Kavayitri Bahinabai Chaudhari

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Third Year Engineering
(Electronics and Telecommunication Engineering)

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
3rd Cycle

SYLLABUS STRUCTURE

Semester – V&VI

W.E.F. 2020 – 21

Syllabus Structure for Third Year Engineering (Semester – V) (Electronics and Telecommunication Engineering) (w.e.f. 2020 – 21)
(As per AICTE Guidelines)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Microcontrollers	D	3	-	-	3	40	60	-	-	100	3
Electromagnetic Waves	D	3	-	-	3	40	60	-	-	100	3
Signals and System	D	3	-	-	3	40	60	-	-	100	3
Professional Elective Course – I	E	3	-	-	3	40	60	-	-	100	3
Open Elective Course – I	F	3	-	-	3	40	60	-	-	100	3
Microcontrollers Lab	D	-	-	2	2	-	-	25	25 (PR)	50	1
Signals and System Lab	D	-	-	2	2	-	-	25	25 (PR)	50	1
Power Devices and Circuits Lab	D	-	-	2	2	-	-	25	25 (PR)	50	1
Minor Project (Stage-I)	G	-	-	6	6	-	-	50	-	50	3
Constitution of India	H	-	-	-	-	-	-	-	-	-	-
			0	**12**	**27**	**200**	**300**	**125**	**75**	**700**	**21**

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

Professional Elective Course – I		Open Elective Course – I	
1	Power Electronics	1	Biomedical Instrumentation
2	Information Theory and Coding	2	Renewable Energy Sources
3	Error Correcting Codes	3	E-waste Management

Syllabus Structure for Third Year Engineering (Semester – VI) (Electronics and Telecommunication Engineering) (w.e.f. 2020 – 21)
(As per AICTE Guidelines)

Name of the Course	Group	Teaching Scheme				Evaluation Scheme					Credits
						Theory		Practical		Total	
		Theory Hrs / week	Tutorial Hrs / week	Practical Hrs / week	Total	ISE	ESE	ICA	ESE		
Control System	D	3	-	-	3	40	60	-	-	100	3
Electronic Measurement	D	3	-	-	3	40	60	-	-	100	3
Electronics Design	D	3	-	-	3	40	60	-	-	100	3
Professional Elective Course – II	E	3	-	-	3	40	60	-	-	100	3
Open Elective Course – II	F	3	-	-	3	40	60	-	-	100	3
Electronics Design Lab	D	-	-	2	2	-	-	25	25 (PR)	50	1
Elect. Measurement Lab	D	-	-	2	2	-	-	25	25 (PR)	50	1
Control system Lab	D	-	-	2	2	-	-	25	-	25	1
Minor Project	G	-	-	6	6	-	-	50	25 (OR)	75	3
Internship*	H	-	-	-	-	-	-	-	-	-	-
		15	**0**	**12**	**27**	**200**	**300**	**125**	**75**	**700**	**21**

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

Professional Elective Course – II		Open Elective Course – II	
1	C-MOS Design	1	Wireless Sensor Networks
2	Wavelets	2	Project Management
3	Micro Electro Mechanical Systems	3	Cyber Law and Ethics

* Internship is a mandatory and non-credit course. It shall be during summer vacation after Semester – VI. The satisfactory completion of Internship should be submitted to University at the end of Semester – VIII.

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3rd Cycle

COURSE OUTLINE

Semester - V

W.E.F. 2020 – 21

Microcontrollers					
COURSE OUTLINE					
Course Title:	**Microcontrollers**	**Short Title:**	**MC**	**Course Code:**	

Course description:

This subject covers basic knowledge of microprocessor (8085 &8086) and microcontroller (8051). Similarly the 8051 microcontroller internal on chip devices, peripheral interfacing and their assembly language programming is covered in this subject. Microcontroller is basic building block of all domestic, industrial, consumer goods and other high end products. Automation in every field of life is being used and microcontroller is inbuilt element of these systems and devices.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	03	14	42	03

Prerequisite course(s):

Knowledge first year Basic Electronics is required

Course objectives:

1. To introduce students with the architecture and operation of typical microprocessors and Microcontrollers.
2. To familiarize the students with the programming and interfacing of microcontrollers.
3. Provide background knowledge and core expertise in microcontroller.
4. To understand the importance of different peripheral devices & their interfacing to 8051.
5. Provide strong foundation for designing real world applications using microcontrollers.

Course outcomes:

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

1. Describe architecture of microcomputer, microprocessor and microcontroller.
2. Describe the program for 8051 in assembly language for given problem.
3. Apply basic knowledge to write program for 8051 in timers/ counters, serial / Parallel communication ports and Interrupt.
4. Apply basic knowledge for interface I/O devices, memory to 8051 microcontroller.
5. Describe the day to day life applications of microcontroller.

COURSE CONTENT

Microcontrollers		Semester:	V
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	No. of Lectures: 09 Hours	Marks: 12

Microprocessor Fundamental

Introduction to microcomputer. Block Diagram of Microcomputer. Elements of Microcomputer. (Buses, Microprocessor, memory, I/O devices). Different types of buses: address, Data, and control bus

Introduction to 8085, 8086, Functional Block Diagram & pin diagram of 8085 and 8086.

8085 Registers, ALU, Bus systems, Addressing modes, Instruction format and classification.

Unit–II:	No. of Lectures: 09 Hours	Marks: 12

Understanding of Microcontroller

Evolution of microcontrollers, Comparison of different microcontrollers such as Intel 8051/PIC/At mega 16 & ARM. Comparison of Microprocessor and Microcontroller, Definition of Embedded system, Types of architectures - Harvard and Von-neuman, RISC architecture. Selection factors of microcontroller (Architecture type, speed, Word size, instruction set, memory, and I/O capability). Block diagram description of 8051, Register in 8051,PSW,ROM memory map, RAM memory space allocation, Register Banks 8051 pin diagram, Understanding the function of each pin, port structure, Dual roles and I/O port programming

Unit–III:	No. of Lectures: 08 Hours	Marks: 12

Microcontroller Programming

8051/ 89C51/XX micro controllers. Study of datasheets, programming using assembly language, Assembler directive- ORG, DB, EQU, END, CODE, DATA and programming tools such as simulator, emulator and debugger, assembler, cross "C" compiler, Editor, assembler, linker. Addressing Modes in 8051 and Programming using these modes, MOVC and MOVX Instructions Arithmetic Instructions: Instructions related to Addition, Subtraction, and Multiplication, Division, Increment and decrement. Programming associated with these instructions Logic and Compare Instructions - AND, OR, XOR, NOT, Compare, Rotate, Swap, Boolean or Bit Manipulation Instructions and Programming including number conversion

Jump instruction conditional and unconditional, Stack and subroutine instruction.

