” Wiley India.

7. David Galles,”Starting out with Modern Compiler Design” Dreamtech Press(Wiley India)

List of experiments -

1. Develop an application to simulate first pass of 2-pass assembler
2. Develop an application to simulate second pass of 2-pass assembler
3. Design a simple loader
4. Develop an application to create a simple text editor
5. Develop an application for simulating Lexical phase of Compiler
6. Develop an application for simulating Syntax Analysis phase of Compiler

The term work should include a minimum of five assignments.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

TE (COMPUTER ENGINEERING / INFORMATION TECHNOLOGY)
(w.e.f. 2007-08)

TERM – I

Advanced Development Tools Laboratory

Teaching Scheme:
Practical: 4 Hrs / Week

Examination Scheme:
Term Work: 50

Part I: Windows Programming
Basic Windows SDK programming, Programming involving Dialog Boxes, Menus and standard GUI components, Writing of Windows Help file using “HC”, Writing DLLs and VXDs (Win 95/98/2k)

Part II: Front-End Tools
Assignments based on packages like C# / .NET / VC++ / VB / Java. Assignments should cover basic GUI components, Database Access, ActiveX technology, Network applications.

Part III: Internet Programming Tools
HTML programming, Java Scripts or VB Scripts programming, Internet programming using Java / C# / .NET, (Assignments should cover dynamic page creation) database connectivity (e.g. search engine), online communication (e.g. chatting, email-editor)

Reference Books -

1. Charles Petzold “Programming Windows”, Microsoft Press, 5th Ed
2. Andrew Troelson,”C# and .Net Platform, A Press (Wiley India)
3. Herbert Schildt, “Programming Windows 2000 – Ground Up”, Tata McGraw Hill
4. Schurman and Pardi, “Dynamic HTML in Action”, Microsoft Press, 2^{nd} Ed
5. Sells, “Windows Forms Programming in Visual Basic .NET”, Pearson
6. Deitel, “C# How to program”, Pearson LPE
7. Steven Hozner,” Java 2(Jdk 5) Progg. Black Book” Dreamtech Press(Wiley India)
8. Ivor Horton,”Beginning VC++” Wrox Press(Wiley India)
9. Steven Hozner ,” VB.Net Progg. Black Book” Dreamtech Press(Wiley India)
10. Bakharia, “Microsoft C# fast and easy web development”, PHI
11. Steven Hozner ,”HTML Black Book” Dreamtech Press(Wiley India)
12. Eric Brown,”Windows Forms in Action” Manning Press(Wiley India)

Term work -

Term work should include at least four assignments from each part.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

TE (COMPUTER ENGINEERING)
(w.e.f. 2007-08)

TERM – II

Microprocessor III

Teaching Scheme:
Lectures: 4 Hrs / Week
Practical: 2 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term Work: 25

Unit – I
Architecture of the 80386: Functional DIP, Support for pipelining, Dynamic bus sizing, 80386 SX/DX differences, Programming model of 80386, Register model, Data types and addressing modes, New instructions of 80386, Bus cycles with 16 & 32 bit, Data bus with timing state diagram, INTA, HOLD, HALT and reset cycles.

(10 Hrs, 20 Marks)

Unit – II
Operating Modes and Memory Management: Segmentation, Paging, (Real, Protected and VM86 mode), Debugging support.

(10 Hrs, 20 Marks)

Unit – III
Privilege Levels: Privilege level protection (Call gates, Conforming code segments) in protected and VM86 mode.
Multitasking: TSS, Moving between tasks, Task scheduling, Busy bit, NT bit, Back link field, TS bit, Extension to TSS, I/O permission bit map, Changing privilege levels within a task, Changing LDTs.

(10 Hrs, 20 Marks)

Unit – IV
Faults and Interrupts: Exception processing in Real, Protected and VM86 Mode.

80387 NDP: Register set, Number system, Instruction Set, Programming.
Processor to co-processor interface, Difference among 80387, 80287, 8087

(10 Hrs, 20 Marks)

Unit – V
Study of 80386 and 80486 motherboard (block diagram treatment only), Overview of Intel Chipset, Pentium motherboards – PI to PIV (block diagram treatment only)

Pentium Microprocessor: Introduction, Salient features, System architecture, MMX architecture
Introduction to Pentium II, III, IV (block diagram treatment only)

(10 Hrs, 20 Marks)

Reference Books -

1. James Turley "Advanced 80386 Programming techniques", Tata McGraw Hill
2. Triebel, "Advanced 80386", Tata McGraw Hill
3. Uffenbeck, " the 80x86 Family: Design, Prog & Interfacing, 3/e"- Pearson LPE

4. Brey/Sarma, “The Intel Microprocessors-Architecture, Programming and Interfacing”, Pearson LPE
5. Douglas Hall, “Microprocessors and Interfacing”, Tata McGraw Hill
6. Badri Ram, “Advanced Microprocessors and Interfacing”, Tata McGraw Hill
7. Nelson, “The 80386 Book”, Microsoft Press
8. Hans Peter, “The Indispensable Pentium”, Pearson LPE
9. Murray Pappas, “The 80386 Programming Reference Manual”
10. B Govindarajalu, “IBM PC Clones”, Tata McGraw Hill, 2nd Ed.
11. James Antonakos, “The Pentium Microprocessor”, Pearson
12. Korneev n kiselev,”ModernMicroprocessors”,3rd edition,Dreamtech Press(WileyIndia)
13. Jeff Duntemann,”Assembly Language Progg. For IBM PC Family, 3rd edition,Dreamtech (Wiley India)

List of experiments -

Assembly language programming for 80386/80387

1. Generation of sine/cosine wave
2. Switching from real mode to protected mode and back
3. Solving arithmetic expression
4. 64 bit Arithmetic operations
5. Program using NDP

Study of 386, 486, Pentium motherboards

1. Layout of motherboard and minimum peripherals
2. Study of CMOS setup
3. Installation of peripherals
4. PC diagnostics using diagnostic tools
5. Study assignment on any latest GUI application or mini-project.

The term work should include a minimum of Six assignments.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

TE (COMPUTER ENGINEERING / INFORMATION TECHNOLOGY)
(w.e.f. 2007-08)

TERM – II

Operating Systems

Teaching Scheme:
Lectures: 4 Hrs / Week
Practical: 2 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term Work: 25
Oral: 25

Unit – I
Introduction: Need of OS, Evolution of OS, Types of OS like Batch, Timesharing, Multiprogramming, Multitasking, Real-time and Personal OS.
OS Views and Concepts: Shell command language, system calls, user view, OS components, OS structure like monolithic, layered, kernel based, micro-kernel based, virtual machine.
Process and Process management: Process concepts, interleaved CPU and IO operations, CPU burst, Process states, OS services for process management, threading.

(10 Hrs, 20 Marks)

Unit – II
Scheduling: Process scheduling, schedulers – long term, middle term and short term. Scheduling algorithms and performance evaluation.
Inter-process communication and synchronization needs: Mutual exclusion, semaphores, critical regions and monitor. Classical problems in concurrent programming.

(10 Hrs, 20 Marks)

Unit – III
Deadlock: Principles, detection, prevention, avoidance and recovery with Bankers algorithm.
Process management in UNIX: Structure of process, process control, process system calls – fork, join, exec, system boot (No algorithms).
Memory Management: Types, contiguous and non-contiguous, segmentation and paging concepts.

(10 Hrs, 20 Marks)

Unit – IV
Virtual memory management: Concepts, implementation, allocation, fetch and replacement.
Memory management in Unix: Policies, swapping and demand paging
File management: Organization, concepts, files and directories, hierarchical structures, space allocation, free space management
Security and protection: Overview, goals of security and protection, security and attacks, formal and practical aspects of security, authentication and password security.

(10 Hrs, 20 Marks)

Unit – V
File management in Unix: Internal representation of files, inodes
File structure in Unix: Structure of file and directories, super block, inode assignment to a new file.
Allocation of disk blocks, file creation, and pipes. (No algorithms)
Mass storage structures, disk scheduling, disk management and swap space management.
Distributed OS: Concepts, design issues and system models.

(10 Hrs, 20 Marks)

Reference Books -

1. Silberschatz, Galvin, Gagne, “Operating System Concepts”, 7th Ed,Wiley India
2. D.M. Dhamdhere, “Operating Systems”, Tata McGraw Hill, 2nd Ed.
3. Milenkovic, “Operating Systems Concepts and Design”, Tata McGrawHill
4. M.J. Bach, “The design of Unix Operating System”, Pearson LPE
5. Tenenbaum, “Modern Operating Systems”, Pearson, 2nd Ed
6. William Stallings, “Operating systems-Internals and design principles”, Pearson LPE/PHI, 5th Ed.
7. Deitel, “Operating systems”, Pearson, 2nd Ed
8. Paul Love, “ Beginning Unix”, Wrox Press, (Wiley India)

List of experiments -

1. Study of Unix / Linux commands.
2. Implementation of command interpreter using system calls
3. Simulation of windows explorer
4. Implantation of CPU scheduling algorithm
5. Implementation of Memory Management algorithms – best fit, first fit, worst fit
6. Simulation of page replacement algorithm
7. Implementation of Bankers algorithm
8. Implementation of Inter process communication
9. Implementation of threading
10. Installation of Unix/Linux/Windows server installation with configuration of web-mail and proxy server systems

The term work should include a minimum of six assignments.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

TE (COMPUTER ENGINEERING / INFORMATION TECHNOLOGY)
(w.e.f. 2007-08)

TERM – II

Software Engineering

Teaching Scheme:
Lectures: 4 Hrs / Week
Practical: 2 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term Work: 25
Oral: 50

Unit – I
Introduction: What is and why software engineering? Product: Evolving role of software, Software Characteristics, Components, Applications, Software crisis and Myths, Software Engineering Process, Software development phases and Software Process Models, Prototyping and RAD Model, Water fall, Incremental Model, Spiral Model,4 GT Model, CASE tools.

(10 Hrs, 20 Marks)

Unit – II
Planning and Managing Software projects:

People, Problem and Process, Measures, Metrics and Indicators, Metrics for software quality, Scoping, Software Project Estimation, Make by decision, Software Acquisition Software risks - Identification, Projection, Assessment, Monitoring Project Scheduling and tracking tasks/Work break down structures, Time line charts, Project plan, CASE tools.

System Engineering: Computer based system, System engineering hierarchy.

Information engineering: Information strategy, Planning Enterprise modelling, Business area analysis, Information flow modelling, Product engineering, System analysis, Feasibility study, Economic and Technical feasibility analysis, Modelling system architecture diagram, CASE tools.

(10 Hrs, 20 Marks)

Unit – III
Requirement Analysis: Communication Techniques, FAST, Quality deployment, Analysis Principals: Modelling, partitioning, Prototyping, Specification,

SRS and SRS review analysis models: Data modelling, Functional modelling, Information flow, Data flow Diagrams, Extension to real time systems, Behavioural models, Mechanism of structural analysis, E-R diagrams, controlled modelling, Data dictionary, CASE tools.

(10 Hrs, 20 Marks)

Unit – IV
Design Fundamentals: Software Design and software design process, principals and concepts, Abstractions, Refinement and modularity, Software architecture, Control hierarchy, Partitioning, Data structure, Information hiding, Effective modular design,

Cohesion, coupling, Design Model, Design documents, CASE tools

Design Methods: Architectural design and design process, transform and transaction flow, design steps, interface design, procedural design, graphical and tabular design notations.

(10 Hrs, 20 Marks)

Unit – V
Software Testing Techniques and Strategies: Software testing fundamentals, Test case design, White box testing, Black box testing, Control structure testing, Strategic approach to testing, Strategic issues, Unit testing, Integration testing, Validation testing, System testing, CASE Tools

Introduction to OOSE.
Introduction Unified Modeling Language (UML)

(10 Hrs, 20 Marks)

Reference Books -

1. Pfleeger,” Software Engineering : Theory & Practice”,6th Edition-Pearson LPE
2. Pressman, “Software Engineering”, McGraw Hill, 6th Ed
3. Peters,” Software Engineering” Wiley India
4. Ghezzi, Jazayeri, Mandrioli, ”Fundamentals of Software Engineering”, Pearson/PHI, 2nd Ed
5. Sommervile, “Software Engineering”, Pearson, 7th Ed
6. Rajib Mall, “Fundamentals of Software Engineering”, PHI, 2nd Ed
7. Javadekar, “Software Engineering” Tata McGraw Hill
8. Thayer ,”Software Engineering Project Management “2nd edition, Wiley India
9. Tian ,”Software Quality Engineering” 2nd Edition, Wiley India

Term Work-

The term work should include a minimum of four software mini projects covering problem definition, analysis, design and documentation for each.

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TERM – I

Database Management System

Teaching Scheme:
Lectures: 4 Hrs / Week
Practical: 2 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term Work: 25
Practical: 25

Unit – I

Introduction to DBMS: Basic concepts, advantages of a DBMS over file processing system, Data abstraction, Data models and data independence, components of a DBMS and overall structure.
Database terminology
Database administration issues: DBA role, indexes. Data dictionary, security, backups, Replication, SQL support for DBA, commercial RDBMS selection
Data modeling: Basic concepts, types of data models, E-R data model and Object oriented data model, relational, network and hierarchical data models and their comparison, E-R and ERR diagramming.

(10 Hrs, 20 Marks)

Unit – II

Relational Model: Basic concepts, attributes and domains, interaction and extensions of a relation, concept of integrity and referential constraints. Relational query languages (relational algebra, relational calculus), concepts of view and trigger

(10 Hrs, 20 Marks)

Unit – III

SQL: Structure of a SQL query, DDL and DML, SQL queries, set operations. Predicates and join membership, tuple variables, set comparison, ordering of tuples, aggregate functions, nested query. Database modification using SQL, Dynamic and embedded SQL and concepts of stored procedure, Query optimization

(10 Hrs, 20 Marks)

Unit – IV

Relational database design: Need of normalization, Notation of a normalized relation, Normalization using functional dependency, Multi-valued dependencies and join dependency, 1NF, 2NF, 3NF, BCNF, 4NF.
Transaction Management: Basic concepts of transaction, components of transaction management (concurrency control, Recovery system), Different concurrency control protocols such as Time stamps and locking, different crash recovery such as log based recovery and shadow paging, concepts of cascaded abort, Multi-version concurrency control methods.

(10 Hrs, 20 Marks)

Unit – V

Object oriented DBMS: Review of object oriented concepts: Objects, Classes, attributes, Messages, Inheritance, and Polymorphism etc. Object schemas, Class subclass relationships, inter-object relationships, features of object oriented DBMS and ORDBMS, concepts of OID, persistence of objects in OODBMS, Physical organization, object-oriented queries, schemas modifications, Temporal databases, Active databases.

(10 Hrs, 20 Marks)

Reference Books -

1. Singh," Database Systems: Concepts,Design & Apllication"- Pearson LPE
2. Kahate, " Introduction to Database Management Systems"- Pearson LPE
3. Henry F. Korth, Abraham silberschatz, "Database system concepts", 5th Ed.Mc Graw Hill Inc.
4. Date, "Introduction to Database Management Systems", 8/e Pearson LPE.
5. Rajesh Narang, "Database Management System", PHI
6. Elmasri, Navathe, Somayajulu, Gupta, "Fundamantals of Database Systems", Pearson
7. ISRD, "Introduction to Database Management System", Tata McGraw Hill
8. Connolly, " Database Systems" – Pearson LPE.
9. Bipin Desai, "Introduction to database management systems", Galgotia.
10. Renu Vig, "Fundamentals of database management systems", ISTE learning materials centre
11. Phillip Pratt, "Concepts of DBMS", Thomson Learning, 3rd Ed.
12. Phillip Pratt, "A Guide to SQL", Thomson Learning, 5th Ed.
13. V.K.Jain, " Database Management System" Dreamtech Press (Wiley India)
14. Oracle Sql,Pl/Sql for 9i and 10 g, Dreamtech Press(Wiley India)

15. Andy Oppel, “ Rational Databases-Principles and Fundamentals, Dreamtech Press(Wiley India)
16. Paul Wilton,” Beginning SQL” Wrox Press, (Wiley India)

List of experiments -

1. Creating a sample database application using conventional file processing mechanism and “C” language. The program should provide facilities for retrieving, adding, deleting and modifying records
2. Prepare an E-R diagram for the given problem definition. Prepare and verify a relational database design using concepts of normalization techniques in appropriate normal form.
3. Creating a sample database file and indexes (for the design made in experiment No. 2) using any client server RDBMS (oracle/Sybase) package using SQL DDL queries. This will include constraints (key reference etc.) to be used while creating tables.
4. SQL DML queries: Use of SQL DML queries to retrieve, insert, delete and update the database created in experiment No. 3. The queries should involve all SQL features such as aggregate functions, group by, having, order by, sub queries and various SQL operators.
5. PL/SQL: Fundamentals of cursors, stored procedures, stored functions.
6. Screen design and Report generation: Sample forms and reports should be generated using Developer 2000 (in case of Oracle) or through Power builder or Visual basic front end tools or any prototyping software engineering tool.
7. Prototype of OODBMS/ Active database/ Temporal Database in C++

The term work should include a minimum of six assignments.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

TE (COMPUTER ENGINEERING)
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TERM – II

Analysis and Design of Algorithms

Teaching Scheme:
Lectures: 4 Hrs / Week
Practical: 2 Hrs / Week

Examination Scheme:
Theory Paper: 100 Marks (3 Hrs)
Term Work: 25

Unit – I
Introduction: Role of algorithms in computing, algorithm analysis, complexity issues, designing algorithms, algorithm strategies, methods for designing algorithms

(10 Hrs, 20 Marks)

Unit – II
Divide and Conquer method: Binary search, merge sort, quick sort, Starssen’s matrix multiplication.
Probabilistic analysis and randomised algorithms: The hiring problem, indicator random variables, randomised algorithms, probabilistic analysis.

(10 Hrs, 20 Marks)

Unit – III
Back tracking: Eight Queens Problem, graph coloring, Hamilton cycles, Knapsack problem, Maze Problem.
Branch and Bound: Traveling salesman’s problem, lower bound theory-comparison trees for sorting/searching, lower bound on parallel computation.

(10 Hrs, 20 Marks)

Unit – IV
Advanced Design And Analysis Techniques: Dynamic Programming: Elements of dynamic programming, multistage graph, optimal binary search tree(OBST), 0/1 knapsack problem, Traveling salesman problem
Greedy Algorithms: Elements of greedy algorithms, Theoretical foundation of greedy methods, Job sequencing optimal merge patterns

(10 Hrs, 20 Marks)

Unit – V
NP hard and NP complete Problem: Algorithm complexity, Intractability, Non-deterministic Polynomial times(NP),Decision problems, Cook's theorem.
NP-Complete Problems: Satisfiability Problem, vertex cover problem.
NP-Hard problems: code generation Problems, Simplified NP hard problems, approximation algorithm for NP-hard problems.

(10 Hrs, 20 Marks)

Reference Books -

1. Aho , "Design & Analysis of Computer Algorithms"- Pearson LPE
2. Russ Miller ," Algorithms: Sequencial and Parallel" Dreamtech Press(Wiley India)
3. Goodrich ," Algorithm Design: Foundation and Analysis, Wiley India.
4. Grama , "An Intro to Prarallel Computing : Design & Analysis of Algorithms, 2/e, "- Pearson LPE
5. Baase , " Computer Algorithms: Intro to Design & Analysis, 3/e,"- Pearson LPE
6. Thomas H. Cormen and charles E.L. Leiserson, " Introduction to Algorithm", PHI, 2nd Ed
7. Horowitz/Sahani, "Fundamentals of Computer Algorithm", Galgotia, Reprint 1994
8. A.V. Aho and J.D. Ullman, "Design and Analysis of Algorithms", Pearson LPE.
9. Bressard, Bratly, " Fundamentals of Algorithm", Pearson LPE/PHI
10. Simon Harris, " Beginning Algorithms" Wrox Press (Wiley India)

Term Work -

The term work should consist of minimum six lab assignments covering the above syllabus.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

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TERM – I

Practical Training/Mini Project/Special Study

Examination Scheme:
Term Work: 25

Every student needs to complete following requirements for term work of Practical Training / Special Study / Mini Project.

Practical training in any industry for a period of minimum two weeks and submit training report certified by personnel manager or works manager or any other higher authority of that industry.

OR

Special study on a recent topic from reported literature and submit a report on it

OR

One mini Theoretical or development project and submit a report on it.

Notes:

1. Practical training is to be undergone in summer vacation after SE and / or in winter vacation after first term of TE.
2. Report should be typed on A4 size paper and two copies paper bounded are to be prepared, one copy for the candidate, and one for the library.

North Maharashtra University, Jalgaon
New Syllabus with effect from Year 2008-09
BE Computer
Term I

Sr. No	Subject	Teaching Scheme per Week			Examination Scheme				
		L	T	P	Paper Hr.	Paper	TW	PR	OR
1	Elective I	4	-	2	3	100	25	-	25
2	Artificial Intelligence	4	-	-	3	100	25	-	-
3	Advanced Unix Programming *	4	-	2	3	100	25	25	-
4	Object Oriented Modeling and Design *	4	-	2	3	100	25	-	25
5	Advanced Computer Network	4	-	-	3	100	-	-	-
6	Seminar	-	-	2	-	-	25	-	-
7	Project I			2	-	-	25	-	25
	Total	20	0	10		500	150	25	75
	Grand Total	**30**			**750**				

Elective I
Operation Research *
Embedded Systems *
Image Processing *

Term II

Sr. No	Subject	Teaching Scheme per Week			Examination Scheme				
		L	T	P	Paper Hr.	Paper	TW	PR	OR
1	Elective II	4	-	2	3	100	25	-	25
2	Data Warehousing and Mining *	4	-	2	3	100	25	-	25
3	Software Metrics and Quality Assurance *	4	-	2	3	100	25	-	25
4	Advanced Computer Architecture	4	-	2	3	100	25	-	-
5	Industrial Visit / Case Study		-				25	-	-
6	Project II		-	6	-		100	-	50
	Total	16	0	14		400	225	0	125
	Grand Total	**30**			**750**				

Elective II
Fuzzy Logic and Neural Networks
Mobile Network*
Compiler Construction

* Common subject with BE IT

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING / IT)
(w.e.f. 2008-09)

TERM – I

Elective – I
Operation Research

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction to Operation Research – Modeling in operation research, principles of modeling, Main phases of operation research, scope, role of operation research in decision making, linear programming, model formulation, graphical method, simplex method, advantages of Linear Programming.

Unit – II **(10 Hrs. 20 Marks)**

Dynamic Programming - Introduction, Basic concepts and applications, characteristics of dynamic programming approach, special techniques of Linear programming, Transportation problems, North – West corner rule, Least cost method, Vogel's approximation method, Balanced and unbalanced problems, Assignment problems, Hungarian method, balanced and unbalanced problems, traveling sales man problem.

Unit – III **(10 Hrs. 20 Marks)**

Project Planning Using PERT/CPM : Phases of project management, construction of network or arrow diagrams, time estimates, earliest expected time, latest allowable time and slack, critical path computations for PERT, calculations on CPM networks various floats for activities, critical path, Difference between CPM and PERT , Project time Vs project cost, use of CPM/PERT in project management.

Unit – IV **(10 Hrs. 20 Marks)**

Replacement Model – Deterministic and probabilistic considerations, Replacement of old equipment by the most efficient by the sudden failure items, failure trees, examples of failure trees, sequencing model Terminology and notations, Principles assumptions, Solution of sequencing problems, Processing of n jobs through two machines, Processing n jobs through three machines, Two jobs through m machines, Processing n jobs through m machines .

Unit – V **(10 Hrs. 20 Marks)**

Decision theory and game theory: Decision trees, classes of decision model, decision under certainty, uncertainty and risk.

Game Theory: Theory concept characteristics, maximum and minimum principles saddle points, dominance, basic concept, terminology of two persons zero sum game, MXZ and ZX games subgames methods, graphical method.