Unit–IV:	No. of Lectures: 08 Hours	Marks: 12

Intelligent control system design using Timer, Serial port and Interrupt

Basic registers of timers, structure of TMOD register, Mode 1 programming, , Generation of large delay, Mode 2 programming Counter programming, TCON register structure, Serial communication basics, RS 232, 8051 Serial Port Programming, SCON, RI and TI. Programming for receiving and transmitting data serially. Doubling the baud rate. 8051 interrupts:Interrupt vs. polling, Interrupt service routine, steps in executing an interrupt, Six interrupts in the 8051, Interrupt priority in 8051, enabling and disabling the interrupt, Steps in enabling the interrupt. Programming timer interrupts, External hardware interrupt, Serial communication interrupts.

Unit–V:	No. of Lectures: 08 Hours	Marks: 12

Industrial Interfacing need

Switch interfacing, LED interfacing, 7-Segment, LCD interfacing, ADC interfacing,DAC interfacing, Sensors interfacing, Motor control :Stepper motor, DC Motor. Relay, Buzzer.

External Peripherals - Programmable peripheral interface (8255), Programmable Timers (8254)

Text Books:

1. Microprocessor Architecture, Programming, and Applications with the 8085, Ramesh Gaonkar, PENRAM International Publishers.
2. N Senthil Kumar, M Saravanan, S Jeevananthan, and Satish Shah- Microprocessors and Interfacing (Series - Oxford Higher Education)
3. Douglas Hall, Microprocessors Interfacing, Tata McGraw Hill, 1991.

Reference Books:

1. M.A. Mazidi, J.C. Mazidi, R.D. McKinlay, The 8051 Microcontroller and Embedded Systems using Assembly and C, Second Edition, Pearson
2. Kenneth Ayala, The 8051 Microcontroller, Third Edition, Delmar Learning, a part of Cengage Learning (India Edition)
3. Ajay Deshmukh, Microcontrollers[Theory and Applications], Tata McGraw hill, New Delhi
4. Mike Predko - Programming and Customizing 8051 micro controller, TMH

Electromagnetic Waves					
COURSE OUTLINE					
Course Title:	**Electromagnetic Waves**	**Short Title:**	EMW	**Course Code:**	

Course description:
Electromagnetic waves is an important fundamental course with great academic relevance progress in this exciting theory has made possible the advent of many technologies, such as optical fibre communications, wireless communication, antennas and wave propagation, micro wave engineering, etc. Interference and electrical noise problems that affect industry can also be better understood and their solutions can be provided using field theory.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	14	42	*3*

Prerequisite course(s):
Engineering mathematic such as vector calculus, vector point functions, derivative etc. Basic Electrical Engineering

Course objectives:

1. To study the basics of Electrostatics and Magnetostatics with their applications.
2. To learn the boundary condition particularly a boundary between conducting material and free space.
3. To understand the Time Varying Fields and Maxwell‟s Equations.
4. To interpret the given electromagnetic problem and solve it using Maxwell‟s Equations.
5. To analyze the wave propagation in different media using wave equation**.**

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

1. To apply fundamental knowledge to learn the basic laws of electromagnetism.
2. To analyze the electric and magnetic fields for simple configurations under static conditions.
3. To analyze time varying electric and magnetic fields.
4. To describe the Maxwell's equation in different forms and different media.
5. To describe the propagation of EM waves.

COURSE CONTENT

Electromagnetic Waves		**Semester:**	**V**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	No. of Lectures: 08 Hours	Marks: 12
Basic Electrostatics Review of vector Analysis and coordinate systems. Coulomb's force law & Numerical based on force law. Concept of electric field intensity. Volume charge density, surface charge density, Line charge density, Electric field due to point charge, line charge, surface charge, Volume charge. Numerical based on different configuration of charges. Concept of Electric Flux. Relation between flux density & electric field intensity		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Gauss's law, Energy and Potential:- Gauss's law, Application of Gauss's law to symmetrical charge distribution. Divergence Theorem. Maxwell's first equation in electrostatics. Work Done, Concept of Potential & Potential Difference. Potential difference in field of point, Line, Surface, Volume charge. Dipole and its electric field, Dipole movement. Energy density in electrostatic field		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Applied Electrostatics Current and current density. Current continuity equation. Properties of conductors and dielectric materials. Boundary Condition, between conductor and free space, between conductor and dielectric and between two perfect Dielectric materials. Capacitance, Parallel plate capacitor. Poisson's and Laplace's equations. Calculation of capacitance of spherical capacitor using Laplace's equation (only derivation).		
Unit–IV:	**No. of Lectures: 09 Hours**	**Marks: 12**
Magnetostatics and Transmission Lines :- **Magneto statics-** Biot-Savarts law, Magnetic field due to finite, infinitely and circular loop current carrying Conductor, Ampere's Circuital law, Point form of Ampere's circuital Law/Curl operator. Stokes theorem. Magnetic flux & Magnetic flux density. **Transmission Lines -** Primary and secondary constants of transmission lines and its equations (no derivations). Smith chart -Basic procedure to plot the constant r-circles, constant x-circles and normalized impedance on Smith chart. Applications of Smith chart.		
Unit–V:	**No. of Lectures: 09 Hours**	**Marks: 12**
Time Varying Fields & Uniform Plane Waves:- Maxwell's equations (Differential, Integral and Phasor forms) for time varying, Static & free space. Uniform plane waves, Representation of wave equation in free space. Representation of wave motion in perfect dielectrics and Lossy dielectrics. Poynting's theorem & Wave power. Propagation in good conductor and Skin effect. Introduction to antenna basic parameter-Patterns, Beam area, radiation intensity, Beam efficiency, directivity & gain, antenna aperture, Effective height.		
Text Books:		
1. M. N. O. Sadiku, "Elements of Electromagnetics", Oxford University Publication, 2014. 2. A. Pramanik, "Electromagnetism - Theory and applications", PHI Learning Pvt. Ltd, New Delhi, 2009.		
Reference Books:		
1. Engineering Electromagnetic-William H. Hayt, J A Buck, Tata McGraw Hill Publication 7thEdition. 2. K. D. Prasad - Antenna and Wave Propagation, Satya Prakashan. 3. Electromagnetics- Schaum's outline series, 2nd edition, Joseph A Edminister, Tata Mc Graw Hill edition. 4. R K Shevgaonkar, "Electromagnetic Waves", 1st Edition, Tata McGraw Hill 5. Monojit Mitra," Microwave Engineering" 3rd Eidition,Dhanpat Rai &Co.		