Reference Books:

1. N. D. Vohra, Quantitative Techniques in Management, TMH
2. Taha H. A., Operation Research – An Introduction PHI
3. S. D. Sharma, Operation Research, Kedarnath Ramnath Compay
4. N. G. Nair, Operation Research, Dhanpat Rai
5. Prem kumar Gupta, D. S. Hira, Operation Research, S. Chand & Company
6. L. S. Srinath, PERT and CPM Principles & Applications, EWP

Term work:

Assignment based on:

1. Implementation of Linear Programming Model
2. Implementation of Simplex Method
3. Implementation of Dynamic Programming
4. Implementation of transportation model
5. Implementation of assignment model
6. Implementation of Traveling Sales man problem
7. Implementation of sequencing model
8. Implementation for replacement model
9. Game playing with min / max search
10. Program for decision tree

Any Five Lab Assignment should be framed by concern staff member based on above list.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING / IT)
(w.e.f. 2008-09)

TERM – I

Elective – I
Embedded Systems

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs./ Week	Theory Paper: 100 Marks (03 Hrs.)
Practical: 2 Hrs./ Week	Term Work: 25
	Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Embedded system Introduction

Introduction to Embedded System, History, Design challenges, optimizing design metrics, time to market, applications of embedded systems and recent trends in embedded systems, embedded design concepts and definitions, memory management, hardware and software design and testing, communication protocols like SPI, SCI, I2C, CAN etc

Unit – II **(10 Hrs. 20 Marks)**

System Architecture

Introduction to ARM core architecture, ARM extension family, instruction set, thumb Instruction set, Pipeline, memory management, Bus architecture, study of on-chip peripherals like I/O ports, timers, counters, interrupts, on-chip ADC, DAC, RTC modules, WDT, PLL, PWM, USB etc.

Unit – III **(10 Hrs. 20 Marks)**

Interfacing and Programming

Basic embedded C programs for on-chip peripherals studied in system architecture. Need of interfacing, interfacing techniques, interfacing of different displays including Graphic LCD (320X240), interfacing of input devices including touch screen etc, interfacing of output devices like thermal printer etc., embedded communication using CAN and Ethernet, RF modules, GSM modem for AT command study etc.

Unit – IV **(10 Hrs. 20 Marks)**

Real time Operating System Concept

Architecture of kernel, task scheduler, ISR, Semaphores, mailbox, message queues, pipes, events, timers, memory management, RTOS services in contrast with traditional OS. Introduction to uCOSII RTOS, study of kernel structure of uCOSII, synchronization in uCOSII, Inter-task communication in uCOSII, memory management in uCOSII, porting of RTOS.

Unit – V **(10 Hrs. 20 Marks)**

Embedded Linux
Introduction to the Linux kernel, Configuring and booting the kernel, the root file system, Root file directories, /bin, /lib etc., Linux file systems, Types of file system: Disk, RAM, Flash, And Network. Some debug techniques- Syslog and strace, GDB, TCP/IP Networking- Network configuration, Device control from user space- Accessing hardware directly, Multi processing on Linux and Inter Process Communication- Linux process model and IPCs, Multithreading using pThreads - Threads vs. Processes and pThreads, Linux and Real-Time- Standard kernel problems and patches.

Reference Books:

1. Rajkamal, “Embedded Sytems “, TMH.
2. David Simon, “Embedded systems software primer”, Pearson
3. Steve Furber, “ARM System-on-Chip Architecture”, Pearson
4. DR.K.V.K.K. Prasad, “Embedded /real time system”, Dreamtech
5. Iyer,Gupta, “Embedded real systems Programming“, TMH

Laboratory exercise

- Integrated Development Environment Overview (Project creation, down load & debug)
- Study of JTAG Debugger/on-board debugger-emulator.
- ARM Instructions execution (Barrel Shifter, LDR/STR, SMT/LDM)

Term Work:

Group - A
1) Writing basic C-programs for I/O operations
2) C-Program to explore timers/counter
3) C-programs for interrupts
4) Program to demonstrate UART operation

Group - B
5) Program to demonstrate I2C Protocol.
6) Program to demonstrate CAN Protocol.

Group - C
7) Program to interface LCD
8) Program to interface Keyboard and display key pressed on LCD
9) Program to interface stepper motor

Group - D
10) Program to demonstrate RF communication
11) Program to implement AT commands and interface of GSM modem
12) Implementation of USB protocol and transferring data to PC.
13) Implementation of algorithm /program for the microcontroller for low power modes.
uCOSII /Embedded Linux RTOS Examples

Group - E
14) Interfacing 4 x 4 matrix keyboards and 16 x 2 character LCD display to microcontroller / microprocessor and writing a program using RTOS for displaying a pressed key.
15) Writing a scheduler / working with using RTOS for 4 tasks with priority. The tasks may be keyboard, LCD, LED etc. and porting it on microcontroller/ microprocessor.

Group - F
16) Implement a semaphore for any given task switching using RTOS on microcontroller board.
17) Create two tasks, which will print some characters on the serial port, Start the scheduler and observe the behavior.

Group – G
18) RTOS based interrupt handling using Embedded Real Time Linux.

19) Program for exploration of (Process creation, Thread creation) using Embedded Real Time Linux.

Group – H
20) Program for exploring Message Queues using Embedded Real Time Linux.
21) Ethernet Based Socket Programming using Embedded Real Time Linux.

Note: 1) At least one practical should be performed from each group.
2) Two practicals should be performed using the JTAG debugger/on-board Debugger-emulator.

Term work will be based on above list.

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TERM – I

Elective – I
Image Processing

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hrs./ Week	Theory Paper: 100 Marks (03 Hrs.)
Practical: 2 Hrs./ Week	Term Work: 25
	Oral: 25

Unit – I **(10 Hrs. 20 Marks)**
Introduction - What is digital image processing?, Fundamental steps in digital image processing, A simple Image formation model, Image sampling and quantization , Representing Digital Images, Basic relationship between pixels,
Image Enhancement in the spatial domain: Basic Gray level transformations, Histogram Processing(Equalization, Matching), Basics of spatial filtering, Smoothing spatial filters, Sharpening spatial filters.

Unit – II **(10 Hrs. 20 Marks)**
Image Enhancement in the frequency domain: Fourier Transform and Frequency domain, Filtering in the frequency domain, Basics of filtering in the frequency domain, Basic filters and their properties, Smoothing Frequency domain filters, Sharpening Frequency domain filters, Homomorphic Filtering
Properties of 2 D Fourier Transform, The Convolution and Correlation Theorems

Unit – III **(10 Hrs. 20 Marks)**
Image Restoration: Model Of Image Restoration/ Degradation Process, Noise Models, Restoration in the presence of Noise- Spatial Filtering, Periodic Noise Reduction by Frequency Domain Filtering, Filtering Techniques to restore image.
Image Compression- Compression models- Lossy Compression- Lossless Compression.

Unit – IV **(10 Hrs. 20 Marks)**
Color Image Processing : Color Fundamentals, Color Models, Converting Colors from different color models, Gray Level to Color Transformations, Color Transformations, Color Slicing, Color Image Smoothing.
Morphological Image Processing
Basic Concepts, Dilation, Erosion, Thinning, Thickening, Pruning, Gray level Morphology

Unit – V **(10 Hrs. 20 Marks)**
Segmentaion- Edge linking and Boundary detection, Thresholding, Region Based Segmentation, Histogram Analysis,

Application of Image Processing,
Introduction to Content Based Image Retrieval.

Reference Books:

1. R.C. Gonzalez, R.R. Woods, Digital Image Processing Person Education, Pearson Education
2. B. Chanda, D.Datta Mujumdar, "Digital Image Processing And Analysis", PHI ,
3. William Pratt, "Digital Image Processing", John Willey & Sons
4. Anil Jain, "Fundamentals Of Digital Image Processing", PHI

Term work:

1. Develop C/C++ code to create a simple image and save the same as bitmap image in .bmp file.
2. Develop C/C++ code to implement basic gray level transformations(Any One)
3. Develop C/C++ code to perform basic image enhancement operations
4. Develop C/C++ code to implement image histogram processing (Equalization or Matching)
5. Develop C/C++ code to find basic relationship between pixels.(Any One)
6. Develop C/C++ code to implement image compression (any one algorithm)
7. Implement gray scale thresholding to blur an image.
8. Implement C/C++ code to implement an algorithm for edge detection.
9. Implement C/C++ code to implement image morphological operations.(Any One)

The term work will be based on any 5 assignments from above list.

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TERM – I

Artificial Intelligence

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hrs./ Week	Theory Paper: 100 Marks (03 Hrs.)
	Term Work: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction to Artificial Intelligence: Definition, AI Problems, physical symbol system and hypothesis, AI Technique, Turing test, Problem as a state space search, production system, Problem characteristics, breadth first search, depth first search, AI representation, Properties of internal Representation, Heuristic search techniques, Best files search, A* and AO* Algorithms, Mean and ends analysis

Unit – II **(10 Hrs. 20 Marks)**

Knowledge Representation using Predicate Logic: Predicate calculus, Predicates and Arguments, ISA hierarchy, Frame notation, Resolution, Natural deduction.
Knowledge Representation using Non-monotonic Logic: TMS (Truth Maintenance System), Statistical and probabilistic reasoning, Fuzzy Logic, Knowledge representation, Semantic Net, Frames, Script, Conceptual dependency.

Unit – III **(10 Hrs. 20 Marks)**

Planning: Types of planning, Block world, strips, Implementation using goal stack, Nonlinear planning with goal stacks, Hierarchical planning, List commitment strategy.
Perception: Action, Robot architecture, Vision, Texture and images, Representing and recognizing scenes, Walzs algorithm, Constraint determination, Trihedral and Nontrihedral figures labeling.

Unit – IV **(10 Hrs. 20 Marks)**

Learning: By training neural networks, Introduction to neural networks, Neural net architecture and

applications.
Natural Language Processing and understanding, Pragmatic, Syntactic, and Semantic analysis, Finite State Machine, ATN, Understanding sentences.

Unit – V **(10 Hrs. 20 Marks)**

Expert System: Utilization and functionality, architectures of Expert system, Knowledge representation, Two case studies on expert systems.
Game Playing: Minimize search procedure, Alpha-beta cutoffs, Waiting for Quiescence, Secondary search.

Reference Books:

1. Elaine Rich, Kerin Knight, "Artificial Intelligence". TMH
2. B. Yegnanarayana, "Artificial Neural Network", PHI
3. Dan W. Patterson, "Introduction to artificial intelligence and expert system", PHI
4. Timothy J Ross, "Fuzzy Logic with Engineering Application", TMH

Term Work:

Assignments based on:

1. Implementation of single perceptron training algorithm.
2. Implementation of fuzzy membership function.
3. Implementation of Unification Algorithm.
4. Hill Climbing Algorithm.
5. Game playing with Min/Max Search.
6. Implementation of Dynamic database.
7. Parsing method implementation.
8. Development of Mini Expert System using Prolog.
9. Application development using Neural Network.
10. Development of Intelligent Perception System.

Any six lab assignments should be framed by concern staff member based on above list.

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TERM – I

Advanced Unix Programming*

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hrs./ Week	Theory Paper: 100 Marks (03 Hrs.)
Practical: 2 Hrs./ Week	Term Work: 25
	Practical: 25

Unit – I **(10 Hrs. 20 Marks)**

UNIX System Overview – Introduction, UNIX Architecture, Logging In, Files and Directories, Input and Output, Programs and Processes, Error Handling, User Identification, Signals, Time Values, System Calls and Library Functions.

File I/O – Introduction, File Descriptors, open Function, creat Function, close Function, lseek Function, read Function, write Function, I/O Efficiency, File Sharing, Atomic Operations, dup and dup2 Functions, sync, fsync, and fdatasync Functions, fcntl Function, ioctl Function, /dev/fd.

Files and Directories – Introduction, stat, fstat, and lstat Functions, File Types, Set-User-ID and Set-

Group-ID, File Access Per missions, Ownership of New Files and Directories, access Function, umask Function, chmod and fchmod Functions, Sticky Bit, chown, fchown, and lchown Functions, File Size, File Truncation, File Systems, link, unlink, remove, and rename Functions, Symbolic Links, symlinkand readlink Functions, File Times, utime Function, mkdirand rmdir Functions, Reading Directories, chdir, fchdir, and getcwd Functions, Device Special Files, Summary of File Access Per mission Bits.

Unit – II **(10 Hrs. 20 Marks)**

System Data Files and Information – Introduction, Password File, Shadow Passwords, Group File, Supplementary Group Ids, Implementation Differences, Other Data Files, Login Accounting, System Identification, Time and Date Routines.

Process Environment – Introduction, main Function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit and setrlimit Functions.

Process Control – Introduction, Process Identifiers, fork Function, vfork Function, exit Functions, wait and waitpid Functions, waitid Function, wait3 and wait4Functions, Race Conditions, exec Functions, Changing User IDs and Group IDs, Interpreter Files, system Function, Process Accounting, User Identification, Process Times.

Unit – III **(10 Hrs. 20 Marks)**

Signals – Introduction, Signal Concepts, signal Function, Unreliable Signals, Interrupted System Calls, Reentrant Functions, SIGCLD Semantics, Reliable-Signal Terminology and Semantics, kill and raise Functions, alarm and pause Functions, Signal Sets, sigprocmask Function, sigpending Function, sigaction Function, sigsetjmp and siglongjmp Functions, sigsuspend Function, abort Function, system Function, sleep Function, Job-Control Signals, Additional Features.

Advanced I/O – Introduction, Nonblocking I/O, Record Locking, STREAMS, I/O Multiplexing, 2 poll Function, Asynchronous I/O, readv and writev Functions, readn and written Functions, Memory-Mapped I/O.

Unit – IV **(10 Hrs. 20 Marks)**

Threads – Introduction, Thread Concepts, Thread Identification, Thread Creation, Thread Termination, Thread Synchronization.

Thread Control – Introduction, Thread Limits, hread Attributes, Synchronization Attributes, Reentrancy, Thread-Specific Data, Cancel Options, Threads and Signals, Threads and fork, Threads and I/O.

Daemon Processes – Introduction, Daemon Characteristics, Coding Rules, Error Logging, Single-Instance Daemons, Daemon Conventions, Client-Server Model.

Unit – V **(10 Hrs. 20 Marks)**

Interprocess Communication – Introduction, Pipes, popen and pclose Functions, Coprocesses, FIFOs, XSI IPC, Message Queues, Semaphores, Shared Memory, Client-Server Properties.

Network IPC: Sockets – Introduction, Socket Descriptors, Addressing, Connection Establishment, Data Transfer, Socket Options, Out-of-Band Data, Nonblocking and Asynchronous I/O.

Advanced IPC – Introduction, STREAMS-Based Pipes, Unique Connections, Passing File Descriptors, An Open Server, Version 1, An Open Server, Version 2.

Reference Books:

1. W. Richard Stevens and Stephen A. Rago, Advanced Programming in the UNIX Environment, 2/E, Pearson Education

2.W. Richard Stevens, Unix Network Programming - Interprocess Communications, Volume 2, 2/E, Pearson Education

Term Work:

Concerned staff members should suitably frame the term work (at least 6) based on above syllabus and implementation of Unix commands using library functions as well as implementation of shell scripts.

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TERM – I

Object Oriented Modeling and Design

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hrs./ Week	Theory Paper: 100 Marks (03 Hrs.)
Practicals: 2 Hrs./Week	Term Work: 25 Marks
	Oral: 25 Marks

Unit – I **(10 Hrs. 20 Marks)**

Review of Object Modeling, New Paradigms, Object Oriented Thinking, UML Concepts: Overview of UML.
UML 2.0 New Features.
Rational Unified Process emphasizing Inception, Elaboration, Construction, Transition Phases. 4+1 View architecture, Architectural approaches: Use case Centric, Architecture driven, Iterative approach, OO Concepts Review.

Unit – II **(10 Hrs. 20 Marks)**

Introduction to UML. UML MetaModel. Extensibility mechanisms like stereotypes, tagged values, constraints and profiles. OCL. Overview of all diagrams in UML 2.0.

Unit – III **(10 Hrs. 20 Marks)**

Object diagrams, CRC method, Review of OO concepts. Class diagrams, Classes and Relationships, Interfaces and ports, Templates, Active Objects, Advanced relationships generalization, association, aggregation, dependencies. Composite structure diagrams including composite structures, collaborations.

Unit – IV **(10 Hrs. 20 Marks)**

Interaction diagrams. Interaction Overview diagrams including interactions, signals, exceptions, regions, partitions, Sequence diagrams, Communication diagrams.
State Machine diagrams, States, encapsulation of states, transitions, submachine, state generalization. Timing diagrams, Activity diagrams, Activities, sub activities, signals, exceptions, partitions, regions.

Unit – V **(10 Hrs. 20 Marks)**

Support for modeling Architecture in UML. Package diagrams, Component diagrams, Deployment diagrams. Applications of UML in embedded systems, Web applications, commercial applications.

Reference Books:

1. Grady Booch, James Rumbaugh, Ivar Jacobson “Unified Modeling Language User Guide”, Addison-Wesley
2. Joseph Schmuller “SAMS Teach yourself UML in 24 Hours”, Third edition.
3. Martin Fowler, “UML Distilled: A Brief Guide to the Standard Object Modeling Language”, Third Edition (Paperback) ,Addision Wesley
4. Dan Pilone, Neil Pitman “UML 2.0 in a Nutshell”, O'Reilly
5. Rambaugh, “Object Oriented Modeling and Designing”. PHI

6. Bouch. “Object Oriented Analysis and Design with Applications”. Addison Wesley.
7. Schah, “Introduction to OOAD with UML and Unified Process”, TMH

Term Work:
Concerned staff members should suitably frame the term work at least 5 assignments based on above syllabus. Each assignment must consider definition, analysis, design and modeling of a project.

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TERM – I

Advanced Computer Network

Teaching Scheme:
Lectures: 4 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)

Unit – I **(10 Hrs. 20 Marks)**
Introduction to wireless Networking: Why Wireless? What makes Wireless Network different? A Network by Any other name.
Overview of 802.11 Networks: IEEE 802 Network Technology Family tree, 802.11 Nomenclature and design, 802.11 Network Operation, Mobility Support.

802.11 MAC Fundamentals: Challenges for the MAC,MAC Access Modes and Timing, Contention-Based Access Using the DCF, Fragmentation and Reassembly, Frame Format, Encapsulation of Higher-Layer Protocols Within 802.11,Contention-Based Data Service, Frame Processing and Bridging.

802.11 Framing in Detail: Data Frames, Control Frames, Management Frames, Frame Transmission and Association and Authentication States
Unit – II **(10 Hrs. 20 Marks)**
Management Operations: Management Architecture, Scanning, Authentication, Pre-authentication, Association, Power Conservation, Timer Synchronization, Spectrum Management

Contention-Free Service with the PCF: Contention-Free Access Using the PCF, Detailed PCF Framing, Power Management and the PCF

Physical Layer Overview: Physical-Layer Architecture , The Radio Link , RF Propagation with 802.11, RF Engineering for 802.11
Unit – III **(10 Hrs. 20 Marks)**
The Frequency-Hopping (FH) PHY: Frequency-Hopping Transmission ,Gaussian Frequency Shift Keying (GFSK) FH PHY Convergence Procedure (PLCP), Frequency-Hopping PMD Sublayer, Characteristics of the FH PHY

The Direct Sequence PHYs: DSSS and HR/DSSS (802.11b): Direct Sequence Transmission, Differential Phase Shift Keying (DPSK), The "Original" Direct Sequence PHY, Complementary Code Keying, High Rate Direct Sequence PHY
802.11a and 802.11j: 5-GHz OFDM PHY: Orthogonal Frequency Division Multiplexing (OFDM), OFDM as Applied by 802.11a, OFDM PLCP, OFDM PMD Characteristics of the OFDM PHY
Unit – IV **(10 Hrs. 20 Marks)**
Wired Equivalent Privacy (WEP): Cryptographic Background to WEP, WEP Cryptographic Operations, Problems with WEP, Dynamic WEP

User Authentication with 802.1X: The Extensible Authentication Protocol, EAP Methods, 802.1X: Network Port, Authentication, 802.1X on Wireless LANs
802.11i: Robust Security Networks, TKIP, and CCMP: The Temporal Key Integrity Protocol (TKIP), Counter Mode with CBC-MAC (CCMP), Robust Security Network (RSN) Operations

Unit – V **(10 Hrs. 20 Marks)**

Ad Hoc Wireless Networks: Introduction, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet
Routing Protocols for Ad Hoc Wireless Networks: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks, Classifications of Routing Protocols, Table-Driven Routing Protocols, On Demand Routing Protocols, Hybrid Routing Protocols, Routing Protocols with Efficient Flooding Mechanisms, Hierarchical Routing Protocols, Power-Aware Routing Protocols
Wireless Sensor Networks: Introduction, Sensor Networks Architecture, Data Dissemination, Data Gathering, MAC Protocols for Sensor Networks, Location Discovery, Quality of a Sensor Network.

Reference Books:

1. Matthew Gast, 802.11 Wireless Networks: The Definitive Guide, Second Edition, O'Reilly
2. C.Siva Ram Murthy, B.S. Manoj, Ad Hoc Wireless Networks: Architectures and Protocols, Pearson

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TERM – I

Seminar

Teaching Scheme:
Practical: 2 Hrs./ Week

Examination Scheme:
Term Work: 25 Marks

1. For seminar every student will individually study a topic assigned to him / her and submit a report and shall deliver a short lecture / Seminar on the topic at the end of term.
2. Selection of topic should be done by students in consultation with concerned guide
    a. Topic should be related to branch but it should be extended part of the branch (latest and advance topic).
    b. The topic should be such that the student can gain latest knowledge. Student should preferably refer at least one research paper
3. Seminar topic should not be repeated in the department and registration of the same should be done on first come first served basis
4. Seminar report should be submitted in paper bound copy prepared with computer typing
    a. Size of report depends on advancement of topic.
    b. Student should preferably refer minimum 5 reference books / magazines.
    c. Format of content
        i. Introduction.
        ii. Literature survey.
        iii. Theory
            1. Implementation
            2. Methodology
            3. Application
            4. Advantages, Disadvantages.
        iv. Future scope.
        v. Conclusion.
5. ASSESSMENT OF SEMINAR for TERM WORK

Title of seminar : ____
Name of guide : ____

Sr. No.	Exam Seat No.	Name of Student	Assessment by examiners					Grand Total
			Topic Selection	Literature Survey	Report Writing	Depth of understanding	Presentation	
			5	5	5	5	5	25

6. Assessment of Literature survey will be based on
   a. collection of material regarding history of the topic,
   b. implementation,
   c. recent applications.

7. Assessment of Depth of understanding will be based on
   a. Questioning by examiners.
   b. Questioning by students.
   c. What the student understands i.e. conclusion regarding seminar.

8. Assessment of presentation will be based on;
   a. Presentation time (10 minutes)
   b. Presentation covered (full or partial)
   c. Way of presentation
   d. Questioning and answering (5 minutes)
9. Examiners should be a panel of two one of them must be guide. Examiner must have experience at least 3 years. Examiners will be appointed by HOD in consultation with Principal.

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TERM – I

Project - I

Teaching Scheme:
Practical: 2 Hrs./ Week

Examination Scheme:
Term Work: 25
Oral: 25

1. Every student individually or in a group (group size is of 3 students. However, if project complexity demands a maximum group size of 4 students, the committee should be convinced about such complexity and scope of the work) shall take a project in the beginning of the (B.E. first Term) seventh term in consultation with the guide and the project must be completed in the (B.E. Second Term) eighth term.

2. The project proposal must be submitted in the institute in the beginning of the (B.E. first Term) seventh term. While submitting project proposal care is to be taken that project will be completed within the available time of two term i.e 2 Hrs per week for (B.E. first Term) seventh term and 4 Hrs per week for (B.E. Second Term) eighth semester (total time become 12*2 + 12*4 = 72 Hrs per project partner). The final title of

the project work should be submitted at the beginning of the (B.E. Second Term) eighth semester. .

3. Project title should be precise and clear. Selection and approval of topic:
Topic should be related to real life or commercial application in the field of Computer Engineering

OR

Investigation of the latest development in a specific field of Computer Engineering

OR

Commercial and Interdisciplinary projects should be encouraged. The examination will be conducted independently in respective departments.

4. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide.
5. The group is expected to complete details system/problem definition, analysis, design, etc. in (B.E. first Term) seventh term, as a part of term work in the form of a joint report. Project report must be submitted in the prescribed format only. No variation in the format will be accepted.
6. One guide will be assigned at the most three project groups.
7. The guides should regularly monitor the progress of the project work.
8. Assessment of the project for award of term work marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

A) ASSESSMENT OF PROJECT I TERMWORK B.E. FIRST TERM

NAME OF THE PROJECT: ______________________
NAME OF THE GUIDE: ________________________

Sr No	Exam Seat No	Name Of Student	Assessment by guide (70%)					Assessment by Departmental committee (30%)			Grand Total	Out of 25 Marks
			Literature survey	Topic Selection	Docum-entation	Attendance	Total	Evaluation (10%)	Pres-ntaion (20%)	Total		
		Marks	10	05	15	05	35	05	10	15	50	25

Sign of Guide Sign. of Committee Members Sign. of H. O. D.

9. The guide should be internal examiner for oral examination (If experience is greater than three years).
10. The external examiner should be from the related area of the concerned project. He should have minimum of five years of experience at degree level / industry.
11. The evaluations at final oral examination should be done jointly by the internal and external examiners.

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TERM – II

Elective – II
Fuzzy Logic and Neural Networks

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction to Biological Neurons: Neurons, Axon, Synaptic links, Dendrites, Working,
Artificial Neuron Model: McCulloch-Pitts Neuron Model, Neuron Modeling for Artificial Neural Systems, Activation Functions.
Models of Artificial Neural Networks: Feed forward Network, Feedback Network, Neural Processing, Learning and Adaptation, Supervised and Unsupervised Learning.

Unit – II **(10 Hrs. 20 Marks)**

Neural Network Learning Rules: Hebbian Learning, Perceptron Learning, Delta Learning, Widrow-Hoff Learning, Correlation Learning, Winner-Take-All Learning, Single Layer Perceptron Classifier: Classification Model, Features, Decision Regions, Discriminants Functions, Linear Machine and Minimum Distance Classification, Nonparametric Training Concept.

Unit – III **(10 Hrs. 20 Marks)**

Training and Classification using Discrete Perceptron, Single Layer Continuous Perceptron Networks for Linearly Separable Classifications, Multi-category Single Perceptron Networks.
Multilayer Feedforward Networks: Linearly Nonseparable Pattern Classification, Delta Learning Rule for Multiperceptron Layer, Generalized Delta Learning Rule.

Unit – IV **(10 Hrs. 20 Marks)**

Feed Forward Recall and Error Back Propagation Training, Learning Factors, Single Layer Feedback Networks, Basic Concepts, Hopfield Networks, Boltzmann Machine, Kohonens self organizing maps.
Applications of Neural Networks: Pattern Recognition, Classification and clustering.

Unit – V **(10 Hrs. 20 Marks)**

Fundamentals of ‘Fuzzy System, Crisp Sets, Membership Functions, Fuzzy Sets, Fuzzy Set Properties and Manipulation, Linguistic Variables, Fuzzy System Architecture, Fuzzy System Design and implementation.
Fuzzy Neural Networks: Introduction to Neuro – Fuzzy Systems, Types of Fuzzy-Neural Nets, Nero-Fuzzy Systems Design and implementation.

Reference Books:

1. Robert J. Schalkoff, “Artificial Neural Networks”, McGraw – Hill
2. B. Yegnarayan, “ Artificial Neural Networks”, PHI
3. Timoty J Ross, “Fuzzy Logic with Engineering Applications”, McGraw-Hill
4. Satish Kumar, “Neural Network:A Classroom Approach”, TMH
5. J. M. Zurada, “Introduction to Artificial Neural Networks”, Jaico Publishing House.

Term Work:

1. Implementation of basic learning rules using single neuron
2. Implementation of Single layer discrete perceptron

3. Implementation of Single layer continues perceptron
4. Implementation of operations of fuzzy sets
5. Design and Implementation of fuzzy sets and its membership functions
6. Mini application development using fuzzy sets
7. Mini application development using neural network

Any six-lab assignments should be frame by the concern staff based on above list.

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TERM – II

Elective – II
Mobile Network

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction – PCS Architecture, Cellular Telephony, Cordless Telephony and Low-tier PCS, Third Generation wireless system

Mobility Management – Handoff, Inter - BS handoff, Intersystem handoff, Roaming management, Roaming management under SS7 and Roaming management for CT2.

Handoff Management – Detection and Assignments, Handoff detection, Strategies for handoff detection, Mobile controlled handoff, Network controlled handoff, Mobile assisted handoff, Handoff failure, Channel assignment, Non- prioritized scheme and Reserved channel scheme, Queuing priority scheme, Sub rating scheme, Implementation issues, Hard handoff – MCHO link transfer, MAHO/NCHO link transfer, Sub rating MCHO link transfer, Soft handoff – adding new BS, dropping a BS.

Unit – II **(10 Hrs. 20 Marks)**

GSM Overview – GSM Architecture, location tracking and call setup, Security, Data Services – HSCSD, GPRS, Unstructured supplementary service data.
GSM Network Signaling – GSM MAP service frame work, MAP protocol machine, MAP dialogue.
GSM Mobility management – GSM location update, Mobility databases, Failure restoration, VLR Identification algorithm, VLR Overflow control.

Unit – III **(10 Hrs. 20 Marks)**

GSM short message service – SMS architecture, SMS protocol hierarchy, Mobile originated messaging, Mobile terminated Messaging.
International Roaming for GSM – International GSM call setup, Reducing the International call delivery cost
GSM Operations, Administration, and Maintenance – Call recording functions, Performance Measurement and Management, Subscriber and Service data Management.
Mobile number portability – Fixed network number portability, Number portability for Mobile networks, Mobile number portability mechanism.

Unit – IV **(10 Hrs. 20 Marks)**

VoIP Service for mobile networks – GSM on the Net, iGSM wireless VoIP solution, iGSM procedures and Message flows.

General Packet Radio Services – Architecture, Network nodes, Interfaces, Procedures, Billing, Evolving from GSM to GPRS.

Unit – V **(10 Hrs. 20 Marks)**

Wireless Application Protocol – WAP Model, WAP Gateway, WAP Protocol – WDP, WTLS, WTP, WSP, WAE, Mobile station Application execution environment.

Third Generation Mobile Services – Paradigm shifts in 3G Systems, W-CDMA, cdma 2000, Improvements on core network, Quality of service in 3G, Wireless Operating System for 3G Handset.

Paging Systems – Paging Network Architecture, User Access Interface – Telocator Alphanumeric Input Protocol (TAP), Telocator Message Entry Protocol (TME), Intersystem Interface.

Wireless Local Loop – WLL Architecture, WLL technologies.

Reference Books:

1. Yi-Bing Lin and Imrich Chlamtac “Wireless and Mobile Network Architecture”, Wiley Publication.
2. Kasera Sumit, Narang Nishit, “3G Networks: Architecture, Protocols and Procedures”, TMH

Term Work:

1. Setting up wireless network with and without infrastructure support.
2. Configuring Access Point with bridging mode (Point to Point and Point to Multi Point).
3. Configuring Routing between wired and wireless Networks.
4. Configuring Security in wireless network with and without infrastructure support.
5. At least 3 lab assignments based on above syllabus using any network simulator such as NS2, OPNET, OMNET etc.

Concerned staff members should suitably frame the term work (at least 6) based on above syllabus. Oral will be conducted based on the above syllabus and the term work submitted in the form of journal.

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TERM – II

Elective – II
Compiler Construction

Teaching Scheme:	Examination Scheme:
Lectures: 4 Hrs./ Week	Theory Paper: 100 Marks (03 Hrs.)
Practical: 2 Hrs./ Week	Term Work: 25
	Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction to Compiling: System software’s introduction: Assembler, Loader, Linker. The phases of compiler, preprocessors, overview of simple one pass compiler.

Lexical Analysis: Role of lexical analyzer, input buffering, token specification, token recognition, language for lexical analysis specification, Finite Automata, NFA to DFA, RE to NFA, RE to DFA, state minimization of DFA. LEX tools

Unit – II **(10 Hrs. 20 Marks)**

Syntax Analysis: The role of the parser, context free grammar, ambiguity in grammar and it’s elimination, Top down parsing: recursive descent, predictive, LL(1) parsers. Construction of predictive parsing tables, FIRST and FOLLOW, LL(1) grammar, Error recovery in Predictive parsing . Bottom up parsing: Handle pruning, stack implementation and conflicts of shift reduce parsing, LR parsers: LR parsing algorithm, constructing SLR, canonical LR, LALR parsing tables. Error recovery in LR parsing, YACC tools.

Unit – III **(10 Hrs. 20 Marks)**

Syntax Directed Translation: Syntax directed definition, inherited attributes, construction of syntax tree, directed acyclic graphs for expressions, Bottom up evaluation of S-attributed definitions, L-attributed definitions, top down translation, bottom up evaluation of inherited attributes.

Intermediate Code Generation: Intermediate language, various intermediate forms, TAC, syntax directed translation into TAC, Declaration, Assignment statements, Boolean expressions, case statements, Back patching, Procedure calls.

Unit – IV **(10 Hrs. 20 Marks)**

Code generation: Design issues of code generation, the target machine, run time storage management, basic blocks and flow graphs, a simple code generator, the DAG representation of basic blocks, Peephole optimization, Generating code for DAGs.

Code Optimization: Criteria for code improving transformation, code optimization sources: Local and global common sub-expression elimination, dead code elimination, Induction variable reduction, loop invariant computation, Optimization of basic blocks, loops in flow graph, reducible flow graph, code improving transformations.

Unit – V **(10 Hrs. 20 Marks)**

Run time environments: activation trees, control stacks, storage organization, subdivision of run time memory, activation records, storage allocation strategies: static allocation, stack allocation, heap allocation, symbol table management: hash tables, dynamic storage allocation techniques, explicit allocation of fixed size and variable size blocks.

Reference Books:

1. Aho, Sethi, Ulman, “Compilers Principles, Techniques and Tools”, Addision Wesley
2. Dhamdhere, “Compiler Construction- Principles and Practices”, MacMillan India.
3. Andrew Appel, “Modern Compiler Implementation in C”, Cambridge University Press
4. J.P.Bennett, “Introduction to Compiling Techniques”, TMH
5. Holub A.J., “Complier Design In ‘C’”, Prentice Hall

Term Work:

1. Study of LEX and YACC.
2. Calculator (text or graphics) using LEX and YACC.
3. Lexical analyzer for a subset of a C using LEX.
4. Design of a Predictive parser.
5. Implementation of code generator
6. Implementation of code optimization for
   Common sub-expression elimination, Loop invariant code movement.

Any 5 laboratory assignments should be framed by concern staff member based on above list.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING/IT)
(w.e.f. 2008-09)

TERM – II

Data Warehousing and Mining

Teaching Scheme:	**Examination Scheme:**
Lectures: 4 Hrs./ Week	Theory Paper: 100 Marks (03 Hrs.)
Practical: 2 Hrs./ Week	Term Work: 25

Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Evolution of database technology, What is data mining?, Data Mining Applications, Steps in Knowledge Discovery, Architecture of typical data mining System, Data mining- On What kind of data, Data mining Functionalities, Classification of data mining systems, Major Issues in Data Mining.

What is Data Warehouse? Difference between Operational Database systems and Data Warehouse (OLTP and OLAP), Why Separate Data Warehouse?

A Multidimensional Data Model, Schemas for Multidimensional Databases: Stars, Snowflakes, and Fact Constellations. Measures, Concept Hierarchies, OLAP Operations in the Multidimensional Data Model.

Unit – II **(10 Hrs. 20 Marks)**

Data Warehouse Architecture, Process of Data Warehouse design, A Three tier Data Warehouse Architecture., Types Of OLAP servers.

Data Preprocessing: Why Preprocess Data? Data Cleaning Techniques, Data Integration and Transformation, Data Reduction Techniques, Discretization and Concept Hierarchy Generation for numeric and categorical data.

Data mining Primitives, A Data Mining Query Language.

Unit – III **(10 Hrs. 20 Marks)**

Concept Description: What is Concept Description? Data Generalization and Summarization-Based Characterization, Attribute Oriented Induction, Analytical Characterization: Attribute Relevance Analysis, Methods, Mining Descriptive Statistical Measures in Large Databases.

Mining Association Rules: Association Rule Mining, Market Basket Analysis, Association Rule classification, Mining Single-Dimensional Boolean Association Rules from Transactional Databases, The Apriori Algorithm, Mining Multilevel Association Rules, Constraint-Based Association Mining.

Unit – IV **(10 Hrs. 20 Marks)**

Classification and Prediction: What is Classification and Prediction? Data Classification Process, Issues Regarding Classification and Prediction., Classification by Decision Tree Induction, Bayesian Classification, , Classification by Back propagation, A Multilayer Feed Forward Neural Network, Classification Based on Association Rule Mining, Other Classification Methods

Cluster Analysis: What is Cluster Analysis? Types of Data in Cluster Analysis, A Categorization of Clustering Methods, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods.

Unit – V **(10 Hrs. 20 Marks)**

Cluster Analysis: What is Cluster Analysis? Types of Data in Cluster Analysis, A Categorization of Clustering Methods, Partitioning Methods, Hierarchical Methods, Density Based Methods, Grid Based Methods, Model Based Clustering Methods

Mining Complex Types Of Data: Multidimensional Analysis and Descriptive Mining of Complex Data Objects, Mining Multimedia Databases, Mining Text Databases, Mining the World Wide Web.

Reference Books:

1. Han and Kamber, “Data Mining: Concepts and Techniques”, Morgan Kaufmann Publishers
2. Alex and Berson, “Data warehousing, Data Mining and OLAP”, TATA McGraw Hill

Term Work:

1. Develop a application to construct a multidimensional data model (Star, Snowflake or Fact constellations)
2. Develop a application to perform OLAP operations.
3. Develop a application to implement data preprocessing techniques.
4. Develop a application to implement data integration techniques.
5. Develop a application to implement data generalization and summarization techniques
6. Develop a application to extract association mining rules.
7. Develop a application for classification of data.
8. Develop a application for implementing one of the clustering technique.
9. Study of commercial data mining tools.

Any 6 laboratory assignments should be framed by concern staff member based on above list.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING / IT)
(w.e.f. 2008-09)

TERM – II

Software Metrics and Quality Assurance

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25
Oral: 25

Unit – I **(10 Hrs. 20 Marks)**

Software Measurements: Measurement in Software Engineering, Scope of Software Matrices, The representational theory of measurements, Measurement and Models, Measurements Scales and scale types, Meaningfulness in measurement, Classifying software measures, Applying the framework, Software measurement validation.

Unit – II **(10 Hrs. 20 Marks)**

Measuring internal product attributes: Size- Aspects of software size, Length, Reuse, Functionality, Complexity.
Measuring internal product attributes: Structure- Types of structural measures, Control-flow structure, Modularity and information flow attributes, Data structure, Difficulties with general "complexity" measures.
Measuring internal product attributes: Modeling software quality, Measuring aspects of quality.

Unit – III **(10 Hrs. 20 Marks)**

Software Reliability: Basics of reliability theory, software reliability problem, parametric reliability growth models, predictive accuracy, importance of operational environment.

Good estimates, cost estimation: problems and approaches, models of effort and cost, problem with existing modeling methods, dealing with problems of current estimation methods, implication for process predictions.

Unit – IV **(10 Hrs. 20 Marks)**

Software documentation, Standards, Practices, Conventions and metrics, The software inspection process, The walkthrough process, Audit process, Document verification, The ISO 9000 Quality Standards, Comparison of the ISO 9000 model with SEI's CMM.

Unit – V **(10 Hrs. 20 Marks)**

Cleanroom Software Engineering: The cleanroom approach, Functional Specification, Cleanroom design, Cleanroom testing.
Reengineering: Business process reengineering, Software reengineering, Reverse reengineering, Reconstructing, Forward engineering, The economics of reengineering.

Reference Books:

1. Flanton, Pfleeger, "Software Metrics- A Rigorous and Practical Approach", Thompson Learning
2. Mordechai Ben-menachem/Garry S.Marliss, "Software Quality", Thompson Learning
3. Roger S. Pressman, "Software Engineering- A Practitioner's Approach", TMH
4. Swapna Kishore and Rajesh Naik, "ISO 9001:2000 for Software Organizations", TMH

Term Work:

Concerned staff members should suitably frame the term work at least 5 assignments based on above syllabus.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING)
(w.e.f. 2008-09)
TERM – II

Advanced Computer Architecture

Teaching Scheme:
Lectures: 4 Hrs./ Week
Practical: 2 Hrs./ Week

Examination Scheme:
Theory Paper: 100 Marks (03 Hrs.)
Term Work: 25

Unit – I **(10 Hrs. 20 Marks)**

Introduction to Parallel Processing: Evolution of computer Systems, Parallelism in uni-processor Systems, Parallel Computer Structure, Architectural Classification Schemes, Clock rate and CPI, performance factors, system Attributes MIPS rate ,Throughput rate, Implicit parallelism, Explicit parallelism, Parallel processing applications.

Program and Network Properties: Condition of Parallelism, Program partitioning and Scheduling, Program flow mechanism, system Interconnect architectures.

Unit – II **(10 Hrs. 20 Marks)**

Processor and Memory Hierarchy: Design space of processors, Instruction set architectures, CISC scalar processors, RISC scalar Processors, Super scalar and Vector Processors.

Inclusion, coherence and Locality, memory capacity planning. Bus, cache and shared memory.

Back, plane Bus System: Back plane bus specification, addressing and timing protocol, Arbitration and Interrupt, shared memory organization: Interleaved memory organization, Bandwidth and fault tolerance, memory allocation schemes.

Principles of Pipelining: Principles of Linear pipelining, classification of pipeline processor, General pipelines and Reservation tables.

Unit – III **(10 Hrs. 20 Marks)**

Pipelining and Super scalar Techniques: Linear pipeline processors, nonlinear pipeline processors, Instruction pipeline design, Arithmetic pipeline design, Super scalar and Super pipeline design.

Array Processors: SIMD Array processors: SIMD Computer Organization, Masking and data Routing Mechanism, Inter-PE Communications SIMD Interconnection networks.

Parallel Algorithms for array processor: SIMD Matrix Multiplication, Parallel sorting.

Associated array processing: Associative search Algorithms.

Unit – IV **(10 Hrs. 20 Marks)**

Multiprocessor Architecture: Loosely Coupled Multiprocessors, Tightly Coupled multiprocessors, Processor characteristics for multiprocessing.

Parallel Algorithms for Multiprocessing: Classification of parallel Algorithms, Synchronized and Asynchronous parallel Algorithms, Multiprocessor OS.

Vector Processing: Vector processing principles , vector access memory schemes, characteristics of vector processing.

Unit – V **(10 Hrs. 20 Marks)**

Data Flow Computers: Data driven computing and languages, data flow computer architectures.

Principles of Multithreading: Issues and solution, multiple context processor, Multidimensional Architectures, Multithreading.

Parallel Programming Modules: Shared-variable model, message- passing model, data- parallel model, object- oriented model, Functional and logic models.

Parallel languages: languages features for parallelism, parallel language construction.

Reference Books:

1. Kai Hwang, “Advance Computer Architecture, Parallelism, Scalability, Programmability”, Mc-Graw Hill Publication
2. Kai Hwang and Faye A Briggs, “Computer Architecture and Parallel Processing”

Term Work:

Any five lab assignments should be framed by concern staff member based on above syllabus.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING)
(w.e.f. 2008-09)

TERM – II

Industrial Visit / Case Study

Teaching Scheme:

Examination Scheme:
Term Work: 25

EDUCATION TOUR / TECHNICAL VISITS / CASE STUDY AND ITS EVALUATION

1. During (B.E. First Term / Second Term) seventh and / or eighth terms or during vacation between (B.E. First Term / Second Term) seventh and eighth terms, every student; shall visit minimum two industries, factories arranged by colleges and accompanied by teachers. There shall be at least one teacher for a group of 20 students and at least one non-teaching staff accompanied with the students.

2. The colleges should obtain appropriate certificates of visit from the concerned organizations just after the visits.

3. Students should submit written report about the visits individually at the end of (B.E. Second Term) eighth term.

4. The report should contain information about the following points:

   (a) The organization - activities of organization and administrative setup technical personnel and their main duties.
   (b) The project / industry brief description with sketches and salient technical information.
   (c) The work / processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.
   (d) Suggestions (if any) for improvement in the working of those organizations.

5. The evaluation of the report of technical visits will be made by panel of two teachers appointed by principal based on following points:

   (a) Coverage aspect: All above points should be covered.
   (b) Detailed observations: System / Process / Product explained with data, diagram specifications.
   (c) Quality of presentation: Report should be very objective and should consist of clear

and systematic organization of topics and information.

(d) Viva - voce: A viva -voce shall be conducted on the technical visit report by the teachers to assess the specific knowledge gained by the students for technical applications.

6. The case study should include the study problem in Computer Engineering branch.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

BE (COMPUTER ENGINEERING)
(w.e.f. 2008-09)

TERM – II

Project - II

Teaching Scheme:
Practical: 6 Hrs./ Week

Examination Scheme:
Term Work: 100
Oral: 50

1. The Project group in (B.E. first Term) seventh term will continue the project work in (B.E. Second Term) eighth term and complete project.
2. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide.
3. The guides should regularly monitor the progress of the project work.
4. The project work along with project report should be submitted as part of term work in (B.E. Second Term) eighth term on or before the last day of the (B.E. Second Term) eighth term.
5. Project report must be submitted in the prescribed format only. No variation in the format will be accepted.
6. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

B) ASSESSMENT OF PROJECT II TERMWORK (B.E. SECOND TERM)

NAME OF THE PROJECT: ____
NAME OF THE GUIDE: ____

Sr. No	Exam. Seat No	Name Of Students	Assessment by guide (70%)						Assessment by department (30%)			Grand Total
			Fabrication /software / actual work	Execution of project	Project report	Scope/ Cost / Utility	Attende-nece	Total	Evaluation (10%)	Prese-ntaion (20%)	Total	
		Marks	20	10	20	10	10	70	10	20	30	100

Sign of Guide Sign. of Committee Members Sign. of H. O. D.

7. The guide should be internal examiner for oral examination (If experience is greater than three years).
8. The external examiner should be from the related area of the concerned project. He should have minimum of five years of experience at degree level / industry.
9. The evaluation at final oral examination should be done jointly by the internal and external examiners.
10. The Project work should be kept in department for one academic year after University Examination.

NORTH MAHARASHTRA UNIVERSITY
JALGAON

SAYLLABUS FOR SECOND YEAR ENGINEERING DEGREE COURSE

IN

ELECTRICAL ENGINEERING

(w.e.f. July. 2006-07)

NORTH MAHARASHTRA UNIVERSITY JALGAON
S.E. (ELCTRICAL) W.E.F 2006 -2007
TERM - I
ENGINEERING MATHEMATICS – III

Teaching Scheme:		Examination Scheme:
Lectures : 4 Hrs/Week	Theory Paper	: 100 Marks (3 Hours)
Tutorials : 1 Hr/Week	Term Work	: 25 Marks

Unit – I : Linear Differential Equations

Linear Differential equation of order n, Solution of LDE with constant coefficient, method of variation of parameters, equations reducible to linear form with constant coefficients, Cauchy's linear equation, Legendre's linear equation.Solution of Simultaneous and Symmetric Simultaneous Differential equation Applications to electrical circuts. Lectures-10, Marks -20

Unit – II : Complex Variables

Functions of complex variables, Analytic functions, C-R equations, Conformal mapping, Billinear transformation, Residue theorem, Cauchy's Integral theorem and Cauchy's Integral formula (without proof). . Lectures-10, Marks -20

Unit – III : Fourier and Z – Transforms

Fourier Transform (FT): Fourier Intergral theorem. Sine and Cosine Integrals. Fourier ,Transform, Fourier Cosine Transform, Fourier Sine Transform and their inverses.,Problems on Wave equation.

Z Transform (ZT): Definition, standard properties (without proof), ZT of standard sequences and Inverse. Solution of simple difference equations, Applications of Z Transform to discrete system analysis.

. Lectures-10, Marks -20

Unit –IV: Laplace Transform (LT)

Definition of LT, Inverse LT. Properties and theorems. LT of standard functions. LT of some special functions viz, error, 1st order Bessel's Periodic, Unit Step, Unit Impulse and Ramp. Problems on finding LT and Inverse LT. Initial and final value theorems.Applications of LT for Network Analysis.