Signals and System					
COURSE OUTLINE					
Course Title:	**Signals and System**	**Short Title:**	**S&S**	**Course Code:**	

Course description:

This course is designed to lay the foundation for further studies in areas such as communication, signal processing, and control systems etc. This course will explore the basic concepts of signals and systems. Students will understand and learn various types of signals, signal operations and representation of signal and system in time and frequency domain using Fourier and Laplace transform. In this course, more emphasis is given on analysis of continuous time signals and systems.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	3	14	42	3

Prerequisite course(s):

Knowledge of basic Electrical and Electronics engineering and its concept.

Course objectives:

1. To make strong foundation of basics of signals and systems
2. To learn Fourier Transforms for discrete time signal and system.
3. To understand the Laplace transform of signals and their application.
4. Understand the Z-Transform and properties of signal.
5. To understand the state space representation and application of signal and system.

Course outcomes:

At the end of this course

1. Students will describe the mathematical concepts of signal representation and its analysis.
2. Students will analyze the signals and systems using fourier domain analysis.
3. Students will apply the knowledge of Laplace transformation concept to analyze signal
4. Students will able to understand the use of Z-transform.
5. Students will able to apply the knowledge of state space analysis and real time applications in day to day life.

COURSE CONTENT

Signals and System		**Semester:**	**V**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**
Introduction to Signal and System Introduction to signals: Definition, sampling theorem, sampling of continuous time signals, elementary signals: exponential, sine, step, impulse, ramp, rectangular, triangular, signum, sinc, operations on signals, Classifications of Signals: Deterministic and non-deterministic signals, periodic and aperiodic signals, even and odd signals, energy and power signals, causal and noncausal signals. Case study of different signals from communication and biomedical field Classifications of Systems: Static and dynamic systems, linear and non-linear systems, time variant and time invariant systems, stable and unstable systems. communication and control system as examples		
Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**
Fourier series and Fourier Transform. Fourier Transform Introduction: Trigonometric Fourier series, complex or exponential form of Fourier series, Parseval‟s identity for Fourier series, Gibbs phenomenon. Fourier Transform: Energy spectrum for non-periodic function, properties of Fourier Transform. Discrete Fourier Transforms (DT): Discrete convolution, properties of convolution, circular convolution, Discrete -Time Fourier Transform (DTFT), properties of DFT.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Laplace Transform Laplace Transforms Definition, Region of Convergence (ROC), LT of some important function and numerical. Initial value theorem, Final value theorem. Convolution integral. S-Plane Poles and Zeros and numerical. Application of LT only in series R-L circuit and series R-C circuit.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Z -Transform Z-Transforms Introduction, definition, Region of convergence (ROC), properties of the ROC for the z transform and numerical. Properties of z-transform such as Linearity, Time Reversal, Time Shifting, Scaling, Differentiation, Convolution and numerical based on these properties.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
State space analysis and application of signal and systems Concept of state, State variable and state model, State model (general case & linear system), Eigen Values of Matrix A. Solution of state equation. Properties of State Transition Matrix and numerical, transfer function. Signal Processing Applications: Speech and Audio Processing, Multimedia (image & video) processing, Underwater acoustic signal processing, Biological signal analysis Communication and Control System Application: Modulation (Analog and Digital) process, Feedback/Feedforward Control system.		
Text Books:		
1. NagoorKani, “Signals and Systems”, Tata McGraw Hill, Third Edition, 2011. 2. B.P. Lathi, “Principles of Linear Systems and Signals”, Oxford, Second Edition, 2010. 3. S. L. Nalbalwar, A. M. Kulkarni and S. P. Sheth, “Signals and Systems”, Synergy Knowledgeware, 2016. 4. Simon Haykin and Barry Van Veen, “Signals and Sytems”, John Wiley and Sons, Second Edition,2004.		
Reference Books:		

1. Hwei. P Hsu, “Signals and Systems”, Tata McGraw Hill, Third edition, 2010
2. V. Krishnaveni and A.Rajeshwari, “Signals and Systems”, Wiley-India, First Edition 2012.
3. Narayana Iyer, “Signals and Systems”, Cenage Learning, First Edition 2011.
4. Michael J Roberts, “Fundamentals of Signals and systems”, Tata McGraw Hill, special Indian Economy edition, 2009.
5. Rodger E Ziemer, William H. Tranter and D. Ronald Fannin, “Signals and Systems”, Pearson Education, Fourth Edition 2009.
6. Alan V. Oppenhiem, Alan S. Willsky and S. Hamid Nawab, “Signals and Systems”, Prentice-Hall of India, Second Edition, 2002.
7. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition: c1999.
8. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons, 1995.
9. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB", TMH, 2003.

Power Electronics
(Professional Elective Course–I)

COURSE OUTLINE

Course Title:	**Power Electronics**	**Short Title:**	**PE**	**Course Code:**	

Course description:

This course includes power semiconductor-based devices such as SCR, IGBT and related applications. This course is designed to introduce to the students to the basic principles and applications of power semiconductor devices. It includes fundamentals, operation & characteristics of the power devices. This course provides instruction in the theory and application of power devices in the electronics and electrical industry. Emphasis is placed on the physical characteristics and uses of power devices.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

Knowledge of basic Electrical and Electronics engineering and its concept.

Course objectives:

1. To gain the knowledge of Power electronic devices and its applications.
2. To Introduce the SCR turn-on turn-off process, current-voltage ratings and its protection.
3. To develop the knowledge about which device to choose for a particular application.
4. To study power conversion topologies like- Rectifiers , DC to DC converter, DC to AC inverter etc.
5. To develop the knowledge of AC controllers, SMPS and UPS etc.