Lectures-10, Marks -20

Unit – V Vector Integration.

a) Applications of partial differential equations to :

1. Vibration of strings or wave equations:

$$\frac{\partial^2 y}{\partial t^2} = a^2 \frac{\partial^2 y}{\partial x^2}$$

2. One dimensional heat flow equation.

$$\frac{\partial u}{\partial t} = a^2 \frac{\partial^2 u}{\partial x^2}$$

3. Laplace equation Two dimensional heat flow equation.

$$\frac{\partial^2 u}{\partial x^2} + \frac{\partial^2 u}{\partial y^2} = 0$$

by separating variables only.

b) Line Integral, Surface and Volume integrals, Gauss's, Stoke's and Green's Theorems (without proof). Applications to problems in Electromagnetic Fields. Lectures-10, Marks -20

REFERENCE BOOKS:

1. Erwin Kreyszig :Advanced Engineering Mathematics , John Wiley and sons
2. H.K. Dass : Advanced Engineering Mathematics , S. Chand
3. Wylie C.R. and Barrett : Advanced Engineering Mathematics , Mc Graw Hill
4. B.S. Grewal : Higher Engineering Mathematics , Khanna Publication, Delhi.
5. B.V. Raman : Engineering Mathematics , Tata Mc- Graw – Hill.
6. P.N. Wartikar and J.N. Wartikar : Applied Mathematics (Volume I and II), Pune Vidhyarthi Griha Prakashan, Pune
7. Thomas L. Harman James Dabney and Norman Richer : Advance Engineering Mathematics with MATLAB, Books/Cole, Thomson Learning 2/e
8. Dr. Gokhale, Dr. Chaudhari and Dr. Singh :Engineering Mathematics – III

SEM–III

Electrical Engineering Materials

Teaching Scheme:	Examination Scheme:
Lectures:- 3 Hrs/week	Theory paper :-100
Practical :- 2 Hrs/week	ICA : 25 marks
	ESE:25marks

Unit:-I

Introduction :- Classfication of electrical engineering materials based on atomic structure, hydrogen atom,energy levels, bond and arrangement in solid, quantum numbers and Pauli's exclusion principle. Crystal structure and defects. Semi-conducting materials: Bonds in silicon and Germanium ,their electrical properties. Hall effect,. High resistence materials; Nickel-Chromium alloys, Constantan, Kanthal, tungsten, Molybdenum.

(08 Hrs, 20 Marks)

Unit II

Conducting Materials:Free electrons theory , resistivity of metals,relaxation,collosion time and mean free path. Heat develop in current carring conductor ,Thermal conductivity, wiedmann frenz law, super conductivity,cryotons and other modern application of super conductivity, thermal bimetal,thermocouple materials.

(08 Hrs, 20 Marks)

Unit III

Dielectric properties of insulating material in static field:- static dielectric field, polarisationand dielectric constant ,types of polarization , deravation of expression for orientational polarization, internal field and clausius-mossotti relation, ferroelectricity, spontaneous polarization,piezoelectricity.

(08 Hrs, 20 Marks)

Unit IV

Dielectric properties of insulating material in alternating field: Dependence of polarizability on frequency and temperature. Dielectric by circuit equivalent. Breakdown of insulating material, principles of electric breakdown and factor influencing the breakdown strength. Different type of insulating material used for electric machines,transformer, power cable,capacitors and electronic equipment. Testing of insulating material as per i.s. specification.

(08 Hrs, 20 Marks)

Unit V

Magenetic material:- review of magnetic circuit. Magnetic dipole moment, magnetization, induced dipole moment, classification of the maganetic material , domeain structure, spontaneous magnetization and curie wiesse law ,ferromagnetic and ferrites ,electric sheet steel, hot rolled and cold rolled steel, , permanent magnet material, properties and application of amorphous magnetic material.

(08 Hrs, 20 Marks)

Reference Books

1. A.J.Dekker,Electrical Engineering Materials.
2. S.P.Seth and P.V.Gupta, A course in Electrical Engineering Materials.
3. C.S.Indulkar and S.Thiruvengadam, Electrical Engineering Materials.
4. S.P.Chhaiotra and B.K.Bhat, Electrical Engineering Materials.
5. Electrical Engineering Materials: T.T.T.I Chennai ,TMH.

List of Experiments:-

1.Testing of insulating oil as per I.S.
2.Testing of solid insulating materials as per IS
3. Testing of power capacitors as per IS
4. Measurements of resistivity of conducting materials.
5.Measurements of resistivity of resistive material.
6 .Use of spark gap for measurements of high voltage.
7.To study Seeback and Peltier effects.
8. Study of hysterisis loop of ferromagnetic materials.
9 .Study of various insulating materials.

The term work should include a minimum of eight experiment from the above list.

TERM - I
APPLIED THEMODYNAMICS

Teaching scheme	Examination scheme
Lectures:4 Hrs/week	Theory:100 Marks 3 Hrs
Practicals:2 Hrs/week	Termwork : 25 marks

Unit I

Steam generators. Classification, constructional features of process and power boilers, Boiler mountings and accessories, Equivalent evaporation, boiler efficiency ,energy balance , rankine cycle , work power out put, steam consumption ,rankine efficiency ,method to improve efficiency steam turbine classification ,construction and necessity of compounding of steam turbine (10hrs,20 Marks)

Unit II

Internal combustion engine: classification otto and diesel cycles , construction and working of 2 stoke and 4stoke engines, calculations of IP,BP,FP,BSFC,MEP and a efficiencies, heat balance sheet . engine trial and performance. Study of fuel feeding ignition, starting ,governing ,cooling ,lubrication, exhaust and power Take off

(10hrs,20 Marks)

Unit III

Air compressor : uses of compressed air , classification, construction and working of air compressor, power input , concept of clearance volume , swept volume ,single and multi stage compression ,volumetric and isothermal efficiencies and factors affecting these efficiencies. Necessity of cooling of compressor and compressed air , FAD, air motor ,its use, construction and working (10hrs,20 Marks)

Unit IV

Introduction to heat transfer: various models of heat transfer, fundamental laws of conduction , convection and radiation. Concept of thermal conductivity , heat transfer coefficient and emmisivity, concept of black, gray , white body, use of fins on electrical appliances

(10hrs,20 Marks)

Unit V

Refrigeration and air conditioning: Refrigeration effect and its uses. Vapour compression cycle, calculations of vapour compression, Refrigeration system, coefficient of performance, TR capacity. Common refrigerants and their desirable properties. air conditioner and its requirement. Properties of moist air psychometric chart and its use. Psychometric processes such as sensible heating and cooling, humidification and dehumidification. Study of central air conditioning plant. Refrigeration controls and industrial air conditioning . vapour absorption system. (10hrs,20 Marks)

Reference Books

1. P.K.Nag, engineering thermodynamics,.
2. R.K.Rajput., thermal engineering,
3. Gupta and Prakash,. heat transfer,
4. V.Ganeshan, Internal combustion engine,
5. T.Roy chowdhary. Basic thermodynamics,

List of experiments

Group A

1. Study of steam power plant.
2. Study of boiler mountings and accessories.
3. Study of fuel feeding system of an I.C. engine
4. Study of ignition system of an I.C. engine

Group B

5. Study and trial on petrol engine at one load.
6. Study and trial on reciprocating air compressor.
7. Study and trial on refrigeration system.
8. Study and visit of central air conditioning plant.
9. Determination of thermal conductivity of metal rod
10. Determination of Stefan Boltzmann's constant
11. Calculation of fin efficiency in natural and forced convection.
12. Study and trial on diesel engine at one load.

The termwork should include minimum eight experiments, two from group A and six from group B.

Term-I

AC CIRCUITS AND TRANSFORMERS

Teaching scheme	Exam. Scheme
Lectures-4 hrs/week	Theory paper-100marks (3 hrs)
Practicals-4 hrs/week	Term work-25marks
	Practical-50marks

Unit-I

Polyphase systems-Concepts of Polyphase systems, power in balanced and unbalanced three phase circuits, measurment of power in three phase, three wire and four wire systems, two wattmeter method for balanced and unbalanced three phase, three wire system ,balanced three phase loads,modification of two wattmeter method by using a single wattmeter, use of wattmeter readings for determining power factor of the load and its nature (lagging, unity or leading),effect of load power factor on wattmeter readings, measurements of reactive volt-amperes.

Solution of balanced and unbalanced three phase circuits, star-delta and delta-star conversion of impedances , Millmans theorem and its application for solving unbalanced, star connected circuits. (10hrs, 20 Marks)

Unit-II

Single phase Transformers-constructional details ,arrangements of core and coils in shell type and core type transformer, material used for magnetic cores and windings, EMF equation, voltage and current ratios, concept of leakage flux and its effect, resistance leakage reactance and leakage impedances of transformer windings and their effect on the transformer performance, Exact and approximate equipments circuitr referred to either side, general phasor digrams on load and no load, various losses in transformer,their variation with load ,efficiency, maximum efficiency, transformer rating ,voltage regulation, its determination by direct loading and from equivalent circuits, kapps regulation leakage reactance and impedances. (10hrs, 20 Marks)

Unit III

Polyphase Transformers-connecting a bank of three identical single phase transformer for three phase transformation, construction of shell type and core type three phase transformers, comparison between a bank of three identical single phase transformers and a single three phase transformer .

Standard connections for three phase transformers, their voltage phasor diagrams, phasor groups,sutability of particular connection for suppling unbalanced loads, floating neutral. Parallel operation of three phase transformers, three winding transformers, tertiary winding ,use of tertiary windings in three phase transformers, moving coil voltage regulator ,construction and operation. (10hrs, 20 Marks)

Unit IV

Descriptive treatment of non-sinusoidal waveform of the magnetizing currents of a transformer with sinusoidal applied voltage, sketching this waveform and that of the sinusoidal flux from the B-H curve of the magnetic core , concepts of harmonics and the presence of third harmonics in the magnetizing current of a transformer ,autotransformer and dimmerstat their rating and use., comparision between auto transformer and two winding transformer ,connecting two winding transformer use as an auto transformer,its voltage, current and kva rating as an auto transformer.

Parallel operation of single transformers ,conditions to be satisfied, equivalent circuits and phasor diagrams. Load sharing under various conditions . (10hrs, 20 Marks)

Unit V

Special transformer connections- V and T connection of two single phase transformer for three phase to three phase transformation, their phasor diagrams, applications, scott connection for three phase to two phase transformation and vice-versa ,voltage ratios of the transformers , phasor diagrams of voltage and currents of the input and output sides for balanced and unbalanced loads, application.(4hrs)
Testing of transformers- concept of polarity of transformer windings, standard practice of marking transformer winding terminals ,polarity test using ac supply and voltmeter, polarity test using a battery, tap key and dc galvanometer.
Open circuit and short circuit tests, methods of carrying out the tests and information obtained from these , sumpners test, IS Specifications of transformers, concepts of routing type test, testing of transformers as per IS specifiacations. (10hrs, 20 Marks)

Referance Books

1. M. G. Say , The performance and design of AC machines
2. A. S. Langsdrof , "Theory of AC machinery, second edition", Tata mcgraw hill.
3. Kerchner and Corcoran , AC Circuits, Wiley eastern.
4. Edward Haughes. ,Electrical tech., 6th edition .
5. V.N.Mittle , Basic elect. Engg., Tata mcgraw hill.

List of Experiments

1. Open circuit and short circuit test on a single phase transformer.
2. Polarity test on single phase and three phase transformer 1)using an ac supply and voltmeter 2)using battery, tap key and dc galvanometer.
3. Sumpners test on two identical single phase transformers.
4. Parallel operation of two single phase transformer.
5. Study of connections for three phase transformers.
6. V connection of two single phase transformers on no load and at balanced load.
7. T connection of two single phase transformer on no load and at balanced load.
8. Scott connection of two single phase transformers on no load and at balanced load.
9. a) Study of two wattmeter method for balanced & unbalanced 3-phase loads.
   b) Effect of load p.f. on wattmeter reading in case of balanced laod.

10) Measurement of reactive voltamperers in 3-phase balanced loads.
11) Verification of millmans theorem
12) Study the no-load current waveform of 1-phase transformer on a CRO.

The term work should include a minimum 10 experiments from the above list.

Term-I
Electrical Measurement-I

Teaching scheme:	**Examination Scheme:**
Lectures: 4 Hrs/week	**Theory paper 100 Marks. (3 Hrs)**
Practicals : 2 Hrs/week	**Term work : 25 Marks**

Practical :50 Marks

Unit I

International system of units, dimension of Electrical quantities, Absolute measurements of current and resistance.

Magnetic measurements: Fluxmeter, B-H curve of a ring specimen, hystersis loop, permeameters, Iron loss test at power frequency, effect of voltage, frequency and form factor iron loss, separation of iron losses.

(10 Hrs, 20 Marks)

Unit II

Measurements of resistance : Classification, Ohm meter, ratio-meter, D.C. potentiometer, Kelvin's double bridge, measurements of high restistance, measurment of earth resistance and resistivity, bridge megger and ductor megger, measurement of insulation resistance.

(10 Hrs, 20 Marks)

Unit III

Measuring instruments (General theory) : Static and Dynamic Characteristic of an instrument, accuracy, linearity, reproductivity, sensitivity, resolution, speed of response.

Galvanometer : Construction, deflection, controlling, damping, balancing systems, D'Arsonval, Ballistic and vibration galvanometers.

(10 Hrs, 20 Marks)

Unit IV

Ammeters and Voltmeters : Construction, Principle of operations, torque equations and errors of PMMC, Moving iron and Electro-static instruments. Extension of ranges using short and multipliers.

Instrument transformers : Theory, expression for ratio and phase angle errors. Design consideration and testing. Precautions in using the instruments transformers.

(10 Hrs, 20 Marks)

Unit V

Wattmeters and Energymeters : Construction and principle of operation of electrodynamic and condution type wattmeter. Construction and working of low P. F. wattmeters, Errors and their compensation. Construction and principle of operation and torque equation for the induction type of energymeter. Error and adjustments.

(10 Hrs, 20 Marks)

Reference Books:

1. E. W. Golding. , Electrical Measurements and Measuring instruments.
2. C. T. Baldwin. , Fundamentals of electrical Measurements.
3. Cooper and Derfllick , Electronic instrumentation and measurements Techniques, 3rd edition, Prentice-Hall of India.

List of Experiments :

1. Barlow method of measurements of power using two CT’s
2. Barlow method of measurement of power using P.T.
3. Measurement of the power in 3-phase 4-wire circuit.
4. Calibration of single phase energy meter at different P.F.’s
5. Calibration of three phase two elements energy meter at different P.F.’s
6. Use D.C. potentiometer for calibration of ammeter and voltmeter.
7. Kelvin’s double bridge.
8. Anderson’s bridge.
9. Epstein square.
10. Measurements of phase angle error and ration error of C.T.
11. Measurements of phase angle error and ration error of P.T.
12. Measurement of earth resistance.

The term work should include a minimum ten experiments from the above list.

Term - II

Analog and Digital Electronics

Teaching Scheme:	Examination Scheme:
Lecture: 4 Hrs./week	Theory: 100 Marks(3Hours)
Practical: 2 Hrs./week	Term work: 25 Marks

Practical: 25 Marks

UNIT –I

Introduction, BJT amplifier with reference to operational analysis of CE and CC configuration, FET amplifier , Multistage amplifier, differential amplifier . Operational amplifier, basic configuration differential, inverting ,non inverting, summer and substractor . Op-amp parameters (concept only) CMRR,slew rate , frequency response and gain limitations. (10 hrs,20 Marks)

UNIT- II

Op-amp applications: Integrator , differential , comparator , Schmitt trigger, instrumentation amplifier , precision rectifiers, zero crossing detectors.

Waveform generation using Op-amp – sine, square , saw tooth, and triangular. IC 555 modes of operation-astable, monostable, clock generation. (10 hrs,20 Marks)

UNIT-III

Feedback type of series voltage regulator , protection circuits , fixed and variable voltage regulators using Ics Viz 78xx,79xx,LM723, LM317, study of VCO and PLL.
ADC-sar,dual slope type
DAC-binary weighted ladder type (10 hrs,20 Marks)

UNIT-IV

Flip flop- RS latches, D-latches, edge triggered, D flip flop, edge triggered JK flip flop, JK flip flop, JKmaster slave flip flop opto coupler , opto isolator, opto decoder, opto encoder (10 hrs,20 Marks)

UNIT-V

Buffer register,shift register controlled shift register, ripple counter, synchronous counter, twisted ring counter,N module counter, down counter, up – down counter, three stage registers. (10 hrs,20 Marks)

Reference Books:-

1.Gaikwad R,Operational amplifier, PHI New Delhi
2.K.R.Botkar,Integrated circuit , Khanna Publication,New Delhi

Lab experiments:-

1) Op-amp as square & sine wave generator
2) Op-amp as comparator & Schmitt trigger
3) Instrumentation amplifier using 3 Op-amps
4) IC 555 application – astable, monostable,square wave generator, square counter
5) IC 565/4046 application ,calculation of lock range and capture range
6) Study of JK flip flop
7) A to D & D to A converter using ADC 0808 and DAC 0808
8) Study of up down counter & N-modulo counter
9) Study of IC 723 as low / high voltage regulator
10) IC 7805 used as fixed voltage regulator, elevated voltage and current, constant current source

Term-II

Digital Computational Techniques & Programing.

Teaching scheme:	Examination Scheme:
Lectures: 4 Hrs./ week.	Theory Paper:100 marks((3 Hrs)
Practical: 2 Hrs./ week.	Term work: 25 Marks.

Unit I

Number systems & errors in digital computations; Transcendental & polynomial equations; concept of roots of an equation & methods to find the same. Bisection method,
Secant method, Newton- Raphson method, Muller methods, Regula-Falsi method.
Method of matrix Inversion(Shipley inversion method)

(10Hrs, 20 marks)

Unit II

Linear algebraic simultaneous equations: Cramer's rule,Gauss method, Substitution method (Forward & Backward substitution), Gauss Elimination, Gauss Jordan, Jacobi Iteration, Triangular Factorization (L-U Factorization),Gauss Seidal method.
Non Linear algebraic simultaneous equations: Newton- Raphson method.

(10Hrs, 20 marks)

Unit III

Interpolation: Lagrange & Newton interpolations; finite difference operators, interpolating polynomials using finite differences, Least squares approximation.

(10Hrs, 20 marks)

Unit IV

Differentiation & Integration: Numerical differentiation methods based on interpolation, finite differences, undetermined coefficients. Integration using Simpson's & Trapezoidal rule.

(10Hrs, 20 marks)

Unit V

Ordinary differential equations: Euler's method, Taylor series method, Runge-Kutta methods, and predictor-corrector methods.

(10Hrs, 20 marks)

Reference Books:

1) Jain & Iyengar , Numerical Methods for Scientific & Engineering Computation, 3rd edition, , New Age international.
2) S.K. Gupta , Numerical methods for Engineers, New Age international.
3) Anita, Numerical methods for scientists & Engineers, Tata McGraw Hill.
4) S.S. Shashtry, Introductory methods of Numericals, Tata McGraw Hill.
5) Rajaraman,Numerical methods & computations, Tata McGraw Hill.
6) Yashwant Kanitkar., Let us C.

List of Programs: (To be written in ‘C’ language.)

1) Program to evaluate truncation error in a series.
2) To find roots of polynomial using any iterative method.
3) Solution of simultaneous linear algebraic equations.
4) Evaluation of interpolating polynomial.
5) Differentiation using numerical differentiation.
6) Integration using numerical integration.
7) Solution of differential equations.

The term work should include six programs from above list, executed on the computer.
Note: In theory paper, questions may be asked on numerical methods or algorithms/programs used for solving on the computer.

Term-II

Network Analysis

Teaching Scheme:	Examination Scheme:
Lecturer: 04 Hrs/Week	Paper: 100 Marks(03 Hrs.)
Practical: 02 Hrs/Week	Term Work : 25 Marks
Tutorial: 01 Hr./Week	Practical: 25 Marks

Unit I:

Network Definations , lumped, distributed, linear and non linear, bilateral and unilateral and time variant and time invariant, space variant and space invariant networks, mesh and node circuit analysis concept of supper node and supper mesh, concept of voltage and current divider mutual inductance, dot convention for coupled circuits , concept of duality and dual networks

Topological description of network: Graph oriented graph, Branches, nodes, planner and non planner graph, sub graph, trees and chords.

Network equations: Number of network equations, source transformations, formulation of network equations, loop variable analysis, node variable analysis, determines- minor and gauss elimination method, state variable analysis

Initial conditions in network: Initial conditions in elements, procedure for evaluating initial conditions, initial state of network (10 Hrs,20 Marks)

Unit II

Second order differential equation- internal excitation, solution and initial conditions, network excited by external energy source, solution and initial conditions.

Laplace Transformation: Transforms of linear combinations, transforms of derivatives, transforms of integrals, solution of problem with laplace transformation, partial fraction expansion, Heavisides expansion theorem, Example of solution by laplace transmission, laplace transforms of standard functions, shifted waveforms – unit step, ramp and impulse, initial and final value of f(t) from f(s). (10 Hrs,20 Marks)

Unit III

Impedance functions and network theorems: Concepts of complex frequency, transform impedance and transform circuits, series and parallel combinations of elements, super position and reciprocity theorem, Thevenin's and Norton's theorem and Milliman's and Tellegn's theorem and maximum power transfer theorem.

Network functions, poles and zeros : terminal pairs of ports, network functions for one port and two port network, impedance (or admittance) function, voltage transfer function, transfer impedance, transfer admittance, calculation of network function, lader network, bridge T , parallel T and Lattice networks, poles and zeros of network functions, restrictions on poles and zero location of driving point function- transfer function, time domain behaviour from pole zero plot. (10Hrs,20 Marks)

Unit IV

Two-port parameters : z parameter , y parameter, h parameters, transmission (abcd) parameter, relation between various parameters, inter connection of two port network,

cascade connection of two port network, parallel connection of two port network, series connection and series parallel connection of two port network.
Fourier series and signal spectra: Fourier series, evaluation of Fourier coefficients, waveform symmetries as related to Fourier coefficients, exponential form of Fourier series. (10Hrs,20 Marks)

Unit V
Sinusoidal steady –state analysis : Sinusoidal steady state , sinusoid and e+,solusition using e+jwt, phasor diagram, analysis of series resonating and parallel resonating R-L-C circuit, Q factor resonance frequence and band width of the series resonating and parallel resonating R-L-C circuit, power, power transfer and insertion loss : energy and power, average and complex power, optimizing power insertion loss, (10 Hrs,20 Marks)

Reference Books :

1. M.E. Van Valkenberg ,Network Analysis , third edition, Printice Hall of India.
2. William Hayt, Jack Kemmerly,Engineering circuits analysis, fifth editions, McGraw Hill International edition.
3. D. Roy Choudhary,Networks and systems, New Age International.
4. Franklin Koo, Network analysis and Synthesis, New Age International
5. Shyam Mohan and sudhakar, Network Analysis, TMH Publications.

List of Experiments:

1. Verifications of Thevenin’s Theorem for two port network.
2. Verification of Norton’s Theorem for two port network.
3. Verification of Superposition Theorem for two port network.
4. Pole and Zero plot of one port network.
5. Measurement of Z parameter of two port network.
6. Measurement of Y parameter of two port network.
7. Measurement of ABCD parameter of two port network.
8. Two plot frequency response of series RLC circuit.
9. Two plot frequency response of parallel RLC circuit.
10. To study power transfer and insertion loss.

The termwork should include minimum eight experiment from the above list.

Term -II

Electrical Machines-I

Teaching scheme:
Lectures:4Hrs/week
Practical: 25 marks

Examination scheme:
Theory Paper:100 marks(3hrs)
Practical:2Hrs/week
Term work: 25 marks

Unit -I

D.C .Machines: Construction of field system, flux distribution and fringing, magnetic leakage, magnetization curve, construction of armature and its main parts, commutator,
Brush rockers and brush gears, type of armature windings type of enclosures

D.C.generator: Basic principles of working e.m.f. Equation, types, characteristics and applications of different types of d.c.generator. building up of e.mf .in d.c. shunt generator and causes of failures, remedies (10 Hrs, 20 Marks)

Unit-II

D.C.Motors:-Basic principles of working,significance of back e.m.f. torque equation,types,characteristics and applications of different types of d.c. motors,starting,
Reversing and speed control by armature voltage and field control.and starers. Armature reaction in d.c. machines,effect on field with and without brush lead,
Effect of saturation ,demagnetising and crossmagnetising mmfs and their estimation,remedies to overcome armature reaction (10 Hrs, 20 Marks)

Unit –III

Process of commutation, types of commutation, reactance voltage, straight line commutation,with variable current density,under and over commutation ,causes of bad commutation and remedies. Interpoles,compensating windings

Losses and efficiency of d.c.machines, condition of maxium efficiency and maximum power output,effect of saturation and armature reaction on losses

Testing of d.c.machines: insulation resistance test ,break test,Swinburne's test,regenerative test on series and shunt motors,separation of various losses,retaration test,heat run and temperature rise test , commutation test,armature faults,types of routine tests according to I.S.I.specification. (10 Hrs, 20 Marks)

Unit-IV

Poly phase induction machines:-construction ,production of rotating magnet fields,
Principles of working,induction motor as grneralised transformer,simplified theory with constant flux,slip,rotor e.m.f.,current,.power,torque relations,torque slip characteristics,condition for maximum torque ,exact and approximate equivalent circuit,circle diagram computation,experimrntal test for ploting circle diagram

(10 Hrs, 20 Marks)

Unit-V

Methods of starting of slipring and cage rotor induction motor,varies types of starters,high starting torque squirrel cage motors,double squirrel cage motors,industrial applications of different types of motors,cogging,crawling and noice production in induction motor

Speed and power factor control of motors: -Rheostatic speed control,phase advancers,speed adjustment by pole changing,speed control by change of frequency,cascading.
Induction voltage regulators,induction generator.test as per I.S.I.specification.

(10 Hrs, 20 Marks)

Reference Books: -

1) E.W.Clayton.Design and performance of d.c.machines-
2) M.G.Say. Design and performance of a.c.machines-
3) Langsdorf A.C.machines,TMH.
4) P.C.Sen. D.C.machines- - Langsdorf,TMH.
5) Nagrath and Kothari Electric machine –TMH

Lists of experiments.

Group A

1) Determination of magnetization ,external and internal characteristics of d.c. shunt generator.
2) Determination of magnetization ,external and internal characteristics of d.c. series generator.
3) Determination of external characteristics of d.c. compound generator.as 1) differtial compound ii) cumulative compound generator.
4) Speed control of D.C shunt motor by armature and field control
5) A) Study of 3 and 4 point starters B) Reversal of motor rotation.
6) Load test on d.c.shunt motor.

Group B

7) Load test on induction motor
8) Determination of performance of induction motor from circle diagram.
9) Study of induction motor starters.
10) Speed control of slip ring induction motors using rotor resistance method.
11) Determination of equivalent circuit from no load and blocked rotor test On induction motor.

The term work should include minimum eight experiments (four from each group A and B)

Term-II
POWER SYSTEM -I

TEACHING SCHEME: Examination scheme:
Lectures:4 Hrs/week Paper: 100 Marks(3Hrs)
Term work: 25Marks

UNIT I:

Generation: types of generating plants, basic requirements, site selection, principle of working ,main components and auxiliary components ,schematic block diagram and role played by each block for Hydro ,thermal, nuclear plants using conventional fuels.

(10 hrs,20 Marks)

UNIT II:

Non-conventional sources of energy: like solar, tidal, MHD, fuel cells, geo-thermal energy, principle of working, main components and auxiliary components, schematic block diagram and role played by each block

(10 hrs,20 Marks)

UNIT III:

Power plant terminology: load, demand. Classification of power plants as Base load Peak load & Intermediate load plants. Hydrograph, Flow duration curve. Load curves, Load duration curve , Load factors , Demand factor , Diversity factor, Plant capacity factor, Plant use factor.

(10 hrs,20 Marks)

UNIT IV

Major electrical equipments in power plants: descriptive treatment of ratings, special features, field of use of equipments like alternators, transformers, busbars, exciters, and excitation systems, control panels, metering and control room equipments in generating stations.

(10 hrs, 20 Marks)

UNIT V

Transmission : Importance of 3 phase overhead transmission lines in power systems & factors to be considered while planning their layout. Resistance, skin effect, Inductance and its estimation for two-wire-single-phase, 3-wire-3-phase, single and double circuit lines, with and without transposition, equal/unequal and horizontal spacing. Circuit representation of lines: Classification of lines based on length as short, medium & long transmission lines. Representation of transmission line as tee & pie ckts using r-l-c parameter, voltage and current relation of short & medium transmission line (10 hrs,20 Marks)

Reference Books: -

1. B.R.GUPTA, Generation of electrical energy, S Chand publication
2. William Stevenson ,Elements of Power System Analysis M-H international addition
3. OllE Elgerd, Electrical energy system theory second edition, TMH.
4. J.B.Gupta A course in electrical power system, Dhanpat Rai and sons’ Publication.

NORTH MAHARASHTRA UNIVERSITY, JALGAON

SE (ELECTRICAL) REVISED SYLLABUS TERM-II

(WITH EFFECT FROM JULY 2006)

ELECTRICAL WORKSHOP

Teaching scheme:	Examination Scheme:
Practical: 2 Hours/week	Term Work: 50 Marks

1) **Study of different wires** – size of wires, standard wires, TRC and CTS wires, weather proof wires, Flexible wires.
2) **Study of wiring accessories-** Types of switches, types of lamp holders, ceiling rose, mounting blocks, socket outlets plugs, wooden boards, main switches (ICDP/ICTP), Junction boxes, Distribution boxes, Fuse boards, fuses.
3) **Lamp circuits-** Simple circuit, series parallel circuit, Motor switches circuit.
4) **Underground Cable-** Fiber optic cable, Cable insulation, Types of three Phase cable, Cable joining, Coaxial cable, Twisted pair cable, Flat ribbon cable.
5) **Study and use of DC / AC voltmeter-** Study and use of DC/AC ammeter.
6) **Study and use** of Analog multi-meter to measure electrical quantities. Study and use of Digital multi-meter to measure electrical quantities.
7) **Study and use** of Megger.
8) **Electrical Shocks and safety precautions**.
9) **Industrial Visit-** Electrical substation, electrical workshop, electrical process industries (minimum two visits) and its reports.

Reference Books-

1) S L Uppal ,Electrical wiring, Estimation and Costing

2) Surjit Singh, Electrical wiring, Estimation and Costing

3) S K Bhattacharya, Electrical wiring, Estimation and Costing

4) B R Gupta, Electrical wiring, Estimation and Costing

Faculty of Engineering & Technology

।।अंतरी पेटवू ज्ञानज्योत।।

NORTH MAHARASHTRA UNIVERSITY, JALGAON.

Syllabus For

THIRD YEAR ENGINEERING (T.E.)

ELECTRICAL ENGINEERING

TERM- I & II

(W.E.F.2007-2008)

NORTH MAHARASHTRA UNIVERSITY, JALGAON
STRUCTURE OF TEACHING AND EVALUATION
T.E.(*ELECTRICAL ENGINEERING*)
FIRST TERM
W.E.F. 2007-08

Sr. No	Subject	Teaching Scheme Hours/week			Examination Scheme				
		Lectures	**Tutorial**	**Practical**	**Paper Duration Hours**	**Paper**	**TW**	**PR**	**OR**
1	Electrical Installation, Estimation and Distribution	4	--	2	3	100	25	--	--
2	*Electromagnetic Engineering	4	1	--	3	100	25	--	--
3	Power System-II	4	--	2	3	100	25	25	--
4	Electrical Machines-II	4	--	2	3	100	25	25	--
5	Microprocessor and Micro controller	4	--	2	3	100	25	25	--
6	Software Applications	--	--	2	--	--	50	--	--
	Total	**20**	**1**	**10**	**--**	**500**	**175**	**75**	**--**
	Grand Total	**31**			**750**				

SECOND TERM

Sr. No	Subject	Teaching Scheme Hours/week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Power Electronics	4	--	2	3	100	25	--	--
2	Electrical Measurement-II	4	--	2	3	100	25	25	--
3	Control System-I	4	--	2	3	100	25	25	--
4	Electrical Machine Design-I	4	--	4	3	100	50	--	25
5	Industrial Organization and Management	4	1	--	3	100	25	--	--
6	Practical Training / Mini Project / Special Study	--	--	2	--	--	25	--	--
	Total	**20**	**1**	**12**	**--**	**500**	**175**	**50**	**25**
	Grand Total	**33**			**750**				

* Common with TE (Electronics, Electronics and Communication, Electronics and Telecommunication).

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F : 2007- 08
TERM – I

Electrical Installation , Estimation and Distribution

Teaching Scheme	**Examination scheme :**
Lectures : 4 Hrs/ week	**Paper :** 100 marks (3Hrs)
Drawing : 2 Hrs / week	**Term work :** 25 marks

Unit I

Supply Systems : typical transmission and distribution system from generation to utilization (overall layout). A.C. transmission , d.c. transmission and comparison between them .

Types of transmission : overhead transmission , underground transmission and comparison between them.

Various systems of transmission: dc systems –two wire dc, two wire dc with midpoint earthed, dc three wire system; single –phase systems – single –phase two wire , -single phase two wire with midpoint earthed , single phase three wire system; two –phase ac systems ; two phase three wire system, two phase four wire system ; three phase a.c. system- three phase three wire system, three- phase four wire system.

Cost of conductors in overhead and underground systems.

Different types of tariffs. **(10 Hrs. : 20 marks)**

Unit II

Overhead transmit line components : The support –poles , towers , and their types ; cross arm and clamps ; guys and stays. Conductors-characteristics of conductor material , types of conductor- solid conductor , bundle conductor, concentrically standard conductor (AAC, ACAR conductor). Insulators – types (pin , strain, shackle and suspension insulator), comparison between them, requirement of material, failure of insulators, testing and protection od insulators..

Fuses –types and operation .

Underground cables ; classification , construction of cable, requirements of insulating materials , insulation resistance , capacitance dielectric stress in single-core/multi-core/ sheathed /armored cables. Grading cables – capacitance grading and inter sheath grading. Causes of failure of underground cables, cable faults and location of faults.

(10 Hrs. : 20 marks)

Unit III

Earthing : Neutral Earthing methods-solid ,resistance ,reactance, voltage transformer, zig-zag transformer .

Design of distribution system : A.C. distribution – service mains design , design of radical and ring distributors for concentrated , distributed loads and combination of both types of loads, feeder design based on Kelvin’s law Lamp Flickers-types and design, Application of capacitors to distribution system. **(10 Hrs. : 20 marks)**

Unit IV

Alarm and timer circuits ; basic alarm circuits for audible and visible signals, types of timers, time sequence charts for reset and sequential timers, time delay relay circuits, thermal time delay and electronic time delay relays, contactors.

Control panel : Introduction , advantages , symbols used on control panels, types of control panel, control panel components , toggle switches , controllers, timers, relays, protection circuits; introduction to SCADA and PLC panels ,distribution automation

(10 Hrs. : 20 marks)

Unit V

Illumination : nature of light , definitions –plane angle , luminous flux luminous intensity , illuminance and their units, luminous efficiency ; laws of illumination – inverse square law and Lambert's cosine law , polar curves.

Requirements of good lighting scheme: Polar curves, direct, indirect , semi direct , semi-indirect lighting.

Design of lighting scheme : factors to be considered , working plane space to height ratio, absorption factor, maintenance factor , depreciation factor , coefficient of utilization ; design of illumination schemes for industrial workshops assembly halls, street lighting.

Design of flood lighting schemes: factors like reflection factor , waste light factor and beam factor and design of such schemes for typical installation.

Design and Estimation : design and estimation of installation of domestic , commercial , industrial heads as peer IE rules and IS 732 ; design and estimation of town or village electrification schemes as per IE rules and IS 732 **(10 Hrs. : 20 marks)**

Drawing sheets;

1. Transmission line components : Five insulators –one piece pin, three piece pin type , suspension insulator (one disc) string insulator (one disc), shackle insulator; towers for single circuit and double circuit lines; lightening arrestor, stays, clamps, pin; typical pole including service mains, HT, LT lines supporting pole , 'H' type pole.
2. Distribution substation; Two views (front view and side view) of distribution substation layout ; single line diagram, pipe earthing , plate earthing.
3. Wiring diagrams and symbols**:** minimum 25 symbols as per IS standards.
   Any four circuit diagram out of the following: 1 Rotor resistance starter, 2. Scooter /motor cycle electric wiring diagram,
4. Lift (passenger /goods) or crane, 4. Automatic star /delta starter, 5. Auto synchronous motor starter, 6. Battery charging circuit, 7. Maximum demand indicator.
5. Project on illumination design of laboratory / workshop or small scale industrial establishment along with estimation.
6. Project on electrification of given area showing distributors , feeders and substations along with estimation.

The term work should include five drawing sheets and reports based on the above topics.

References

	Author	Name	Publisher
1.	J.B.Gupta	Transmission and Distribution	S.K.Kataria and Sons, New Delhi.
2.	S.L.Uppal	Electrical Wiring , Estimation and costing	Khanna Publishers, New Delhi.
3.	W.N.Alerich	Electric motor control	D.B.Taraportwala and Sons, Mumbai
4.	S.L.Uppal	Electric Power	Khanna publishers, New Delhi.
5.	H.Pratap	Art and Science of Electrical Utilization	Dhanpat Rai and Sons, New Delhi.
6.	B.D.Arora	Electric Wiring, Estimating and Costing	New Heights, New Delhi

7. I.E.Rules.
8. Practical Relay Circuits, Frank J.Oliver, D.B. Taraporewala and Sons , Mumbai -1

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRONICS, ELECTRONICS and COMMUNICATION, ELECTRONICS and TELECOMMUNICATION,ELECTRICAL)
W.E.F : 2007- 08
TERM – I

ELECTROMAGNETIC ENGINEERING

Teaching scheme:	**Examination scheme:**
Lectures : 4 hrs/week	Theory Paper : 100 Marks (3 Hrs).
Tutorial : 1 hrs/week	**Term Work : 25 Marks**

UNIT – I

Electrostatics:- Coulomb's law, Electric field due to line charge, Sheet charge and volume charge densities,
Electric flux density, Gauss's law and Divergence theorem. Energy, Potential and Work-done, Potential
gradient. Dipole and its electric field, Dipole movement. Energy density in electrostatic field.
Lectures-10, Marks -20

UNIT-II

Conductor, Dielectrics and Capacitance:- Current and current density. Current continuity equation, Properties of conductors, Boundary conditions (C.D.I. and D.D.I.). Energy stored in capacitors, Poisson's and Laplace's equation's, Capacitance between parallel plates and co-axial cable using Laplace's equation. **Lectures-10, Marks -20**

UNIT-III

Magnetostatics:- Biot-Sarverts law and its vectorial form, Magnetic field due to infinitely long current carrying conductor ,Ampere's Circuital law. Application to co-axial cable. Curl operator, Magnetic flux density, Stoke's theorem. Scalar and Vector magnetic potential. Lorentz's Force equation. Energy stored in magnetic field. **Lectures-10, Marks -20**

UNIT-IV

Time Varying Fields:- Faradays law , Maxwell's equations (Differential , Integral and Phasor forms). Uniform plane waves. Representation of wave motion in free space, perfect dielectrics and Lossy dielectrics (Wave equations). Pointing Theorem and Power density. Propagation in good conductor and Skin effect. Reflection of Uniform plane waves. VSWR.
Impedance matching ,Single stub and Double stub transmission line. Introduction to Smith Chart. **Lectures-10, Marks -20**

UNIT-V

Radiation and antennas: - Radiation resistance. Radiation pattern. Calculation of Radiation resistance for short dipole, Short monopole, Half-wave dipole and Quarter-wave monopole antennas. Directivity, Reciprocity between Transmitting and Receiving antennas, Hertzian dipole, Vector retarded potential.
Types of Antennas: - Folded dipole, Yagi-uda, Horn antenna, Parabolic and Cassegrain feed antenna. Broadside, End fire, Binomial, Tchebysheff antenna arrays. Principle pattern multiplication, General pattern of two isotropic radiators,. **Lectures-10, Marks -20**

REFERENCES:

1) **"Engineering Electromagnetic" by W. Hayt, TMH. (5th or 7th edition).**
2) **"Antenna and Wave Propagation" by K. D. Prasad , Satya Prakashan.**

Topics	Reference No / Name and Author	Lectures
Unit-I	1(Hayt)	10 Lectures
Unit-II	1(Hayt)	10 Lectures
Unit-III	1(Hayt)	10 Lectures
Unit-IV	1 and 2 (Hayt) and K. D. Prasad	10 Lectures
Unit-V	1(Hayt) K. D. Prasad	10 Lectures

Termwork:- Assignment for the termwork will be based on the problems on each unit (min.FIVE Assignment).

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F : 2007- 08
TERM – I
POWER SYSTEM-II

Teaching scheme:	**Examination scheme:**
Lectures-4 hrs/week	**Theory scheme**: 100 marks (3hrs)
Practical: 2 hrs/week	**Term work**: 25 marks
	Practicle: 25 marks

Unit-I

Introduction: - Growth of national and international power system, constituents of power systemand role, role of digital computers in operation control and analysis of power system, different aspect of power system analysis and necessity ,relationship, and use of both under normal and abnormal condition .

Complex power: Real, reactive , complex power component, load on system and it's composition, nature and variation, load voltage frequency ,real power load frequency, real power load voltage frequency, reactive power load voltage dependency and method of voltage control. **(10 hrs, 20 marks)**

Unit-II

Long transmission line: V/I relation, hyperbolic equation, ABCD constants, propagation constant, surge impedance and loading, incident and reflected voltage/ current efficiency and regulation on load, equivalent " T " and " π " models, Ferranti effect.

Power system model: Single line impedance and reactance diagrams and their use, PU system, relation, selection of base, reduction of common base and advantages, application of impedance diagrams, representation and modeling of 3 winding transformer,

(10 hrs, 20 marks)

Unit-III

Symmetrical Fault analysis:- 3 phase s.c. analysis of unloaded alternator – subtransient, transient and steady state current , impedances , dc offset ,effect of instant s.c. on the waveforms ,estimation of fault currents with and with-out pre fault current for simple power system ,selection of circuit breakers and current limiting reactors.

Unit-IV

Unsymmetrical Fault analysis: method of Symmetrical components, relationship, advantages, representation of power system by positive, negative, zero sequence diagrams with p.u. values, nature of sequence impedances, L-L, L-G, L-L-G Fault analysis of unloaded , pre-loaded , alternators and simple power system with and with –out Fault impedances.

(10 hrs, 20 marks)

Unit-V

Load flow analysis: Development of mathematical model of simple system by network reduction, nodal voltage/mesh current forms, concept of Z and Y matrices and their ,relation Concept of Load flow analysis, formulation of power flow equations (PFE's) consideration of constraints, bus classification in adopting final strategy solution of power flow equations, outline of Gauss, Gauss seidal and N-R method to solve non linear equations in the form of power flow equations. **(10 hrs, 20 marks)**

References:-

1. W.D. Stevenson – Elements of Power System Analysis, Tata McGrawHill
2. Olle I. Elgard, Introduction to electrical energy system theory, Tata McGraw- hill.
3. I. J. Nagernath, D. P.Kothari, Modern power system Analysis,Tata McGraw hill.
4. B. R. Gupta , Power system analysis and Design,

List of Experiments;

1. Measurements of ABCD constants of long transmission line and plotting of circle diagram to estimate performance parameters.
2. The effect of VAR compensation on receiving and voltage profile of transmission line using capacitor bank.
3. Determination of steady state power limit of a transmission line.
4. Measurement of sub-transient reactance of salient pole synchronous machine by static/Dalton- Cameron method.
5. Study of load flow on a three-bus power system using A.C. network analyses or by actual simulation.
6. Measurement of sequence reactance of a synchronous machine.
7. Fault analysis for symmetrical 3 phase fault by simulation or by ac dc analyzer
8. Unsymmetrical fault analysis for LL,LG, LLG FAULT ON A.C / D.C network analyzer.
9. Computer- added solution of a 3 bus load flow problem using gauss seidal method
10. Formulation of " Y bus " matrix using computer program.

The term works should include a minimum eight experiment from the above list.

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F : 2007- 08
TERM – I

Electrical Machines-II

Teaching Scheme:	**Examination:**
Lectures: 4Hrs./Week	Paper:100 marks
Practical: 2Hrs./Week	Termwork:25 marks
	Practical: 25 marks

Unit-I

Synchronous machines:- Principle of generator action and motor action ; construction – rotating field type ; rotating armature type ,salient pole type , Arrangement of armature winding, E.M.F. equation , winding factors.

3 Ø Synchronous generator :- Alternator on- load ,no load condition; effect of armature current ; armature reaction ;resistance drop; Concept leakage flux; and leakage reactance; armature reactions rotating m.m.f.;production of electromagnetic torque; concept of synchronous reactance and synchronous impedance.

Unit-II

Voltage regulation –definition; regulation by direct load testing, short circuit ratio. Regulation of non salient pole alternator by synchronous impedance method; (e.m.f. method); m.m.f. method; potier triangle; and A.S.A.method.

Two reaction theory for salient pole machines, direct axis and quadrature axis reactance; their determination by slip test; phasor diagram of salient pole alternator and calculation of regulation.

Power: - power angle relation for non salient pole machines and salient pole (steady state power angle charct.) losses in alternator and efficiency.

Unit-III

Parallel operation of alternator: alternators working single and alternator working with infinite bus bar Parallel operation of alternator; load sharing between 2 parallel alternators.

Parallel generator theorem- synchronizing –lamp method and use of synchroscope, synchronizing torque; operating chart of alternator working with infinite bus bar.

Time period oscillation. an alternator connected to infinite bus bar working as motor ,if prime mover is failed. Representation of syn. M/c in a power system network

Unit-IV

Synchronous motors:- motor action , phasor diagram on the basis of synchronous impedance, expression for gross mechanical power develop; power flow. Operatation with const. Load and variable excitation : locus of tip of current phasor under the above condition and v curve

Operatation with const. exciation and variable load : locus of tip of current phasor circle phasor. Starting method, hunting and it causes and remedies.

Unit-V

Harmonics- Concept of time and space harmonicsand their generation, effect of harmonics on performance of synchronous machines, remedies.

1 Ø Induction motors- construction, rotating field theory, equivalent circuitand T-N characteristics, test to determine equivalent circuit parameters.

Types, constructions, connections, T-N characteristics, comparison with 3 Ø I.M.;

Special purpose machines:- universal motor, repulsion motor, reluctance motor, hystresis motor, printed circuit motor, linear induction motor,.

REFERENCES

Author	Name	Publisher
M.G.Say	Performance and design of A.C.machine	ELBS.
A.S.Langsdort	Theory of alternating current machinery , Second edition	Tata McGraw - Hill
Nagrath and Kothari	Theory and Problems of Electrical machines	Tata McGraw – Hill
E.D.Taylor	Performance and Design of A.C.Commutator	ELBS
S.K.Bhattacharya	Electrical machines Second Edition	Tata McGraw – Hill

List of Experiments:

1. Direct loading test on three phase alternator.
2. O.C. and S.C. test on alternator: determination of its regulation by e.m.f. method and m.m.f. method.
3. Zero power factor test on alternator: regulation by Potier method and A.S.A. method.
4. Slip test on salient pole synchronous machine: determination of direct and quadrature-axis synchronous reactance and hence regulation by two reaction theory.
5. Synchronizing alternators: lamp methods and use of synchroscope.

Group B :

6. V- Curves of synchronous motor at constant load.
7. Load test on synchronous induction motor or synchronous motor at constant excitation.
8. Study of various types of single-phase induction motors.
9. No load and blocked rotor tests on capacitor – start single –phase induction motor and determination of parameters of equivalent circuit.
10. Load test on single phase induction motor.

The term work should include a minimum of eight experiments four each from groups A and B of the above list. The term work marks will be based on performance in theory and practicals having a weightage of 40 % and 60 % respectively.

MICROPROCCER &MICROCONTROLLER

Teaching scheme:
Lectures-4 hrs/week
Practical: 2 hrs/week

Examination scheme:
Theory scheme: 100 marks (3hrs.duration)
Term work: 25 marks
ORAL: 25 marks

Unit-I

8085 Intel microproccer: Organization, architecture, Generation of control signal,Addressing mode, Instruction format , Instruction set, classification of instructions, interrupt.- interrupt structure , Assembler , types of Assembler.

(10 Hour, 20 marks)

Unit-II

stack , subroytine, types of subroutine , Programming in assembly language, Programms on 8085, data transfer technique, -synchronous & asynchronous, interrupt driven data transfer, and polling data transfer, parallel data transfer ,memory organization & interfacing, chip capacity, memory module, address space,. Memory specification, Types of memory- ROM, RAM, PROM, EPROM, EEPR0OM, static & dynamic.