Course outcomes:

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

1. Build and test circuits using power devices such as SCR
2. Analyse and design controlled rectifier, DC to DC converters, DC to AC inverters,
3. Learn how to analyze these inverters and some basic applications.
4. Apply the knowledge, to design the SMPS and UPS.
5. To describe the application of power electronics in day to day life.

COURSE CONTENT

Power Electronics		**Semester:**	**V**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	No. of Lectures: 08 Hours	Marks: 12

Introduction to Power Devices

Silicon Controlled Rectifier (SCR): Structure, symbolic representation, working principle, two transistor Analogy of SCR-Derivation of anode current, Ratings, characteristics (Static and Dynamic: Turn- ON and Turn OFF methods) (Numerical expected), Gate triggering circuits of SCR- R,RC,UJT.

Commutation Methods: Class A, B, C, D, E, F commutation (Circuit diagram, working principle and waveforms)

Protection circuits of SCR: di/dt and dv/dt protection and Snubber circuit (Numerical expected) **IGBT, GTO, DIAC, TRIAC, MCT, Power MOSFET:** Structure, symbolic representation, Working principle, characteristics.

Concept of fast recovery and schottky diodes as freewheeling and feedback diode.

Unit–II:	No. of Lectures: 09 Hours	Marks: 12

Controlled Converters / Rectifiers

Single phase Half Controlled Bridge Rectifier (R, RL & RLE Load)- Circuit diagram, waveforms, average load voltage, RMS load voltage, average load power, active power, reactive power, current distortion factor, displacement factor, input power factor, efficiency, Ripple factor, Form factor. (Numerical expected)

Single phase Full Controlled Bridge Rectifier (R, RL & RLE Load)- Circuit diagram, waveforms, average load voltage, RMS load voltage, average load power, active power, reactive power, current distortion factor, displacement factor, input power factor, efficiency, Ripple factor, Form factor. (Numerical expected)

Three phase half and full controlled converter (R, RL & RLE Load)- Circuit diagram, waveforms, average load voltage, RMS load voltage, Average load current, Operating Modes.

Effect of Source Inductance: 1-Phase and 3-Phase Fully controlled Rectifier

Unit–III:	No. of Lectures: 08 Hours	Marks: 12

Choppers

Classification of Choppers (dc - dc- converter) -Type A, Type B, Type C, Type D and type E choppers, Control strategies of dc - dc- converter -TRC and CLC

Step down and Step up dc-dc converter- Circuit diagram, waveform, and output voltage calculations. Continuous conduction mode, Boundary between continuous and discontinuous conduction Mode and Discontinuous Conduction Mode. (Numerical expected)

Full Bridge dc-dc converter: PWM with Bipolar voltage switching (Derivation of output voltage.) (Numerical expected)

Switching Power Supplies: Analysis of fly back, forward converters for SMPS

Unit–IV:	No. of Lectures: 09 Hours	Marks: 12

Inverters

Inverters: Basic Series and Parallel inverters, construction and principle of operation,

Square and PWM Bridge Inverters: Single phase half bridge and full bridge inverters with R and R-L load, output voltage calculations. Square wave, quasi-square wave and sinusoidal PWM switching, selection of frequency modulation ratio and amplitude modulation ratio. (Numerical expected)

Three phase Bridge inverter: with balanced star resistive load, 120 degree and 180 degree conduction mode for line and phase voltages.

Harmonic reduction Techniques. By single pulse-width modulation, By transformer connection, By multiple commutation in each half cycle, By stepped wave inverter

Unit–V:	No. of Lectures: 08 Hours	Marks: 12

AC Controllers and UPS

AC controllers: Principle of On-Off control or integral cycle and phase angle control**.**

1-Phase Half wave and full wave AC control with R and R -L load, derivation of output Voltage. (Numerical expected) **UPS**- Basic principle, Different configurations/ types of UPS – Off-line On-line, Line disturbances, their comparison, Battery- Ah, back up time and battery charger rating calculations.
Text Books:
1. Ned Mohan, T. M. Undeland and W. P. Robbins- Power Electronics, converters , Application, and Design, John Wiley and sons , (3rd Edition) 2. M. D. Singh , K. B. Khanchandani - Power Electronics, TMH (3rd Edition) 3. M. H. Rashid - Power Electronics circuits, devices and applications, PHI, 3/e. Or Pearson. 4. Dr. Shailendra Jain, Modeling and simulation using MATLAB-Simulink, Wiley India pvt.Ltd.
Reference Books:
1 P. C. Sen Power Electronics Tata Mc-Graw-Hill Publishing Company Limited. 2 Dr. P. S. Bimbhra, Power Electronics, Khanna Publication. 3 M Ramamurthy - An Introduction to Thyristor and their application, Second Edition, 4 M. S. Jamil Asgar, - Power Electronics, PHI, 2004, New Delhi. 5 S. K. Bhattacharya - Industrial Electronics and control , Tata Mc-Graw-Hill (TMH)

Information Theory and Coding (Professional Elective Course–I)					
COURSE OUTLINE					
Course Title:	**Information Theory and Coding**	**Short Title:**	**ITC**	**Course Code:**	

Course description:

This course is about how to measure, represent, and communicate information effectively. Why bits have become the universal currency for information exchange. How information theory bears on the design and operation of modern-day systems such as smart phones and the Internet. What are entropy and mutual information, and why are they so fundamental to data representation, communication, and inference.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

Knowledge of basic Digital Communication Engineering and its concept.

Course objectives:

1. To familiarize the students with the Information Theory.
2. To study and understanding of the concept of coding technique and its applications.
3. To understand the aspects of channel capacity.
4. To study the various techniques of coding and decoding in information theory.
5. To understand the various multiple access techniques.

Course outcomes:

At the end of this course students will demonstrate the ability to

1. Learn the concept of information and entropy
2. Describe the Shannon's theorem for coding
3. Describe the channel capacity
4. Apply various kinds of coding methodology.
5. Describe the real time application of coding techniques.