(10 Hour, 20 marks)

Unit-III

Study of common peripheral devices, their architecture & different modes of operation- 8255 PPI, mode 0, 1, BSR mode, ; 8279 keyboard display interface, , 8155, static RAM, I/O ports, timers. DMA controller 8257 **(10 Hour, 20 marks)**

Unit-IV

8086 Microproccesor- architecture, memory segmemtation,parrelel processing, addressing modes,reviw of instruction set of 8086.
D to A – types, Ladder, R-2R
A to D converters, SAR type, dual slope. **(10 Hour, 20 marks)**

Unit-V

Microcontroller-

Signal description of 8051, register set of /8051, timmer & modes i/o port strucher.
Microproccer Applications in –b power system, measurement of voltage, frequency, power factor, Electrical drives- stepper motor control, D.C. motor speed control,

(10 Hour, 20 marks)

REFERENCE:

1. Microproccer Architecture, programming, & Applications with 8085, third edition, R.S.Gaonkar.
2. 8085 Assembly languages programming Leventhal, McGraw hill
3. Microproccer & digital system second edition, Douglas V. Hall McGraw hill
4. Fundamental of Microproccer & Microcomputers B, Ram, Dhanpat Rai & co.
5. Microprosser & interfacing programming& hardware.D.V.hall McGraw hill

List of Experiments-

1. Study of Architecture of 8085. Microproccer & write program of 8 bit addition & subtraction.
2. Instruction set of 8085. & write program of 16 bit addition & subtraction.
3. write program for asending/ desending/comparision of given number.
4. study of different memories & write program of block transfer.
5. Study of 8255 PPI
6. Study of 8253 PIT
7. Study of D/A & A/D converter.
8. Study of 8259 interrupter controller.
9. Study of Architecture of 8086.
10. Applications in power measurement
11. Applications in Electrical drives speed control
12. Study of micro controller based system.

The term work should contain minimum 8 experiments from above lists

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL) W.E.F 2007--2008
TERM - I
SOFTWARE APPLICATION – I

Teaching scheme: **Examination scheme:**
Practical : 2 hrs/week **Term Work : 50 Marks**

Objectives:
To make the students aware of:
1. Programming practice in C for numerical methods .
2. Use of application specific software tools in the design development simulation and testing of electronic circuits .
3. Use of mathematical software packages for understanding and modeling electrical signals and linear systems .

Section- A : **Numerical computational techniques**:
Instruction of following techniques assited by C programme/ function implimentation of at least THREE of them is expected .
Solution of transcendental &polynomial equation, bisection method,Newton Raphson ,secant, successive methods, solution of linear equations using Gauss elimination .Gauss-Jordan methods Newton's forward and backward difference equations, interpolation, numerical integration and differentiation: trapezoidal rule Simpson's 1/3 and 3/8 rule, Euler's Method.

List of suggested assignments:
1: Program to solve numerical methods : bisection method, Newton Raphson method using users defined functions. Functions should incorporate parameter passing techniques.
2. Program using Functions to solve differential equations by Euler's modified method.
3. Program using Function to find integration by Simpson's 1/3 and 3/8 method.

Section B: Simulation of typical circuits using circuit simulation tools
(1) Two stage amplifiers.
(2) Series regulatator.
(3) Combinational Logic
(4) Timer Circuit

REFERENCES:
W H Hayt / J E Kemmerly / S M Durbin : Engineering circuit Analysis, TMH 6/e

Note: Term work should be based on minimum **FIVE** assignments, **THREE** from section **A** and TWO from section **B .**

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F : 2007- 08
TERM – II
POWER ELECTRONICS

Teaching scheme:	**Examination scheme:**
Lectures-4 hrs/week	**Theory scheme**: 100 marks (3hrs.)
Practical: 2hrs/week	**Term work**: 25 marks

Unit-1
Modern Power Semi-conducting Devices: Introduction, Basic Structure, ON-OFF Control and Operational Charact. and Applications. Viz;
Gate Assisted Turn-off Thyristors (GATT), Bi-directional Diode Thyristors (DIAC), Bi-directional Triode Thyristors (TRIAC), Silicon Unilateral Switch (SUS), Silicon Controlled Switch (SCS), Insulated Gate Bipolar Transistor (IGBT), Metal- Oxide Field Effect Transistor (MOSFET), Programmable Unijunction Transistor (PUT), Light Activated Silicon Controlled Rectifiers (LASCRs), Gate Turn Off Thyristors (GTO), Static Induction Thyristors (SITH), Field Controlled Thyristors (FCT), MOS Controlled Thyristors (MCT). **(10 Hours, 20 marks)**

Unit-2
Thyristors: Principle of Operation, Operating Charact. of SCR, Turn on Methods, di / dt , dv/dt Protection,
Commutation: Forced and Natural, Classification of Forced Commutation- Class A, Class B, Class C, Class D, Class E, Class F. Gate Triggering Circuits- R, RC, UJT Triggering.
Internal Power Dissipation and Temp. rise, Multi-Connections of SCRs. Series, Parallel connection, String Efficiency, SPICE Thyristor model.
(10 Hours, 20 marks)

Unit-3
Full Wave controlled Rectifiers: M-2 and M-6 Connections, Bridge Circuits, Single Phase B-2 Connection, Three Phase B-2 Connection, Analysis of Bridge Circuits, Half Controlled Bridge Circuits, Single Phaseand Three Phase, Analysis of Line Commutated Control rectifiers, Input-Output Charact. Effect Source Impedance and Load Impedance, Effect of Overlap angle, Inter-Phase Reactor Connection.
Power Factor Improvement: Phase Angle, Symmetrical Angle, PWM.
(10 Hours, 20 marks).

Unit-4
Inverters: classification, Series inverter, Parallel inverter, Single Phase and Three Phase Current Source Inverters (CSI), Voltage Source Inverters, Bridge Inverters With Conduction modes, Inverter Fed Induction Motor with V/ F Control.
Dual Converters : Principle of Operation Ideal and Non-ideal, Dual Converters With and Without circulating current Schemes.
Cycloconveters: Principles, Single Phase Cycloconveters, Control Circuit.
(10 Hours, 20 marks

Unit-5

Dc Choppers: Basic Principle of Operation, Step Up / Step Down Chopper, Chopper Configuration, Class A, Class B, Class C, Class D, Class E, Multi-purpose Choppers.
Ac Choppers: Single Phase and Three Phase with R, RL Load.
Frequency Changer, Doubler, Tripler, High Frequency Conversion.
AC Regulators: Single Phase Half and Full wave R,RL load, Three Phase AC regulators.
Solid State Speed Control of Dc motors: Chopper fed Separately Excited DC motors.

(10 Hours, 20 marks)

References:

1) M. Rashid, Power Electronics, PHI Pub.
2) M.D. Singh and Khanchandani, Power Electronics, TMH Pub.
3) M. Rammamurty, An Introduction to Thyristors and its Applications, East-West Press.
4) Shingare, Industrial and Power Electronics, Electo-Tech. Pub.

List of practical

1) Triggering Circuit of SCR
2) Characteristics of SCR,MOSFET,
3) Commutation circuit class C, class D
4) Single phase full wave controlled rectifiers R, R-L characters tics
5) Single phase semi-converter
6) Three phase full wave controlled rectifiers
7) Step up chopper
8) Step down chopper
9) Series and parallel inverter
10) Three phase inverter

Minimum eight experiments out of ten are to be conducted.

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F : 2007- 08
TERM – II

ELECTRICAL MEASUREMENT-II

Teaching scheme:	**Examination scheme:**
Lectures-4 hrs/week	**Theory scheme**: 100 marks (3hrs.)
Practical: 2 hrs/week	**Term work**: 25 marks
	Practical: 25 marks

Unit-I
A .C. Bridges : classification, Maxwell, Anderson ,hay, Schering, Campbell,and wein bridge ,accessories and errors ,Special measuring instruments- construction and principles of 1 Ø and 3 Ø p.f.meters ,frequency meters ,synchronoscope, trivector meter , max. Demand indicators, multimeter, C.R.O. **(10 hours, 20 marks)**

Unit-II
Introduction to instrumentation: definition, purpose, measurement – definitions, types and classification of instruments, generalized measurement system, standards, and calibrations. **Instrument Response -** Instrument Response to step, ramp, sinusoidal i/p up to second order system. Errors – types – gross, systematic, random, limiting, sources of errors, techniques to minimize them. **(10 hours, 20 marks)**

Unit-III
Introduction to transducers - definition, classification, selection of transducer.
Measurement of temperature - using R T D, thermocouple, bimetallic thermocouple. Pressure thermometers, pyrometers.
Pressure Measurement- Bourdon Tubes, bellows, diaphragms.
Vacuum Measurement- McLeod gauge, pirani gauge. **(10 hours, 20 marks)**

Unit-IV
Flow measurement- Rota meter, electromagnetic flow meter, hot wire anemometer, ultrasonic flow meter.
Level measurement – mechanical, pneumatic methods , electrical methods- capacitance level gauge, hot wire / carbon resistance method nucleonic level gauge, ultrasonic method.
Displacement measurement – LVDT, strain gauge, -types, working principles, measurement circuitry, temperature compensation, and application. **(10 hours, 20 marks)**

Unit-V
Recorders- necessity, construction, working, types- strip chart, circular chart, self balance potentiometric, X-Y recorder, ultraviolet recorder.
Electronic technique – for measurement of voltage, current, power, energy, phase angleand rms values. **(10 hours, 20 marks)**

Reference:-

1) Golding, widding, Y.P.Chopra ,Electrical Measurement and measuring Instruments – 5th edition, (A.H.Wheelerand co.Ltd.)
2) C.T.Baldwin ,Fundamental electrical measurement- 2 nd edition, lyall book depot.,
3) E.B.Deoblin,Measurement system- Application and design, 4 th Edition , Mcgrawhill.
4) B.C.Nakva,Instrumentation, measurement and analysis- TAta McGraw hill.
5) A.K.Sawhne.A course in electrical and electronic measurement and Instrumentation, 11 th Edition, Dhanpat Ray and co.
6) H.S.kalsi ,Electronics Instrumentation TAta McGraw hill.

List of Experiments-

1. Measurement of inductance by Andersons Bridge.
2. Measurement of capacitance and loss angle of capacitor by Schering bridge.
3. Measurement of frequency / mutual inductance by campbell's bridge.
4. Strain Measurement using strain gauge .
5. Study of LVDT.
6. Measurement of temperature by RTD/Thermocouple.
7. Study of pressure transducers.
8. Study of recorders.
9. Measurement of speed by magnetic pick-up / photo electric method.
10. Study of CRO of it's different types and Applications.
11. Step response of meters.
12. Measurement of systematic errors of wattmeter..

The term works should include a minimum eight experiment from the above list.

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F : 2007- 08
TERM – II

CONTROL SYSTEM-I

Teaching scheme:
Lectures-4 hrs/week
Practical: 2 hrs/week

Examination scheme:
Theory scheme: 100 marks (3hrs.)
Term work: 25 marks
Practical: 25 marks

UINT I

Introduction to atomic control: open loop and close loop system, servomechanisms, mathematical modeling of physical system, transfer function- definitions assumptions, transfer function of simple electrical and mechanical system, block diagram-constructions of block diagram for system equations, block diagram reduction techniques, single flow graphs, and mason's gain formula. Effect of feed back on sensitivity to parameter variation and reduction of noise. **(10 Hrs. 20 Marks)**

UNIT II

Control system components: electrical/ electromechanical components such as ac/ dc. servo motors ,stepper motors potentiometer, techogenerators, there functional analysis and operating characteristics and there applications, pneumatic controls devices **(10 Hrs. 20 Marks)**

UNIT III

Time response analysis: time responses of first and second order systems to standard inputs. Transient response specifications, types of system, error analysis, error coefficient, steady state errors, dynamic errors series. Approximate methods for higher order system proportional, derivative and integral control **(10 Hrs. 20 Marks)**

UNIT IV

Stability: Stability of control systems, characteristics equations, impulse response, Routh Hurwitz stability criterion, relative stability. Root locus: construction of root locus, determination of roots from root locus, condition of variable parameters for stability effect of addition of poles and stability. Stability of control systems, characteristic equation, impulse response, Routh Hurwitz stability criterion, relative stability **(10 Hrs. 20 Marks)**

UNIT V

Frequency Response of linear system

Specification of polar plots of various systems, Nyquist criteria / Nyquist plots and stability analysis, bode plots from open loop transfer functions for various systems, gain margin and phase margin, stability analysis from Bode plots, Estimation of approximate transfer functions from the frequency response. **(10 Hrs. 20 Marks)**

Reference books:

1) Nagrath I.J ,Control system engg. –.- Wilay Eastem
2) Ogate K.Modern control system: -prentice hall of India
3) Kuo B.C ,Linear control system -.- khanna publications.

List of experiments:

1) Study of potentiometer as on
   a) Error detector
   b) Determination of sensitivity
   c) Determination of input and output characteristics.
2) Study of
   a) synchro characteristics.
   b) Electrical zeroing of syncro.
   c) Synchronous as error detector.
   d) synchros on position control system
3) To determine the transfer functions of armature and field controlled dc generator.
   40to determine transfer function of dc generator.
5) To study performance characteristic of dc motor angular position control system.
6) To plot the torque speed characteristic of two phase ac servomotor.
7) Frequency response plot of second order system.
8) To determine transfer function of AC servomotor...
9) Operation of stepper motor in single step and multistep.
10) Study of P, PI, and PID controller.

The term work should include a minimum of 8 experiments from the above list.

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F : 2007- 08
TERM – II

ELECTRICAL MACHINE DESIGN-I

Teaching scheme:	**Examination scheme:**
Lectures-4 hrs/week	**Theory scheme**: 100 marks (3hrs.)
Practical: 4 hrs/week	**Term work**: 50 marks
	Oral-25 marks

Unit-I

Introduction- principles of design and design factors, rating, specifications, standards, performances, brief study of magnetic, electric, dielectric and other material.

Design of Induction Motors-1 phase and 3 phase.

(10 hours,20 marks)

Unit-II

Design of electric Apparatus and devices:- detailed design of heating coils, rotor resistance starters, regulators, field coils, choke coils, and Introduction to design of lifting magnets.

(10 hours,20 marks)

Unit –III

Design of Transformer- Design of distribution and power Transformer,-types, classifications, specifications, design of main dimension, core, yoke, winding, tank, cooling tubes, radiators, estimation of leakage reactance for equal height of H.V. and L.V. winding, resistance of winding, calculation of losses, determination of voltage regulation and efficiency, calculation of mechanical forces develop during short circuit, their estimation and remedies.

(10 hours,20 marks)

Unit- IV

D.C.Machine Windings- types of d.c. Windings, choice and design of simplex and duplex lap and wave Windings, equalizer connections, dummy coils, concept of multiplex Windings , reason for choosing them. **(10 hours,20 marks)**

Unit- V

A.C. Machine Windings- single and double layer, single phase ac Windings with integral and fraction slots, three phase Windings. **(10 hours,20 marks)**

Reference:-

1. A. K .Sawhney, Electric machine design tenth edition, Danpat ray and sons.
2. A. E .clayton, Performance and design of DC machine, third edition, ELBS, Isaac pitman sons.
3. A. E. clayton Performance and design of AC machine, third edition, ELBS, Isaac pitman sons.
4. N. Vinogradov, Electric machine winder, MIR publication.
5. N. PerelmuterRepair of Windings and insulation of Electric machine, N.Perelmuter.
6. Say and Taylor, D.C. Electric machine, Say and Taylor, ELBS, pitman sons.
7. Feinberg,Macmillan,Modern power Transformer design practices.first edition, Feinberg,Macmillan,
8. Transformers BHEL.

Drawing Sheets-

1. **one of electric devices From following:**
   a) Rotor resistance starter for slip ring I.M.
   b) DC series/shunt generator field regulator.
   c) DC series/shunt generator field regulator for speed control.
   d) Lifting Magnet.
2. Details and assembly of three phase Transformer.
3. Details and Layout of DC Windings.
4. Details and Layout of AC Windings.

The term work should include four drawing sheets and reports based on actual design of the above topics.

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F: 2007- 08
TERM – II

INDUSTRIAL ORGANISATION and MANAGEMENT

Teaching scheme:
Lectures-4 hrs/week

Examination scheme:
Theory scheme: 100 marks (3hrs.)
Term work: 25 marks

UNIT-I

Basic management-meaning and definition of management, administration, organization concept, contributors to management science, whether management is science, art or profession. MBO, characteristics of MBO , objective benefits, limitations
Forms of business organization - different forms of business organization, organization structure in industry. **(10 hours 20 marks)**

Unit-II

Elementary economics- Basic economics concept, law of demand and supply, law of diminishing utility, elasticity of demand and supply, money- it's evaluation, different, cost and types of cost elasticity of demand, price elasticity, types, MMF of elasticity, demand forcasting **(10 hours 20 marks)**

Unit – III

Plant location and layout- factors affecting Plant location, different types of Plant layout. CPM PERT , quality control manufacturing system
Work study- techniques of Work study-method study, work measurement, therbligs, different charts, diagrams used in method study. **(10 hours 20 marks)**

Unit-IV

Personnel management – manpower planning, recruitment, selection and training of employees, wages, different methods of wage payment, administration, job evaluation,
Merit rating, incentives, essential of good incentive plan.
Financial management – capital, types of capital, source of capital, financial institutes, elements of costs, depreciation, stores and inventory control, money market, capital market, role OF SEBI. **(10 hours 20 marks)**

Unit- V

Marketing management –marketing and selling concept, market survey and research, management productivity, advertising-media of advertising market forcasting
Industrial Laws- The factories Act, minimum wages act, pollution control act, works man compensation act, industrial safety- Causes of accidents, prevention of accidents, legal provisions. Domestic and international market, brand, trademarks, strategies, pricing, distribution channel **(10 hours 20 marks)**

References-

1. O.P.Khanna. Industrial Engineering management-
2. Banga and Sharma, Industrial. Organization and Engineering economics
3. Dutta, Sundaram. Elementary economics,
4. S.A. Sherlekar. Modern business organization and management
5. Philip Kotler, Marketing management.
6. C.B. Mamoria, Personnel management-.

NORTH MAHARASHTRA UNIVERSITY JALGAON
T.E. (ELECTRICAL)
W.E.F: 2007- 08
TERM – II
PRACTICAL TRAINING / MINI PROJECT / SPECIAL STUDY

Teaching scheme:	Examination scheme:
Practical : 2 hrs/week	Term Work : 25 Marks

- Every student has to undergo industrial / practical training for a minimum period of two weeks during summer vacation between (S.E. Second Term) fourth and (T.E. First Term) fifth term or during winter vacation between fifth and sixth term (T.E. First Term and Second Term).
- The industry in which practical training is taken should be a medium or large scale industry
- The paper bound report on training must be submitted by every student in the beginning of (T.E. Second Term) sixth term along with a certificate from the company where the student took training.
- The report on training should be a detailed one.
- Maximum number of students allowed to take training in a company should be five. Every student should write the report separately.
- In case if a student is not able to undergo practical training, then such students should be asked to

prepare special study report on a recent topic from reported literature .

or

a mini project related to the Electrical branch of engineering.

1. The circuit for mini project must be designed by a student.
2. The circuit should be simulated using any of the standard simulation software available.
3. Result verification for paper design and simulation should be carried out and discrepancies should be discussed.
4. Verified circuit should be assembled and tested on general purpose PCB/ Protoboard for actual working and practical results.
5. Layout of circuit using standard Layout tool (Orcad / Protel / CADstar / Pads / Ultiboard) should be designed and PCB making process should be carried out.
6. Assemble and test the circuit on PCB. Prepare bill of materials.
7. Project report should be detail of work, carried out by student, including layouts, circuits, bill of materials and relevant details

- The practical training / special study / mini project shall carry a term work of 25 marks. Every student shall be required to present a seminar in the respective class in the presence of two teachers. These teachers (fixed by the head of department in consultation with the Principal) shall award marks based on the following:

(a) Report	**10 marks.**
(b) Seminar presentation	**10 marks.**
(c) Viva -voce at the time of Seminar presentation	**05 marks.**

Total	**25 marks.**

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NORTH MAHARASHTRA UNIVERSITY, JALGAON
STRUCTURE OF TEACHING AND EVALUATION
B.E. (ELECTRICAL ENGINEERING)

FIRST TERM

W.E.F. 2008-09

Sr. No.	Subject	Teaching Scheme Hours/week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Power System operation and Control	4	--	--	3	100	25	--	--
2	Industrial Electrical Engineering	4	--	2	3	100	25	25	--
3	Energy Audit and Conservation	4	--	--	3	100	25	--	--
4	High Voltage Engineering	4	--	2	3	100	25	--	25
5	Elective-I	4	--	--	3	100	25	--	--
6	Seminar	--	--	2	--	--	25	--	--
7	Project – I	--	--	4	--	--	25	--	25
	Total	**20**	**--**	**10**	**--**	**500**	**175**	**25**	**50**
	Grand Total	**30**			**750**				

SECOND TERM

Sr. No.	Subject	Teaching Scheme Hours/week			Examination Scheme				
		Lectures	Tutorial	Practical	Paper Duration Hours	Paper	TW	PR	OR
1	Switchgear and Protection	4	--	2	3	100	25	--	25
2	Power System Stability	4	--	2	3	100	25	--	25
3	Industrial Drive and Control	4	--	2	3	100	25	--	25
4	Elective-II	4	2	--	3	100	25	--	--
5	Project – II	--	--	4	--	--	100	--	50
6	Industrial Visit / Case Study	--	--	--	--	--	25	--	--
7	Entrepreneurship Development Skills	--	--	2	--	--	--	--	--
	Total	**16**	**02**	**12**	**--**	**400**	**225**	**--**	**125**
	Grand Total	**30**			**750**				

Elective-I
1. Control System-II
2. Computer Methods on Power System
3. Electromechanical Energy Conservation
4. Optimization Techniques
5. Power System Dynamics

Elective-II
1. Flexible AC Transmission
2. Power System Design Practice
3. Electric Traction Engineering
4. Generation Planning and Load Dispatch
5. Extra High Voltage Transmission

NORTH MAHARASHTRA UNIVERSITY, JALGAON
B.E. (ELECTRICAL) W.E.F : 2008- 09
Term I

1) Power System Operation & Control

Teaching Scheme	**Examination Scheme**
Lectures : 4 hrs/week	**Paper : 100 marks**
	Duration: 3 Hrs.
	Term work:25 Marks .

UNIT I: ECONOMIC LOAD DISPATCH & OPTIMAL OPERATION OF POWER SYSTEM
Input Output characteristics, Heat-rate characteristics, Incremental fuel rate and cost, Incremental production cost, , optimum scheduling of generation between different units. (Neglecting transmission losses), Transmission loss as a function of plant generation (A simple system connection two generating plants to load) and incremental transmission loss for optimum economy, Calculation of loss coefficients (Two plants system), Optimum scheduling of generation between different plants considering transmission loss concept and significance of penalty factor, Automatic load dispatch, function and applications

(10 Hrs., 20 Marks)

UNIT II: GENERATOR VOLTAGE CONTROL
Automatic voltage control, generator controllers, Cross coupling between P–f and Q–V control channel, automatic voltage regulator, types of exciters and excitation systems, exciter modeling, transfer function modeling for control static performance and dynamic response of AVR loops.

(10 Hrs., 20 Marks)

UNIT III: LOAD FREQUECNY CONTROL
Automatic load frequency control, speed governing system and hydraulic valve actuator for individual generator, Turbine modeling, generator and load modeling transfer function representation of power control mechanism of generator.

(10 Hrs., 20 Marks)

UNIT IV: ELECTRIC POWER CONTROL
Concept of control area, division of power system into control areas, Load frequency of single areas, two area and multi area (control) power system with and without integral controls. Advantage of pool operation, tie line bias control area exchange.

(10 Hrs., 20 Marks)

UNIT V: VOLTAGE STABILITY AND COMPENSATION
Power system security, Operating stage (State transition diagram), Voltage stability, Comparison of angle and voltage stability, Reactive power flow and voltage collapse, voltage stability analysis and prevention of voltage collapse.
Compensation in power system: Load compensation, load ability of compensated and uncompensated over head transmission line, compensation of transmission line (Shunt& Series). Introduction of FACTS

(10 Hrs., 20 Marks)

Reference:

1) Electrical Energy system theory & Introduction Olle L. Elgerd, TMH.
2) Modern Power system analysis : I. J. Nagrath & D. P. Kothari, TMH.
3) Elements of Power system analysis : Willium D. Stevenson Jr., TMH.
4) Electric Power control : Dr. C.S. Indulkar.
5) Economic Control of power system : L.K. Kirchmayer
6) Electrical Power System Analysis : C L Wadhwa, New Age International Publication

NORTH MAHARASHTRA UNIVERSITY, JALGAON
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TERM I

2) Industrial Electrical Engineering

Teaching Scheme	**Examination scheme**	
Lectures: 4Hrs/week	**Paper**	**:100 Marks**
Practical: 2Hrs/week	**Duration**	**: 3 Hrs.**
	Term work	**: 25 Marks**
	Practical	**: 25 Marks**

UNIT I :- ELECTRIC DRIVES
Industrial group and collective drives, types of motors, their running characteristics , characteristics of load, starting , speed control and reversing of d.c. and 3 phase induction motors, electric braking, plugging, rheostatic braking, regenerative braking. Types of Enclosures.

(10 Hrs., 20 Marks)

UNIT II: - TYPES OF DUTIES
Continuous, intermittent and short time rating , temperature rise and rating calculations for these duties mechanical features , features of load diagram construction, load equalization & use of flywheel.

(10 Hrs., 20 Marks)

UNIT III:- TRACTION SYSTEMS
Requirements of ideal traction system, Systems of track electrification and their comparison, speed time curve, energy consumption calculation, calculation of tractive effort.

(10 Hrs., 20 Marks)

UNIT IV: - TRACTION MOTORS:
General features and types, characteristic and control of locomotive motor coaches, series parallel control .Electric breaking including regenerative breaking, overhead equipment control gear for overhead equipment.

(10 Hrs., 20 Marks)

UNIT V: - NATURE OF LIGHT
Units, luminous efficiency, glare production of light Types & applications of electric lamps polar curves, control of light by reflection , refraction and diffusion, Design of factory lighting, flood lighting, street lighting .
Methods of electric heating & its advantages, transfer of heat, resistance oven, induction heating electric welding.

(10 Hrs., 20 Marks)

Reference Books:
1) J.B.Gupta -- A course in Electrical power
2) S.K. Bhattacharya - Electrical Machines (2nd edition) - Tata Mc Graw Hill
3) V.V.L.Rao - Utilization of electrical energy -TMH
4) O.E.Taylor - Utilization of electrical energy -TMH
5) S.K.Pillai - A course in electrical energy TMH
6) H. Partab - Art & Science of Utilization of electrical energy.

List of experiments:-

1) To perform load test on single phase induction motor &plot its performance characteristics.
2) To perform load test on DC series motor& plot its performance characteristics.
3) Speed control of DC series motor.
4) Rheostatic breaking of three phase induction motor.
5) To perform load test on three phase induction motor & plot its performance characteristics.
6) Rheostatic breaking of DC shunt motor.
7) Speed control of three-phase slip ring induction motor by rotor resistance method.
8) To perform the load test on DC shunt motors and plots its performance characteristics.
9) Study of illumination system.
10) Study of induction heating &Welding.
11) Study of different types of enclosures.

The term work should include a minimum **eight** experiments from above list.

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TERM I

3) Energy Audit and Conservation

Teaching Scheme	Examination Scheme	
Lectures: 4 Hrs/Week	Paper	: 100 Marks
	Duration	: 3 Hrs.
	Term Work	: 25 Marks

UNIT I: - ENERGY AUDIT

Energy audit, pre-requisite of energy conservation, principles of energy audit, preliminary energy audit and detailed energy audit, procedures of carrying out energy audit. Energy production relationship, specific energy consumption, least square methods consume technique, data energy flow diagram, sankey diagram. Instruments used for energy audit. Policy of government to promote renewable energy.

(10 Hrs., 20 Marks)

UNIT II: - ECONOMICS OF ENERGY CONSERVATION:

Simple payback period analysis, advantages &limitations of payback period, time value of money, net present value method, internal rate of return method, and profitability index for benefit cost ratio. Study and selection of proper tariff for particular application, fixed &variable components in tariff, impact of tariff on energy management.

(10 Hrs., 20 Marks)

UNIT III: - ENERGY MANAGEMENT:

concept of energy management –energy inputs in industrial ,residential, commercial, agricultural and public sector-comparison of different energy inputs on the basis of availability , storage feasibility, cost (per unit output)etc. electrical energy management-energy accounting and management of power factor, voltage profile, current energy requirement ,power demand monitoring target setting etc.

Concept of supply side management and demand side management (DSM), load management, voltage profile management from receiving end .methods of implementing DSM. Advantages of DSM to consumers, utility and society.

(10 Hrs., 20 Marks)

UNIT IV: - ENERGY CONSERVATION

Objectives of energy conservation, planning for energy conservation

i) Motive power: potential for saving electrical energy in motors - oversizing or under loading, speed, improving, efficiency of an existing motor, energy efficient motors, use of soft starters, variable or adjustable speed drives for energy conservation selection of cost effective drive.
ii) Lighting: level of illumination for different areas. Use of right source of lamp for different applications, energy efficient lamps, fixtures and types of illumination controllers.
iii) Heating processes: most efficient space, furnace water heating and welding processes.
iv) Cooling systems: energy saving in air coolers air conditioners, ventilating systems and refrigeration.

(10 Hrs., 20 Marks)

UNIT V: - SCOPE OF CONSERVATION

Energy conservation in industrial, agricultural, commercial, domestic and municipal sectors.

i) Energy conservation in generation, Co-generation, Tri-generation, transmission and distribution, effective measures to reduce the T and D losses.
ii) Energy Efficient motors:- Features of energy efficient motors, high efficiency motor design, European agreement on low voltage electric motor efficiency, NEMA, high efficiency motors,
iii) Determination of cost effectiveness, implementation of motor management program.

(10 Hrs., 20 Marks)

Reference books

1. S. C. Tripathy-Electrical Energy Utilization and conservation – THM Publication.
2. S.Rao-Energy Technology-Khanna Pub.
3. Dr. S.P. Sukhtme-Solar energy.
4. Preceding of the Seminar on " Energy Audit & Demand Side Management" held at Govt. College of Engineering, Pune-5 organized by M.S.E.B.(SEA) ON 16.09.1998
5. Hand Book on energy efficient motors , International Cooper proposition council , B.E. Kushare.

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TERM I

4) High Voltage Engggineering

Teaching Scheme	**Examination scheme**
Lectures: 4Hrs/week	**Paper : 100 Marks**
Practical: 2Hrs/week	**Duration : 3 Hrs.**
	Term work : 25 Marks
	Oral : 25 Marks

UNIT I: - BREAKDOWN IN GASES, LIQUIDS & SOLIDS
Classification of insulating material, gases as insulating media, Ionization and decay process, breakdown in gases, Townsend's law. The streamer mechanism of spark, Paschen's law, corona discharge, electronegative gases. Breakdown in pure and commercial liquids, solid dielectric and composite dielectric, high voltage bushing guarding, shielding and field plotting.

(10 Hrs., 20 Marks)

UNIT II: - LIGHTING AND SWITCHING OVER VOLTAGE PROTECTION
Lighting strokes to lines and towers mechanism & characteristics. Protection of transmission lines from lighting, lighting arrestors, insulation co-ordination of HV and EHV power system and substation.

(10 Hrs., 20 Marks)

UNIT III: - GENERATION OF HIGH VOLTAGE & CURRENTS
Generations of high dc, ac and impulse voltages, standard impulse wave shapes, generation of weitching surges and high impulse generator

HVDC Power transmission
Kinds of dc links, limitations and advantages of ac & dc transmission. Principle application of dc, ground return advantages & application.

(10 Hrs., 20 Marks)

UNIT IV: - MEASUREMENT OF HIGH VOLTAGE AND CURRENTS
Methods of measurement of peak voltage, impulse voltage and high direct current, non destructive measurement and testing, high voltage dielectric loss and capacitance measurements, ratio frequency & partial discharge measurements.

(10 Hrs., 20 Marks)

UNIT V :-TTESTING AND EHV LINE INSULATION
Basic technology , testing of insulators bushing , cables , transformer, surge diverters & threshold current , capacitance of long objects, Electromagnetic interference, E.H.V line insulation design based upon transient over voltages.

(10 Hrs., 20 Marks)

Reference Books:-
1) M.S. Naidu & V.Kamaraju - High voltage Engg - Tata McGraw Hill
2) E.Kuffel and W.S Zaenglo -High voltage Engg - PERgamon Press
3) EHV, Rakash Das - Begamudre
4) C.L. Wadhawa - H.V Engg Wley Eastern
5) K.R. Padiyar; HDVC power transmission systems technology & system interaction -New Age International
6) H.V. Engg - R.S.Jha

List of Experiments:-

1) Measurement of insulation resistance of 600/250 V.P.T by megger.
2) Power frequency withstand test on 11KV, 10/5 amp CT
3) Study of corona discharge
4) Determination of insulating break-down strength of solid, liquid and gaseous dielectric media.
5) Power frequency high voltage withstand test on cable
6) Study of impulse generator.
7) Dry & Wet power frequency withstand test in insulator
8) Flash over test on insulator.
9) Double voltage double frequency withstand test on insulator.
10) Study of calibration of sphere gap.
11) Study of 100KV high voltage testing set.

The term work should include a minimum **eight** experiments, from the above list.

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TERM I

5) Elective-I

I) CONTROL SYSTEM – II

Teaching Scheme	**Examination scheme**
Lectures: 4Hrs/week	**Paper : 100 Marks**
	Duration : 3 Hrs.
	Term work : 25 Marks

UNIT I: - STATE SPACE TECHNIQUES

State, state space and state variables. States variable models of SISO/MIMO linear systems, from differential equations, transfer function and block diagrams, state diagram (Signal flow graphs)

Decomposition of transfer functions in phase variable forms, canonical forms, Jordan canonical form, transfer function from the state model, transfer matrix.

Solutions of state equations, state transition matrix (STM) various methods to obtain STM, Resolvent matrix time response of SISO system.

Controllability and observability of linear systems. Gilibert's method and kalman's test to test the controllability and observability of SISO/MIMO system.

System design using pole placement technique for close loop system via state variable feedback for SISO controllable system.

(10 Hrs., 20 Marks)

UNIT II: - SAMPLE DATA CONTROL SYSTEM

Representation of sample data (Discrete system) review of Z transforms, sample and hold zero order hold. Sampling theorem Z-transform analysis of sampling data control system. (Open loop and closed loop), Z transfer function of systems. Solutions of different equation by Z transfer methods. Response of discrete system.

Pulse transfer functions of open loop and closed loop system with different sample locations.

Digital controller and its transfer functions. Stability analysis, relation between S and Z domain, stability by Jury's test and bi-linear transformation and root locus method.

(10 Hrs., 20 Marks)

UNIT III: - NON LINEAR SYSTEM ANALYSIS I

Behavior of non linear system, various general non linear ties and their characteristics.

Stability analysis by describing function method. Existence and stability of limit cycles.

Limitation of describing function method.

(10 Hrs., 20 Marks)

UNIT IV: - NON LINEAR ANALYSIS II

Liberalization in a small region operating point. Singular point and their nature. Phase plane method of analysis of nonlinear system, construction of phase trajectories by isoclines method. Limit cycle behavior stability analysis, limitation of phase plane method.

(10 Hrs., 20 Marks)

UNIT V: - STABILITY ANALYSIS BY LIAPUNOV METHOD

Concept of stability, asymptotic stability in the large, instability, the sense of a Lipunov, Positive of a scale function, quadratic forms. Second method of Lipnov, stability theorems, Lipunov fuctions stability of linear time invariant systems, Lipunov equations.

Krasowakii's method for time examining the stability of non-linear time invariant system.

(10 Hrs., 20 Marks)

Reference Books :

1) Nagrath & Gopal : Control system engineering - Wiley Eastern
2) OgataK : Modern controll theory - Prentice Hall Of India
3) Naresh Sinha - control system - Wiley Eastern
4) Kuo B.C: Automatic control system - Prentice Hall Of India.

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TERM I
5) Elective-I

II) COMPUTER METHODS ON POWER SYSTEM

Teaching Scheme
Lectures: 4Hrs/week

Examination scheme
Paper : 100 Marks
Duration : 3 Hrs.
Term work : 25 Marks

UNIT – I NETWORK TOPOLOGY

Topology of Electric power system-Network Graphs, Incidence matrices, fundamental loop and cutset matrix, primitive impedance and admittance matrix, singular transformation of network matrix.

(10 Hrs., 20 Marks)

UNIT – II INCIDENCE MATRIX

Formation of bus impedance and admittance matrices by algorithm – Modification of bus impedance and admittance matrix to account for change in networks. Derivation of loop impedance matrix.
Algorithm for formulation of 3- phase bus impedance matrix.

(10 Hrs., 20 Marks)

UNIT – III SHORT CIRCUIT STUDIES

Three phase network, Symmetrical components. Thevenin's theorem and short circuit analysis of multimode power system using bus impedance matrix. Short circuit calculations for balanced and unbalanced short circuit bus impedance and loop impedance matrices.

(10 Hrs., 20 Marks)

UNIT – IV LOAD FLOW STUDIES

: Slack bus, loop buses, voltage control buses, Load flow equations, power flow model using bus admittance matrix, Power flow solution through Gauss-Seidal and N-R methods sensitivity analysis, Second order N-R method, fast decoupled load flow method, Sparsity of matrix.

(10 Hrs., 20 Marks)

UNIT – V FAULT ANALYSIS

Simultaneous faults, Simultaneous Faults by two port network Theory (Z, Y and H-type Faults), Simultaneous faults by matrix Transformations, Analytical simplifications of series and shunt fault.

(10 Hrs., 20 Marks)

References:-

1. J. J. Gringer/W.D. Stevenson, power System Analysis, McGraw Hill. 1994
2. G.W.Stagg and A.H.EI-biad,Computer Methods in Power System Analysis, Mc Graw Hill, 1968.
3. I.J.Nagrath and D.P.Kothari, Modern Power System Analysis, Tata McGraw Hill,1980.
4. G.L.Kusic, Computer Aided Power System Analysis, Prentice Hall, 1986.
5. Hadi Sadaf, Power System Analysis, Tata McGraw Hill.

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TERM I

5) Elective-I

III) Electromechanical Energy Conservation

Teaching Scheme	**Examination scheme**
Lectures: 4Hrs/week	**Paper : 100 Marks**
	Duration : 3 Hrs.
	Term work : 25 Marks

UNIT I: - MAGNETICALLY COUPLED CIRCUITS AND TRANSFORMER:

Self and mutual flux linkages and inductances. Voltage
Equation of coupled circuits. Coefficients of coupling and leakage coefficient.
Two winding transformers:
Steady state and transient analysis using mutual and self inductances. Variable frequency transformers. Energy flow considerations.

(10 Hrs., 20 Marks)

UNIT II: - ELECTROCHEMICAL ENERGY CONVERSION PRINCIPLES:

Electrochemical System, Energy process in electromagnetic systems.
Law of conversation of energy as applied to electromechanical system. Linear and non-linear, singly and doubly excited magnetic systems;
Energy and co-energy, various expressions for forces and torques; Energy, forces and torque in a system of rigid currents. Application to various magnetic field transducers.

(10 Hrs., 20 Marks)

UINT III: -ELECTRIC FIELD AND TRANSDUCERS

Quasi-static electric fields as coupling medium, Energy forces and torques in a system of charged conductors, Application of electric field transducers. Incremental motion transducers (detailed analysis of few cases).

(10 Hrs., 20 Marks)

UNIT IV: - BASIC ROTATING MACHINES:

Common structural features of rotating machines. Machine windings and their basic properties.
Distributed bindings as current sheets.
Equivalence between concentrated and distributed windings M.M.F. and flux distributation and various windings. Rotating magnetic field.

(10 Hrs., 20 Marks)

UNIT V: - TYPES OF ROTATING MACHINES:

Commutator, Synchronous and asynchronous machines
Induced e.m.f.s and electromagnetic torque in non salient pole machines.

(10 Hrs., 20 Marks)

Reference Books:

1. Rakosh Das, Begamudre- Electromachinical Energy Conversion- Wiley Eastern Publication.
2. Gourishankar- Electromechnical Energy Conversion.
3. Fitzgerald, Kingsley & Kusko- Eletric Machinary- McGraw Hill Kogo Kusha Ltd.

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TERM I

5) Elective-I

IV) OPTIMIZATION TECHNIQUES

Teaching Scheme	**Examination scheme**
Lectures: 4Hrs/week	**Paper : 100 Marks**
	Duration : 3 Hrs.
	Term work : 25 Marks

UNIT I:- LINEAR PROGRAMMING

Linear Programming, Simplex Method, Revised Simplex Method, Duality, Sensitivity Analysis.

(10 Hrs., 20 Marks)

UNIT II:-NON LINEAR PROGRAMMING

Non Linear Programming, One-Dimensional Minimization, Elimination Methods. Fibonacci Method, Golden Method, Interpolation method, Qadratic and Cubic Interpolation methods.

(10 Hrs., 20 Marks)

UNIT III:-UNCONSTRAINED OPTIMIZATION METHODS

Unconstrained Optimization Methods, Univariate and Pattern Search Methods, Rosenbrock's Method of Coordinates,

(10 Hrs., 20 Marks)

UNIT IV:-OPTIMIZATION METHODS

Simplex method. Descent Methods, Steepest descent Method, Conjugate Gradient Method Reevs Method, Davidon, Fletcher-Powell Method.

(10 Hrs., 20 Marks)

UNIT V:-CONSTRAINED OPTIMIZATION

Constrained Optimization, Complex method, Cutting Plane Method, Method of Feasible Directions. Integer Programming, Dynamic programming.

(10 Hrs., 20 Marks)

References,

1. S.S.Rao, Optimization Theory and Applications, Willey Eastern Limited.
2. H.A.Taha, Optimization Research.
3. R.L.Fox, Optimization methods for engineering design.
4. Hummel Blau, Non-linear Programming.

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TERM I
5) Elective-I
V) POWER SYSTEM DYNAMICS

Teaching Scheme	**Examination scheme**
Lectures: 4Hrs/week	**Paper : 100 Marks**
	Duration : 3 Hrs.
	Term work : 25 Marks

UNIT I: - INTRODUCTION

Reliable electrical power services, Stability of Synchronous machine, Tie-line oscillation, Method of simulation.

Synchronous machine:

Review of synchronous machine equations, parameters, Equation in a-b-c phase co-ordinates and Park's co-ordinates, Representation of external system Phasor diagram p.u. reactances.

(10 Hrs., 20 Marks)

UNIT II: - SYSTEM RESPONSE TO LARGE DISTURBANCES

System of one machine against infinite bus, Classical model, Mechanical and electrical torques, Critical clearing angle and time, Automatic reclosing, Precalculated swing curves and their use.

(10 Hrs., 20 Marks)

UNIT III: - SYSTEM RESPONSE TO SMALL DISTURBANCES

Two machine system with negligible losses, Clarke diagram for two machine series reactance system, Extension of Clarke diagram to cover any reactance network, Equation for steady state stability limit, Two Machine system with losses, Effect of inertia, Effect of governor action, Conservative Criterion for stability, Effect of saliency, saturation and short circuit ratio on steady state power limits.

(10 Hrs., 20 Marks)

UNIT IV: - REGULATED SYNCHRONOUS MACHINES

Demagnetizing effect of armature reaction and effect of small speed changes, Modes of oscillations of unregulated multimachine system, Voltage regulator and governor coach with delay Distribution of power impacts.

(10 Hrs., 20 Marks)

UNIT V: - EFFECT OF EXCITATION ON STABILITY

Effect of excitation on generator power limits, transient and dynamic stability, Examination of dynamic stability by Routh's criterion, Root locus analysis of a regulated machine connected to an infinite bus. Approximate System representation, Supplementary Stabilizing Signals, Linear analysis of stabilized generator.

(10 Hrs., 20 Marks)

REFERENCES:-

1. Synchronous Machines by C.Concordia, John Wiley& Sons.
2. Power System Stability by E.w..Kimbark,Vol.-3,John Wiley & Sons, New York.
3. Power System Control & Stability by P.A. Anderson, Galgotia Publ.
4. Power System Stability by S.B.Crary, John Wiley&Sons.

SEMINAR

Teaching scheme | **Examination scheme**
Practical: 2 hrs/ week | **Term Work :25** .

1. For seminar every student will individually study a topic in depth assigned to him / her and submit a report and shall deliver Seminar on the topic at the end of term.
2. Selection of topic should be done by students in consultation with concerned guide
   a. Topic should be related to branch but it should be extended part of the branch (latest and advance topic), preferably outside the syllabus.
   b. The topic should be such that the student can gain latest knowledge. Student should preferably refer at least one research paper
3. Seminar topic should not be repeated in the department and registration of the same should be done on first come first served basis
4. Seminar report should be submitted in paper bound copy prepared with computer typing
   a. Size of report depends on advancement of topic.
   b. Student should preferably refer minimum 5 reference books / magazines / proceedings / journals.
   c. Format of content
      i. Introduction.
      ii. Literature survey.
      iii. Theory 1) Implementation 2) Methodology 3) Application 4) Advantages, Disadvantages.
      iv. Future scope.
      v. Conclusion.

5 FORMAT FOR ASSESSMENT OF SEMINAR for TERM WORK
Title of seminar: ____
Name of guide : ____

Sr. No.	Exam Seat No.	Name of Student	Assessment by examiners					Grand Total
			Topic Selection 5	Literature Survey 5	Report Writing 5	Depth of understanding 5	Presentation 5	25

6 . Assessment of Literature survey will be based on
   a. Collection of material regarding history of the topic.
   b. Implementation.
   c. Recent applications.

7. Assessment of Depth of understanding will be based on
    a. Questioning by examiners.
    b. Questioning by students.
    c. What the student understands i.e. conclusion regarding seminar.

8. Assessment of presentation will be based on;
    a. Presentation time (15 minutes)
    b. Presentation covered (full or partial)
    c. Way of presentation
    d. Questioning and answering (5 minutes)

9. Examiners should be a panel of two one of them must be guide. Examiner must have experience at least 3 years.
    Examiners will be appointed by HOD in consultation with Principal.

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TERM I

PROJECT-I

Teaching Scheme	**Examination Scheme**
PRACTICAL:	**Term Work: 25(Term I)**
4Hrs. /Week (For Term-I)	**Oral : 25 Marks (Term I)**

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1. Every student individually or in a group (of appropriate group size) shall take a project in the beginning of the B.E. First Term in consultation with the guide or sponsored by the industry and the project must be completed in the B.E. Second Term.
2. The project proposal must be submitted in the institute in the beginning of the B.E. first Term. While submitting project proposal care is to be taken that project will be completed within the available time of two terms. The final title of the project work should be submitted at the beginning of the B.E. Second Term.
3. Project title should be precise and clear.
4. Selection and approval of topic:
   Topic should be related to real life application in the field of electrical engineering.
   .OR Manufacturing / Fabrication of a prototype unit include selection, concept, design, material manufacturing of the component, testing and performance evaluation.
   OR Computer aided design and analysis of system/electrical equipments.
   OR Problems related to material handling system.
   OR Energy audit of organization / use of renewable energy source.
   OR Low cost automation, electric / microprocessor control of electrical machines, control system, power systems etc.
   OR Software development for solution of problems in control / power systems.
   Interdisciplinary projects should be encouraged. The examination will be conducted independently in respective departments.
5. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solutions evolved etc., duly signed by guide.
6. The group is expected to complete detailed system design, layout etc. in B.E. first Term as a part of term work in the form of a joint report. Project report must be submitted in the prescribed format only.
7. The guides should regularly monitor the progress of the project work.
8. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

A) ASSESSMENT OF PROJECT- I TERMWORK at B.E. FIRST TERM

NAME OF THE PROJECT ____

NAME OF THE GUIDE: ____

Sr No	Exam Seat No	Name Of Student Marks	Assessment by guide (70%)					Assessment by Departmental committee (30%)			Grand Total	Out of 25 Marks
			Liter-ature survey	Topic Sele-tion	Docum-Entation	Atte-nden-ce	To-tal	Eval-uation (10%)	Pres-ntaion (20%)	Total		
			10	05	15	05	35	05	10	15	50	25

Sign of Guide Sign. of Committee Members Sign. of H. O. D.

9. The guide should be internal examiner for oral examination .

10. The external examiner should be from the related area of the concerned project. He should have minimum of five years of experience at degree level / industry.