COURSE CONTENT

Information Theory & Coding		**Semester:**	**V**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**
Introduction to Information Theory Entropy, discret meemoryless source, Shanon's noiseless coding theorem,shenon's fano code, runlength encoding, ARQ system		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Noisy Coding System Encoding of discrete sources. Markov sources, Shannon's noisy coding theorem and converse for discrete channels.		
Unit–III:	**No. of Lectures: 09 Hours**	**Marks: 12**
Channel Capacity Channel model, channel coding theorem, information capacity theorem &its implication Calculation of channel capacity and bounds for discrete channels ,Techniques of coding & decoding, random selection code, channel capacity for MIMO system.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Cyclic codes & Information Theory Application Cyclic codes, data compression, cryptography, overview of encryption technique. Application of information theory.		
Unit–V:	**No. of Lectures: 09 Hours**	**Marks: 12**
Convolutional codes & Communication link Convolutional arithmetic codes. Introduction to multiuser communication, Multiple access technique. Introduction to satellite communication system.Binary signaling , TDMA & CDMA wireless communication system		
Text Books:		
1. R.B. Ash, Information Theory, Prentice Hall, 1970. 2. Shu Lin and D.J. Costello Jr., Error Control Coding, Prentice Hall, 1983. 3. Ranjan Bose - Information Theory Coding and Cryptography, TMH		
Reference Books:		
1. N. Abramson, Information and Coding, McGraw Hill, 1963. 2. M. Mansurpur, Introduction to Information Theory, McGraw Hill, 1987. 3. Taub and Schilling - Principle of Communication Systems, (TMH) 2nd edition.		

Error Correcting Codes
(Professional Elective Course – I)

COURSE OUTLINE

Course Title:	**Error Correcting Codes**	**Short Title:**	**ECC**	**Course Code:**	

Course description:

This course introduces students to iterative decoding algorithms and the codes to which they are applied, Low-Density Parity-Check Codes. The course will begin with an introduction to the fundamental problems of Coding Theory and their mathematical formulations. The technical portion of the course will conclude with a study of tools for explaining and predicting the behavior of iterative decoding algorithms..

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

Knowledge of Analog and Digital Communication Engineering and its concept.

Course objectives:

1. To introduce the students with information & channel securacy.
2. To study and understanding about representation of signals.
3. To learn and understand various Coding Technique for Error Correction.
4. To analyse of Discrete Time signals and systems
5. To understand of the various coding algorithms.

Course outcomes:

At the end of this course students will demonstrate the ability to

1. Describe the error sources
2. Analyse of error control coding applied in digital communication.
3. Describe the various signals with their representation.
4. Analyse the various codes with their algorithms applicable to signal securacy.
5. Describe the various coding algorithms.

COURSE CONTENT

Error Correcting Codes		**Semester:**	**V**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**
Linear block codes Matrix description of LBC, equivalent codes, Linear block codes, Systematic linear codes and optimum decoding for the binary symmetric channel, Generator and Parity Check matrices, Syndrome decoding on symmetric channels.		
Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**
Cyclic Codes Weight enumerators and the McWilliams identities, optimal linear codes, maximum distance separable codes, cyclic redundancy check codes, introduction to cyclic code polynomial, division algorithm, matrix description of cyclic codes, Introduction to finite fields and finite rings, factorization of (X^n-1) over a finite field.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Coding Techniques BCH codes, Reed-Solomon codes, Justeen codes, MDS codes, Alterant, Goppa codes; Hamming codes, Perfect codes.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Decoding Techniques Decoding of BCH codes, Berlekamp's decoding algorithm, Massey's minimum shift register synthesis technique and its relation to Berlekamp's algorithm. A fastBerlekamp - Massey algorithm.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Coding Algorithms Convolution codes, Wozencraft's sequential decoding algorithm, Fann's algorithm and other sequential decoding algorithms, Viterbi decoding algorithm.		
Text Books:		
1. R.E. Balahut, Theory and practice of error control codes, Addison Wesley, 1983. 2. J.G. Proakis - Digital Communications, (MGH), 4th Ed.		
Reference Books:		
1. F.J. McWilliams and N.J.A. Slone, The theory of error correcting codes, 1977. 2. J. Das , K Mulik, P.K. Chatterjee - Principle of Digital Communication , (New Age Int.)		

Biomedical Instrumentation
(Open Elective Course – I)

COURSE OUTLINE

Course Title:	**Biomedical Instrumentation**	**Short Title:**	**BMI**	**Course Code:**	

Course description:

This course provides knowledge about Electronic instruments used in medical application medical recording and monitoring at patient monitoring system.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	14	42	3

Prerequisite course(s):

Knowledge of human organ system, Basic measuring instrument and sensors.

Course objectives: The objectives of this course are

1. To introduce the students with Biomedical measurement in patient monitoring system.
2. To understand operation of various medical measuring instrument
3. To study and measure the signal like ECG, EMG and EEG, their block diagram, specifications and applications.
4. To understand principle and operation of instrument for blood pressure, body temperature and cardiac measurement.
5. To study the modern imaging system like x-ray and ultrasound imaging system.

Course outcomes:

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

1. Describe the importance of biomedical measurement in patient monitoring system.
2. Describe the application of the electronic systems in medical applications.
3. Able to interpret the signals like ECG, EMG and EEG.
4. Apply the fundamental knowledge for measurement of blood pressure, body temperature and cardiac parameter..
5. Describe the applications of modern imaging system like x-ray and ultrasound imaging system.

COURSE CONTENT

Biomedical Electronics		**Semester:**	**V**
Teaching Scheme:		**Examination scheme**	
Lectures: 03	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**
Bioelectric signals: Brief introduction to human physiology, Origin of bioelectric Signals, ECG, EEG, EMG. Recording electrode for ECG Limb, Floating electrode Cardiac Pacemakers External pacemaker, Only types of Implantable Pacemaker, Ventricular synchronous pacemaker Programmable pacemaker Defibrillators-DC Defibrillator.		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Biomedical Transducers Displacement transducer - LVDT, Pressure transducer strain gage transducer, variable capacitance pressure transducer.Transducer for Temperature measurement, Thermocouples, Thermometer, pulse sensors.Blood Flow transducer Electromagnetic, Ultrasonic blood flow meter, Range gated pulse Doppler flow meter		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Patient monitoring system: ECG machine, isolation amplifier in ECG machine. ECG leads, Vetorcardiograph. EEG machine, EMG machine. Medical display system Storage oscilloscope, cardio scope.Patient monitoring system- Bedside monitor, Aids for the handicapped.		
Unit–IV:	**No. of Lectures: 09 Hours**	**Marks: 12**
Biomedical Measurement: Measurement of heart rate, Average heart meter.Blood pressure measurement-Direct method Indirect method of blood pressure measurement - korotkoff' method, Rheographic method. Measurement of temperature, Measurement of respiration Rate-Thermistor method , Impedance anemography method.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
X-ray machine and Computed Tomography: Properties of x-ray, units of X-ray, production of x-Rays, x ray machine, X-ray image intensifier television system. Computed Tomography Principle, System component.Hemodialysis machine, Function of kidney Artificial kidney ,heart lung machine		
Text Books:		
1. W.F. Ganong, Review of Medical Physiology, 8th Asian Ed, Medical Publishers, 1977. 2. J.G. Webster, ed., Medical Instrumentation, Houghton Mifflin, 1978. 3. D. S. Chaudhari, Medical Instruments, 1999.		
Reference Books:		
1. R S Khandpur , Hand book of biomedical Instrumentation Tata McGraw Hill publishing Company limited.		

Renewable Energy Sources (Open Elective Course – I)					
COURSE OUTLINE					
Course Title:	**Renewable Energy Sources**	**Short Title:**	**RES**	**Course Code:**	
Course description:					
This course includes the fundamental knowledge and various methods as well as technologies involved in utilization of various types of renewable energy sources.					
Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**	
	3	**14**	**42**	**3**	
Prerequisite course(s):					
Physics, chemistry, thermodynamics, power electronics					
Course objectives:					
At the end of the course, the students are expected to study and identify the new methodologies / technologies for effective utilization of renewable energy sources.					
Course outcomes:					
After successful completion of this course the student will be able to: 1. Describe about worldwide scenario about renewable energy status. 2. Describe the various solar thermal collectors and fundamentals of solar cell. 3. Analysis of wind and geothermal system. 4. Analysis and classify the use of biomass and biogas energy system. 5. Describe and evaluate the performance of different types of turbines used in tidal system.					
COURSE CONTENT					
Renewable Energy Sources		**Semester:**	**V**		
Teaching Scheme:		**Examination scheme:**			
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**		
		Duration of ESE:	**03 hours**		
		Internal Sessional Exams (ISE):	**40 marks**		

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**
Introduction: Causes of Energy Scarcity, Solution to Energy Scarcity, Factors Affecting Energy Resource Development, Energy Resources and Classification, Renewable Energy – Worldwide Renewable Energy Availability, Renewable Energy in India. **Energy from Sun:** Sun- earth Geometric Relationship, Layer of the Sun, Earth – Sun Angles and their Relationships, Solar Energy Reaching the Earth's Surface, Solar Thermal Energy Applications		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Solar Thermal Energy Collectors: Types of Solar Collectors, Configurations of Certain Practical Solar Thermal Collectors, Material Aspects of Solar Collectors, Concentrating Collectors, Parabolic Dish – Stirling Engine System, Working of Stirling or Brayton Heat Engine, Solar Collector Systems into Building Services, Solar Water Heating Systems, Passive Solar Water Heating Systems, Applications of Solar Water Heating Systems, Active Solar Space Cooling, Solar Air Heating, Solar Dryers, Crop Drying, Space Cooing, Solar Cookers, Solar pond. **Solar Cells:** Components of Solar Cell System, Elements of Silicon Solar Cell, Solar Cell materials, Practical Solar Cells, I – V Characteristics of Solar Cells, Efficiency of Solar Cells, Photovoltaic Panels, Applications of Solar Cell Systems, Photovoltaic System		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Wind Energy: Fundamentals of Wind Technology Windmills, Wind Turbines, Wind Resources, Wind Turbine Site Selection. **Geothermal Energy:** Geothermal Systems, Classifications, Geothermal Resource Utilization, Resource Exploration, Geothermal Based Electric Power Generation, Associated Problems, environmental Effects		
Unit–IV:	**No. of Lectures: 09 Hours**	**Marks: 12**
Biomass Energy: Biomass Production, Energy Plantation, Biomass Gasification, Theory of Gasification, Gasifier and Their Classifications, Chemistry of Reaction Process in Gasification, Updraft, Downdraft and Cross-draft Gasifiers, Fluidized Bed Gasification, Use of Biomass Gasifier, Gasifier Biomass Feed Characteristics, Applications of Biomass Gasifier, Cooling and Cleaning of Gasifiers. **Biogas Energy**: Introduction, Biogas and its Composition, Anaerobic Digestion, Biogas Production, Benefits of Biogas, Factors Affecting the Selection of a Particular Model of a Biogas Plant, Biogas Plant Feeds and their Characteristics.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Tidal Energy: Introduction, Tidal Energy Resource, Tidal Energy Availability, Tidal Power Generation in India, Leading Country in Tidal Power Plant Installation, Energy Availability in Tides, Tidal Power Basin, Turbines for Tidal Power, Advantages and Disadvantages of Tidal Power.		
Text Books:		
1. Rai. G.D., "Non Conventional Energy Sources", Khanna Publishers, New Delhi, 2011. 2. Twidell, J.W. & Weir, A., "Renewable Energy Sources", EFN Spon Ltd., UK, 2006. 3. Sukhatme. S.P., "Solar Energy", Tata McGraw Hill Publishing Company Ltd., New Delhi, 1997.		
Reference Books:		
1. Godfrey Boyle, "Renewable Energy, Power For A Sustainable Future", Oxford University Press, U.K., 1996.		

2. Tiwari. G.N., Solar Energy – "Fundamentals Design, Modelling& Applications", Narosa Publishing House, New Delhi, 2002.
3. Freris. L.L., "Wind Energy Conversion Systems", Prentice Hall, UK, 1990.

E – waste management
(Open Elective Course – I)

COURSE OUTLINE

Course Title:	**E – waste management**	**Short Title:**	**EWM**	**Course Code:**	

Course description:

The present era is truly an electronics and IT era. Electronic devices have become an integral part of each and every aspect of day to day modern life. Ultimately, every electronic gadget one day becomes a waste. Its huge quantity and hazardous nature becomes a great concern to the environmentalists. This course is aimed to create awareness in the mind of students about the gigantic issue of e waste and prevailing legislations about it. It appraises the students about its bad effects on environment and human health and to train the student in disposal methodologies in this regard.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	**14**	**42**	**3**

Prerequisite course(s):

Course objectives:

1. To appraise and aware the student about problem of e – waste.
2. To appraise and aware and student about environmental legislations pertaining to solid waste.
3. To train a student in designing a complete e – waste management plan of a locality or industrial sector including collection, recovery, recycling and disposal of solid waste in an environmentally consistent manner.