11. The evaluation at final oral examination should be done jointly by the internal and external examiners.

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TERM - II

1) SWITCH GEAR & PROTECTION

Teaching Scheme	**Examination Scheme**
Lectures: 4Hrs /Week	**Paper : 100 Marks**
Practical: 2Hrs/Week	**Duration : 3 Hrs.**
	Term work : 25 Marks
	Oral : 25 Marks

UNIT – I:- ARC PHENOMEN AND INTERRUPTION

Arc phenomenon, maintenance of arc, properties of arc, interruption theories, transient recovery Voltage, transient analysis, RRRV, Interruption of capacitive current, CB rating, current chopping, construction & Operation of air blast & bulk oil CB.

(10 Hrs., 20 Marks)

UNIT – II:-CIRCUIT BREAKERS AND FUSES

Construction & Operation minimum oil C.B, SF6 & vacuum Ckt. C.B., Earth leakage & moulded case C.B, Testing installation & maintenance Of CBs Rewirable Fuses , HRC fuses Characteristics & application.

(10 Hrs., 20 Marks)

UNIT – III:-PRINCIPLES OF RELAYING

Basic Principle of relaying essential features & characteristics , relaying schemes, terminology ,CT's & PTs, electromagnetic relays constructional features, principle of operation , characteristics and application of attraction type and induction type over current, directional distance and differential relays.

(10 Hrs., 20 Marks)

UNIT –IV: PROTECTION SCHEMES

Protection of transmission lines, Relaying practice using over current, earth fault, directional distance and differential relays, parallel feeders and ring mains,

Protection of electrical equipments and machines like transformer, motors, generators and buses. Static relaying basic concepts, equipments and protection schemes.

(10 Hrs., 20 Marks)

UNIT –V:-MICROPROCESSOR AND MICROCONTROLLER BASED PROTECTION

Evolution of microprocessor, advantages of digital, use of microprocessor & microcontroller in protection, configuration of microprocessor based control for overcurrent, overvoltage, undervoltage, overfrequency, under frequency, DSP & it's use in power system.

(10 Hrs., 20 Marks)

Reference Books :-

1) T.S. Madharao - Power system protection (static rElay), Tata MacGraw Hill
2) C.R.Mason - The art and science of protective relaying.
3) B.Ram &Vishwakarma D.N - Power system protection & switch gear -TMH
4) Sunil S.Rao - Switchgear & Protection - Khurana Pun
5) Geosonoviz - High voltage circuit beakers
6) B.Ravindranath & M. Chandar, Power system protection & switch gear, New age International.
7) A.R.Warrington-Protective relay.
8) A.G. Phadke & Thorpe- Power system protection their theory & practice Chapman & Hall.

List of experiments:

1) Study of relaying components and control circuit developments.
2) To plot operating characteristics of Inverse time over current relay
3) To study the through fault stability of differential relay.
4) Study of MHO distance relay to plot.
    a) R- X diagram
    b) Relay voltage Vs Admittance characteristic
5) Study of combined over current & earth fault protection scheme of alternator.
6) Protection 3 phase transformer using differential relay (Merz- Price protection scheme)
7) To plot the characteristic of rewirable fuses and MCB
8) Study oil Arc extinction phenomenon.
9)Demonstration of microprocessor base protection of 3 phase IM using MM-30 L & T k make
10)Study of different types fuses.

The term should include a minimum of eight experiments from the above list.

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B.E. (ELECTRICAL) W.E.F: 2008- 09
TERM - II

2) Power System Stability

Teaching Scheme	Examination scheme	
Lectures: 4Hrs/week	Paper	: 100 Marks
Practical: 2Hrs/week	Duration	: 3 Hrs.
	Term work	: 25 Marks
	Oral	: 25 Marks

UNIT I: - BASIC CONCEPT

Meaning of stability, steady state transient & dynamic stability limits, Park's transformation equations, Analysis of transient and subtransient state operation of salient and non salient pole machines, phasor diagrams, voltage behind the transient and subtransient impedances, time constants. Determination of parameters and time constants.

(10 Hrs., 20 Marks)

UNIT II: - STEADY STATE STABILITY

SSSL of short transmission lines, Analytical and graphical methods of solutions, loosy lines effect of inertia conservative criterion, synchronizing co efficient multi machine system.

(10 Hrs., 20 Marks)

UNIT III: - FACTORS AFFECTING STEADY STATE STABILITY

Effect of saturation, saturated reactance, equivalent reactance, graphical method to find equivalent effect of short circuit ration effect of governor action, effect of automatic voltage regulator.

(10 Hrs., 20 Marks)

UNIT IV: - TRANSIENT STATE STABILITY

Review of basic concept, TTS and equal area criterion, swing equation, point by point solution, critical cleaning angle and critical angle and critical clearing time.

(10 Hrs., 20 Marks)

UNIT V: - FACTORS AFFECTING TRANSIENT STATE STABILITY

Effects of types of fault, effect of grounding, effect of high speed reclosing Precalculated swing curves and their use, effects of fault clearing time, effects of excitation and governing action, Methods of improving stability, multi-machine problem .

(10 Hrs., 20 Marks)

Reference Books:

1) E .W. Kimbark - Power system stability, Vol- 1 & 3 - John Wiley
2) S. B.Cray - Power system stability vol- 1 & 2 - John Wiley
3) Nagrath & Kothari - Modern power system analysi -TMH

List of Experiment:

1) Parameters and time constants of synchronous machines
2) Synchronous machine of infinite bus
3) Effect of saturation and & determination of equivalent reactance's of synchronous machines.
4) Retardation test on synchronous machines to find moment of inertia of rotating part and angular momentum.
5) To obtain power angle characteristics of lossy & lossless lines.
6) To study steady state stability by point by point method.
7) To determine the steady state stability limit of short transmission line.
8) To determine SSSL of long transmission line.
9) Study of clerk's diagram.
10) Study of different types of automatic voltage regulator.

The term work should include a minimum **eight** experiments, from the above list.

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TERM - II
3) INDUSTRIAL DRIVES AND CONTROL

Teaching Scheme	**Examination scheme**	
Lectures: 4Hrs/week	**Paper**	**: 100 Marks**
Practical: 2Hrs/week	**Duration**	**: 3 Hrs.**
	Term work	**: 25 Marks**
	Oral	**: 25 Marks**

Unit – I: - ELECTRICAL DRIVES
Concept, classification, advantages, parts of drives, choice of electric drives, fundamental torque equation, types of practical mechanical loads, dynamics of electrical drive- stability of an electrical drive, constant torque drive, constant power drive, selection of a D.C and A.C drive, modes of operation.

(10 Hrs., 20 Marks)

Unit - II: - SPEED-TORQUE CHARACTERISTICS AND CONTROL OF ELECTRICAL DRIVES
Characteristics and equivalent circuits; Dc motor; separately excited, series, shunt, compound.
Induction motors, Synchronous motors.
Basic principles of Speed control; closed loop control, current & speed sensing, Phase locked loop, closed loop position control.

(10 Hrs., 20 Marks)

Unit – III: - SOLID STATE CONTROLLERS:
Dc motor: Using thyristors, Phase control, chopper fed, Dual converters.
Single phase Induction motor: Using triac, Inverter circuit, Using cycloconverters, Speed control of universal motor.
Three phase induction motor: Basic schemes using chopper.
Synchronous motor: Self commutation circuits for three phase Synchronous motor.

(10 Hrs., 20 Marks)

Unit – IV: - AC DRIVES AND SYNCHRONOUS MOTOR CONTROL
Stator voltage control using Ac voltage controller, Inverter fed induction motor (VSI / CSI fed), chopper control in rotor circuit. Slip Energy recovery scheme,
CLC for Induction motor.
open loop control, Self Control Strategy, variable frequency operation, margin angle control.

(10 Hrs., 20 Marks)

Unit – V:- DC DRIVES
Single phase DC Drives for separately & self excited Dc motor (continuous & Discontinuous armature current operation), CLC & TRC Controller, chopper fed Dc Drives. Three phase drives for Dc motors, Full converter & semi- converter operation of Series connected converter.
Micro-processor based control for Drives: Micro-processor based chopper fed Dc motor, Micro-computer based control of Dc drives, using dual converter, Micro-processor based speed control of three phase Induction motor, Synchronous motor control.

(10 Hrs., 20 Marks)

Reference Books :

1) Thyristerised control of Electric Drives – V. Subramanyam, Tata McGraw Hill, New Dehli.
2) Thyristor Power Control- Dubey, Joshi, Sinha, Willey Eastern Publication.
3) Power Electronics Circuit Devices & Applications –M. Rashid, Prentice Hall of India.
4) Fundamentals of Electrical Drives – G. K. Dubey , Narosa Publishing House.
5) Fundamentals of Electrical Drives - Mohammad A. EL-sarkawi, vikas Publishing House.

List of experiments:-

1) Control of d.c motor using single phase half controlled rectifier.
2) Control of d.c motor using single phase fully controlled rectifier.
3) One quadrant chopper control of d.c motor.
4) Two quadrant chopper control of d.c motor.
5) Speed control of single phase induction motor using ac voltage regulator
6) Study of stepper motor drive circuit.
7) Speed control of universal motor.
8) Study of Micro-computer based control of Dc drives,
9) Study of vector control method for induction motor.
10) Study of reversible drives

The term work should include a minimum of eight experiments from above list.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
B.E. (ELECTRICAL) W.E.F: 2008- 09
TERM - II
ELECTIVE-II

I) FLEXIBLE A.C.TRANSMISSION

Teaching Scheme	Examination scheme	
Lectures: 4Hrs/Week	Paper	: 100 Marks
Tutorial : 2Hrs/Week	Duration	: 3 Hrs.
	Term work	: 25Marks

UNIT I:- DEVICES AND CONVERTERS

Advanced Power Semiconductor Devices, Voltage Source Converter, Single Phase Full Wave Bridge Converter Operation. Three Phase, Full Wave Bridge Converter. Three Level Voltage source Converter, PWM Converter. Generalized technique of harmonic elimination and voltage control, current sourced converter, and current source verses voltage sourced converters.

(10 Hrs., 20 Marks)

UNIT II:-FACTS CONCEPTS

FACTS Concepts, Flow of Powers in AC System, Dynamic stability consideration of transmission interconnection. Relative importance of controllable parameters, facts controllers.

(10 Hrs., 20 Marks)

UNIT III:-SHUNT COMPENSATORS

STATIC Shunt Compensator, Methods of Controllable VAR Generation, Static VAR Compensators, Static VAR System.

(10 Hrs., 20 Marks)

UNIT IV:-SERIES COMPENSATORS

STATIC Series, compensator, Variable Impedance Type Series Compensators, Switching Converter, Types and Compensators, External Control for series Reactive Compensators.

(10 Hrs., 20 Marks)

UNIT V:-COMBINED COMPENSATORS

Combined Compensator, Unified Power Flow Controller, Interline Power Flow Controller, Generalized Multifunctional FACTS Controllers.

(10 Hrs., 20 Marks)

References,

1. N.G.Hingorani,' Understandig FACTS', IEEE Press, 1999
2. Yang hue Song,'Flexible AC Transmission Systems (FACTS), IEEE Press, 1999

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TERM - II

ELECTIVE-II

II) POWER SYSTEM DESIGN PRACTICE

Teaching Scheme	Examination scheme	
Lectures: 4Hrs/Week	Paper	: 100 Marks
Tutorial : 2Hrs/Week	Duration	: 3 Hrs.
	Term work	: 25Marks

UNIT I:- DESIGN FUNDAMENTALS

Electrical & mechanical design of transmission line. Design of EHV transmission lines.

(10 Hrs., 20 Marks)

UNIT II: - DESIGN OF DISTRIBUTION SYSTEMS

Improvement and expansion of power system. Bus bar arrangements, isolating switches.

(10 Hrs., 20 Marks)

UNIT III:- CIRCUIT BREAKERS

Circuit breakers: operating mechanism, rating and selection, operating under special conditions, specification and technical details for deranged tender preparations.

(10 Hrs., 20 Marks)

UNIT IV: - LIGHTING ARRESTORS

Rating characteristics, testing technical defects, standards followed for details insulation co ordination. Power transformers different types, tapping , fittings, cooling, drying rating, cost comparison, testing technical details for ordering and tender preparations.

(10 Hrs., 20 Marks)

UNIT V: - SHUNT CAPACITORS

Need, construction, location, connections, protection, analysis, special types, testing, technical details. Earthing: Earthing systems, step potential, touch potential and transfer potential.

(10 Hrs., 20 Marks)

REFERANCES:-

1) Pratapsingh Satnam & P.V. Gupta. – Substation Designed equipments, Dhanpat Rai & Sons.
2) M. V. Deshpande: - Electrical Power system Design.

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TERM - II
ELECTIVE-II
III) ELECTRIC TRACTION ENGG.

Teaching Scheme	**Examination scheme**	
Lectures: 4Hrs/Week	**Paper**	**: 100 Marks**
Tutorial : 2Hrs/Week	**Duration**	**: 3 Hrs.**
	Term work	**: 25Marks**

UNIT I: - TRAIN MOVEMENT AND PERFORMANCE

Speed time curve, its analysis and construction, schedule speed and factors affecting it, train resistance and its components. Tractive effort calculations, average acceleration and speed, energy output and consumption.

(10 Hrs., 20 Marks)

UNIT II: - POWER TRANSMISSION AND WEIGHT TRANSFERENCE

Methods of transmission of power from motor to wheels .Idea about riding quantities of an electric loco motive, grouping of motor and weight transference, adhesive weight factors affecting slip.

(10 Hrs., 20 Marks)

UNIT III: - TRACTION MOTORS

Performance of (i) d.c. motors (ii) a.c. single phase series motors at low frequencies and at commercial frequency and (iii) poly phase induction motors, under traction service conditions, specific problems and method of overcoming them, special features of construction effect of differences in driving wheel diameters and speed time curves on division of load, traction motor ratings, speed factor, track and overhead equipments.

(10 Hrs., 20 Marks)

UNIT IV: - POWER SUPPLY FOR TRACTION

Overhead and conductor rail system, third rail construction, Bonding of conductor and track rails, overhead construction for trolley, buses and railways, quaternary's construction, temperature effects, current collectors, out times of feeding and distributing system for d.c low frequency, a.c and commercial frequency, a.c. traction voltage drop control, Electrolytic and inductive coordination, power loading curves, Positions of substations and load - sharing .

(10 Hrs., 20 Marks)

UNIT V :- BRAKING ON ELECTRIFIED RAILWAYS

Mechanical versus electric breaking, rheostatic braking, Regenerative braking, method and energy saved in the process, Magnetic track brakes.

Traction control: Duty cycle, Methods of traction motor control, series-Parallel and other types of controllers, use of interlocks, run back prevented, multiple unit control, Master controllers, Reverses, Dead man's handle, use of Metadyne and Megavolt.

(10 Hrs., 20 Marks)

Reference Books:-

H. Partab: Modern Electric traction, Dhanpat Rai & sons.

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TERM - II

ELECTIVE-II

IV) GENERATION PLANNING AND LOAD DISPATCH

Teaching Scheme	**Examination scheme**
Lectures: 4Hrs/Week	**Paper : 100 Marks**
Tutorial : 2Hrs/Week	**Duration : 3 Hrs.**
	Term work : 25Marks

UNIT-I: - GENERATION

Hydropower, fossil fuels nuclear power generation system. Chronological Load curves, power duration curve, integrated duration curve hydrography, flow duration curve, mass duration curve or hydro power generation stations.

Co-ordination of steam, hydro & nuclear power stations. Optimum generation allocation- line losses neglected & including the effect of transmission losses for thermal power generations.

Low range& short range hydro thermal scheduling of generation the short term and long term hydro thermal scheduling of generation.

(10 Hrs., 20 Marks)

UNIT-II:-PLANNING

Objectives of generation system planning, long term and short term planning. Stages in planning. Policy studies.

(10 Hrs., 20 Marks)

UNIT-III:- LOAD ENERGY FORECASTING

Classification of loads, load forecasting methodology.

peak demand forecasting- non whether sensitive forecast- weather sensitive forecast-total forecast- annual and monthly peak demand forecast.

(10 Hrs., 20 Marks)

UNIT-IV: - GENERATION SYSTEM COST ANALYSIS

Capacity cost, production cost, tuning of addition production analysis- production analysis involving nuclear unit production analysis involving hydro unit. Fuel inventories, energy transition off peak energy utilization.

(10 Hrs., 20 Marks)

UNIT-V:-GENERATION SYSTEM RELIABILITY ANALYSIS

Probabilistic generation unit- model &load model effective load- reliability analysis for isolated system-interconnected system- reliability of interconnected system.

(10 Hrs., 20 Marks)

Reference Books:-

1) Generation of Electric Energy – B.R. Gupta,
   Euresia Publishing House Pvt. Ltd., New Dehli.
2) Power System Planning – R.L.Sullivan, McGraw Hill.
3) Economic Control of Interconnected System – Kirchmayers L.K.,
   John Wiley & Sons, New York.

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B.E. (ELECTRICAL) W.E.F: 2008- 09
TERM - II
ELECTIVE-II
V) EXTRA HIGH VOLTAGE TRANSMISSION

Teaching Scheme	Examination scheme	
Lectures: 4Hrs/Week	Paper	: 100 Marks
Tutorial : 2Hrs/Week	Duration	: 3 Hrs.
	Term work	: 25Marks

UNIT I:-AC POWER TRANSMISSION
Basic aspects of A.C. Power transmission, power-handling capacity and line loss, surface voltage and conductors, electrostatic field of EHV lines. Measurement of electrostatic fields. Electromagnetic interference. Traveling waves and standing waves, Line energization with trapped-charge voltage. Reflection and refraction traveling waves. Transient response of system with series and shunt lumped parameters. Principles of traveling protection.

(10 Hrs., 20 Marks)

UNIT II:-LIGHTNING AND PROTECTION
Lightning & lightning Protection, Insulation coordination based lightning.

(10 Hrs., 20 Marks)

UNIT III:-OVERVOLTAGES IN EHV SYSTEM
Over Voltage in EHV system caused by switching operation, Origin of over voltage and their types caused by interruption of inductive and capacitive currents, Ferro-response over voltage, calculation surges, Power frequency voltage control and over voltages, Power circle diagram.

(10 Hrs., 20 Marks)

UNIT IV:-STABILITY CONSIDERATIONS
Reactive power flow and stability in power systems. Steady-state static real power and reactive power stability, transient stability. Basic principles of system voltage control. Effects of transformer tap changing in the post disturbance effect of generator excitation adjustment, Voltage collapse in EHV lines, reactive power requirement for voltage in long line. Voltage stability

(10 Hrs., 20 Marks)

UNIT V:-MAXIMUM POWER TRANSFER AND STABILITY LIMIT
Power Transfer at voltage stability limit of EHV lines, Magnitude of receiving end voltage, Voltage Magnitude of receiving end voltage during maximum power transfer. Magnitude of Maximum power and stability limit. Optimal reactive power at voltage stability limit

(10 Hrs., 20 Marks)

References,

1. A.Chakrabarti, D.P.Kothari, A.K. Mukhopdadhyay, Performance, operational & control of EHV power system, Wheeler publications.
2. Rakosh Das Begamudre,'Extra high-voltage A.C. transmission Engineering' New Age International.
3. S.Rao, EHVAC & HVDC transmission Engineering & practice' - Khanna publications.

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TERM - II

PROJECT -II

Teaching Scheme	**Examination Scheme**
PRACTICAL:	
4Hrs. /Week (For Term-II)	**Term Work: 100(Term II)**
	Oral : 50 Marks (Term II)

1. The Project group in, BE. first Term will continue the project work in B.E. Second Term, and complete project in all respect (assembly, testing, fabrication, tabulation, test result etc.)
2. The group should maintain a logbook of activities. It should have entries related to the work done, problems faced, solution evolved etc., duly signed by guide.
3. The guides should regularly monitor the progress of the project work.
4. The project work along with project report should be submitted as part of term work in B.E. Second Term on or before the last day of the term
5. Project report must be submitted in the prescribed format only..

Submission of project report:

The student shall submit a detailed report base on his/her project work to his/her institutional guide. It shall include relevant circuit diagrams, graphs, photographs, specification sheets etc.

Format for the project report shall be as follows:

a) The report shall be neatly typed on white paper .The typing shall be of normal spacing and only on one side of the "A4 "size paper.

b) The report shall be submitted with front and back cover card paper, neatly cut and bound together.

c) Front cover shall have the following details in block capitals in the following sequence.

Title at the top, followed by the name of the candidate with roll no and exam seat no in the next line. Name of the guide with designation below the details of the candidate. The name of the institute and year of submission on separate lines at the end.

d) Project work approval sheet in the form of a certificate duly signed, shall be included.

e) The format of the text of the project report:

The synopsis shall be followed by literature survey. The report of analytical or experimental work done, if any shall then follow. The discussion and conclusion shall form the next part of the text. It shall be followed by nomenclature and symbols used and then acknowledgement .The bibliography shall form the last section.

The total number of typed pages, excluding cover, shall be about 50 to100.All the pages shall be serially numbered.

Number of copies of the project report submitted to the department shall be equal to number of students in a group plus three.The oral examination will be base on the project report.

6. Assessment of the project for award of TW marks shall be done by the guide and a departmental committee (consisting of minimum two teachers with experience more than three years) as per the guidelines given in the following table.

B) ASSESSMENT OF PROJECT II TERMWORK (B.E. SECOND TERM)

NAME OF THE PROJECT: ____

NAME OF THE GUIDE: ____

Sr. No	Exam. Seat No	Name Of Students	Assessment by guide (70%)						Assessment by department (30%)			Grand Total
			Fabrication /software / actual work	Execution of project	Project report	Scope/ Cost / Utility	Attende-nece	Total	Evaluation (10%)	Prese-ntaion (20%)	Total	
		Marks	20	10	20	10	10	70	10	20	30	100

Sign of Guide.   Sign of   Committee Members   Sign. of H. O. D.

7. The guide should be internal examiner for oral examination .

8. The external examiner should be from the related area of the concerned project. He should have minimum of five years of experience at degree level / industry.

9. The evaluation at final oral examination should be done jointly by the internal and external examiners.

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TERM - II
INDUSTRIAL VISIT

Term work:25 Marks.

EDUCATION TOUR / TECHNICAL VISITS / CASE STUDY AND ITS EVALUATION

1. During B.E. First Term / Second Term or during vacation between B.E. First Term / Second Term every student; shall visit minimum two industries, factories arranged by colleges and accompanied by teachers. There shall be at least one teacher for a group of 20 students and at least one non-teaching staff accompanied with the students.

2. The colleges should obtain appropriate certificates of visit from the concerned organizations just after the visits.

3. Students should submit written report about the visits individually at the end of B.E. Second Term .

4. The report should contain information about the following points:

   (a) The organization - activities of organization and administrative setup technical personnel and their main duties.
   (b) The project *I* industry brief description with sketches and salient technical information.
   (c) The work *I* processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.
   (d) Suggestions (if any) for improvement in the working of those organizations.

5. The evaluation of the report of technical visits will be made by panel of two teachers appointed by principal based on following points:

   (a) Coverage aspect: All above points should be covered.
   (b) Detailed observations: System *I* Process / Product explained with data, diagram specifications.
   (c) Quality of presentation: Report should be very objective and should consist of clear and systematic organization of topics and information.
   (d) Viva - voce: A viva -voce shall be conducted on the technical visit report by the teachers to assess the specific knowledge gained by the students for technical applications.

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B.E. (ELECTRICAL) W.E.F: 2008- 09
TERM - II
ENTREPRENEURSHIP DEVELOPMENT SKILLS

Practical: 2 hours/week.

1. Entrepreneurship:
Aim alternative to seeking jobs- promote self- employment end accelerate industrialization. Entrepreneurship development program in India and Maharashtra an overview. Institutions promoting entrepreneurship, their objectives and mode of functioning.

2. Motivation, requirement and constraints:
Affiliation, power, achievement, GOAL SETTING, FINCIAL AND CARRER RISK AND Rewards. Sources of information- "where to go and for what?" Entrepreneurial personality, creavity and qualities.

3 Selecting the right entrepreneurship field
Search and scanning: Small scale/ medium scale industries/ manufacturing/ transporting/ consultancy. Criteria for selecting product for elopements/ manufacturing.

4 feasibility report: Market survey, selecting right infrastructure, location and government subsidies, sources of technology, recruiting right people, identifying customers, finding out competitors, preparation of feasibility report, project report.

5 Organizational set-ups: advantages and limitations of proprietorship, partnership, co- operatives, private limited and public limited