Course outcomes:

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

1. Evaluate the rate of generation of e waste from a particular sector
2. Analyze the e waste generated by a sector.
3. Understand the detrimental effects of solid waste.
4. Design a comprehensive plan to collect, recycle and dispose off e waste generated by a sector.
5. Evaluate the economics and man power requirements of the e waste management plan.

COURSE CONTENT

E – waste management		**Semester:**	**V**
Teaching Scheme:		**Examination scheme:**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**
History of solid waste problem, solid waste management in ancient India and modern India, black death incidence of Europe, aspects of global solid waste problem. Types of solid waste, *E* waste: Sources, generation rates and global generation scenario. Hazardous Waste (Management and Handling) Rules, 1989 and amendments, Federal Hazardous Waste Regulations under RCRA, Superfund, CERCLA and SARA. Toxicology, public health impact, and Protocols in *E* waste management.		
Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**
Assessment of *E* waste generation rates, sampling plans and protocols, characterization of *E* waste, constituents of *E* waste, parameters of concern in *E* waste, measurement of toxicity of *E* waste. Various aspects Pollution effects of *E* waste. Occupational and environmental health perspectives of *E* wastes. Objectives and scope of *E* waste management. *E* waste material flow. Components of *E* waste management. Stake holders in *E* waste management.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Mechanisms of *E* waste trade. *E* waste life cycle. Fate of constituents of *E* waste in environment. Current *E* waste management practices, Institutional mechanism, collection system for *E* waste, logistics for *E* waste. Economic aspects specially pertaining to developing countries. G – 8 3R initiative. Global *E* waste sustainability initiative. Strategies for *E* waste management, collection systems, collection channels, collection infrastructures, principles of designing collection system for *E* waste.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
E waste treatment technologies, first level treatment, second level treatment, third level treatment technology. Environmental impacts of first, second and third level of treatment. Assessment of man power for *E* waste management of a locality. Financial aspect of E waste collection, handling, treatment and recycling. Financial models proposed for developing countries.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
E waste management Innovation hubs and knowledge centre's of excellence in emerging economies: case study of India, China and South Africa. *E* waste management Innovation hubs and knowledge centre's of excellence in developed countries: case study of USA. Risk profiling in *E* waste management. Workers' safety and legislations.		
Text Books:		
1. E-waste Volume II: E-waste Management Manual by United Nations Environmental Programme, Division of Technology, Industry and Economics, International Environmental Technology Centre, Osaka/Shiga. 2. RECYCLING FROM E-WASTE TO RESOURCES Guido Sonnemann, UNEP DTIE Bas de Leeuw, UNEP DTIE, Printing Oktoberdruck AG, Berlin, Germany.		
Reference Books:		
1. Electronic Waste: Recycling Techniques. Edited by Hugo Marcelo Veit and Andrea MouraBernardes, Springer publication. 2. E waste management: from waste to resource. Edited by Klaus Hieronymi, RamzyKahhat, and Eric Williams.Published by Taylors and Francis.		

Microcontrollers Lab					
LAB COURSE OUTLINE					
Course Title:	**Microcontrollers Lab**	**Short Title:**	**MicroLab**	**Course Code:**	

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	2	14	28	1

End Semester Exam (ESE) Pattern: **Practical(PR)**

Prerequisite course(s):

Knowledge of Basic Electronics & Digital Electronics is desirable.

Course objectives:

In this laboratory course emphasis is on the hand on writing program on different operation and peripheral Interfacing in laboratory.

Course outcomes:

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

1. Understand Architecture, pins diagram, instruction and interfacing of microcontroller.
2. Learn compiling and downloading of program.
3. Interpret the program for 8051 in assembly language for given problem.
4. Describe the iteration, loop behavior implementation in the program for 8051.
5. Interface I/O devices, memory to 8051 microcontroller.

LAB COURSE CONTENT

Microcontroller Lab		**Semester**	**V**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous Assessment (ICA):	**25 marks**

Lab file should consist of minimum eight experiments. Demonstrate the use of assembler and Simulator for practical's.

1. Write and Execute program to for addition, subtraction, multiplication and division.
2. Write and Execute program to flash and roll LED's.
3. Write and Execute program to display 0 to 9 continuously on 7- Segment display.
4. Write and Execute program to interface a single switch and LED, 4X4 matrix switch and 7-segment display.
5. Write and Execute program to demonstrate interfacing of multiplexed 7-Segment display.
6. Write and Execute program to demonstrate interfacing of DAC.
7. Write and Execute program to demonstrate interfacing of ADC.
8. Write and Execute program to demonstrate interfacing of Stepper Motor.
9. Write and Execute program to demonstrate working of serial protocols
10. Write and Execute program to demonstrate interfacing of relay.
11. Write and Execute program to demonstrate interfacing of sensor.
12. Write and Execute program to demonstrate the phase / frequency / power factor measurement.

Text Books:

1. Microprocessor Architecture, Programming, and Applications with the 8085, Ramesh
2. Gaonkar, PENRAM International Publishers.
3. N Senthil Kumar, M Saravanan, S Jeevananthan, and Satish Shah- Microprocessors and
4. Interfacing (Series - Oxford Higher Education)
5. Douglas Hall, Microprocessors Interfacing, Tata McGraw Hill, 1991.

Reference Books:

1. M.A. Mazidi, J.C. Mazidi, R.D. McKinlay, The 8051 Microcontroller and Embedded
2. Systems using Assembly and C, Second Edition, Pearson
3. Kenneth Ayala, The 8051 Microcontroller, Third Edition, Delmar Learning, a part of Cengage Learning (India Edition)
4. Ajay Deshmukh, Microcontrollers[Theory and Applications], Tata McGraw hill, New Delhi
5. Mike Predko - Programming and Customizing 8051 micro controller, TMH.

Guide lines for ICA:

Students must submit ICA in the form of journal. Each Practical should be well documented. Faculty in charge will assess the Practical continuously and grade or mark each Practical on completion date declared for each Practical.

Guidelines for ESE:

ESE will be based on the performance of laboratory Practical submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

Signals and System Lab					
LAB COURSE OUTLINE					
Course Title:	**Signals and System Lab**	**Short Title:**	**S&S Lab**	**Course Code:**	

Course description:

In this course, the student will acquire hands-on experience with programming in any open source like Scilab or Matlab. Scilab or Matlab will enable you to study and understand the theory behind signals and systems as well as validate the theory with real-word examples. The labs will cover linear time-invariant systems, Fourier series and Fourier transform, sampling, digital filters, along with several accompanying digital signal-processing (DSP) applications.

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	2	14	28	1

End Semester Exam (ESE) Pattern:	**Practical(PR)**

Prerequisite course(s):

Basic concepts of Basic Electrical and Electronics Engineering.

Course objectives:

In this laboratory course emphasis is on the hand on design practice , implementation and testing of various mathematical terms in signal and systems with the help of various transforms.

1. Students will able to Generate and characterize various continuous and discrete time signals.
2. Students will able to understand basic operations on the signals.
3. Students will learn analysis of Fourier transform s and compute its response.
4. Students will think about application of Laplace transform and Z- transform.
5. Students will able to understand the state space analysis.

Course outcomes:

Upon successful completion of lab Course, student will

1. Apply the mathematical description and representation of continuous time and discrete time signals .
2. Analyze the spectral characteristics of signals using Fourier analysis
3. Analyze the systems using Laplace transform and Z-transform.
4. Apply the fundamental knowledge for sampling and quantization of signal.
5. Understand the use of state space analysis.

LAB COURSE CONTENT

Signals and System Lab		**Semester:**	**V**
Teaching Scheme:		**Examination scheme:**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous Assessment (ICA):	**25 marks**

Concern faculty member should suitably frame eight laboratory assignments from the following list.

1. Introduction to MATLAB/Scilab
2. To create user defined functions for generating sinusoidal signal, delta function, unit step function and periodic signal.
3. To create user defined functions for signal operation: signal addition, time shifting, time scaling and time inversion.
4. To compute convolution of two signals and verify its properties.
5. To synthesize the periodic signal using Fourier series.
6. To analyze the spectrum of the signal using Fourier transform and verify its properties.
7. To compute and plot the impulse response and pole-zero diagram of transfer function using Laplace transform
8. To find Z-transform of a signal.
9. Plot the magnitude and phase of the frequency response of the given digital filter using Frequency function: $Y(n) = 0.2x(n) + 0.52y(n-1)–0.68(y(n-2)$.
10. Generate a discrete time sequence by sampling a continuous time signal. Show that with Sampling rates less than Nyquist rate, aliasing occurs while reconstructing the signal.
11. Consider a signal which is sampled at a sampling rate of X Samples per second. Find the power content and power spectral density for the signal.
12. Find transfer function from a given state model and vice versa.
13. Find state model from a given set of poles and zeros and vice versa.
14. Find step, ramp, impulse response of a state model.

Text Books:

1. NagoorKani, “Signals and Systems”, Tata McGraw Hill, Third Edition, 2011.
2. B.P. Lathi, “Principles of Linear Systems and Signals”, Oxford, Second Edition, 2010.
3. S. L. Nalbalwar, A. M. Kulkarni and S. P. Sheth, “Signals and Systems”, Synergy Knowledgeware, 2016.
4. Simon Haykin and Barry Van Veen, “Signals and Sytems”, John Wiley and Sons, Second Edition,2004.

Reference Books:

1. Hwei. P Hsu, “Signals and Systems”, Tata McGraw Hill, Third edition, 2010
2. V. Krishnaveni and A.Rajeshwari, “Signals and Systems”, Wiley-India, First Edition 2012.
3. Narayana Iyer, “Signals and Systems”, Cenage Learning, First Edition 2011.
4. Michael J Roberts, “Fundamentals of Signals and systems”, Tata McGraw Hill, special Indian Economy edition, 2009.
5. Rodger E Ziemer, William H. Tranter and D. Ronald Fannin, “Signals and Systems”, Pearson Education, Fourth Edition 2009.
6. Alan V. Oppenhiem, Alan S. Willsky and S. Hamid Nawab, “Signals and Systems”, Prentice-Hall of India, Second Edition, 2002.
7. Douglas K. Lindner, "Introduction to Signals and Systems", McGraw Hill International Edition: c1999.
8. Robert A. Gabel, Richard A. Roberts, "Signals and Linear Systems", John Wiley and Sons, 1995.

9. M. J. Roberts, "Signals and Systems - Analysis using Transform methods and MATLAB", TMH, 2003.

Guide lines for ICA:

Students must submit ICA in the form of journal. Each Practical should be well documented. Faculty in charge will assess the Practical continuously and grade or mark each Practical on completion date declared for each Practical.

Guidelines for ESE:

ESE will be based on the performance of laboratory Practical submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

Power Devices & Circuits Lab					
LAB COURSE OUTLINE					
Course Title:	**Power Devices & Circuits Lab**	**Short Title:**	**PDC Lab**	**Course Code:**	

Course description:

In this laboratory course emphasis is on the understanding of different Power semiconductor devices and their applications like controlled rectifiers, choppers, inverters and ac regulators.

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	2	14	28	1

End Semester Exam (ESE) Pattern:	**Practical(PR)**

Prerequisite course(s):

Basic concepts of Basic Electrical and Electronics Engineering.

Course objectives:

1. To design the SCR firing circuits.
2. To understand the practical concepts of rectifier, converters and inverters.
3. To understand the practical concept of various commutation circuit.
4. To familiarise the practical concept of various chopper circuits.
5. To study the practical concept of AC regulator circuit.

Course outcomes:

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

1. Design SCR firing circuit.
2. Understand the concept of power conversion AC to DC, DC to DC etc.
3. Measure the response of single phase and three phase supply.
4. Design different types of Controller.
5. Describe the 1-ϕ Half and full controlled Bridge rectifier with R and RL Load

LAB COURSE CONTENT

Power Devices & Circuits Lab		**Semester:**	**V**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**End semester exam (ESE):**	**25 marks**
		Internal Continuous Assessment (ICA):	**25 marks**

Concerned faculty member should suitably frame Eight laboratory assignments from the following list.

Group A

1. Study of R, RC triggering circuits of SCR to plot waveforms for various values of firing angle.
2. Study of UJT triggering circuits of SCR to plot waveforms for various values of firing angle.
3. Study and design of Class A, B, C, D, E and F commutation circuits of SCR.(Any two)

Group B

1. Study of 1 - ϕ Half controlled Bridge rectifier with R and RL Load, plot input and output voltage waveforms, average load voltage v/s firing angle.

2. Study of 1- ϕ full controlled converter with R and R-L load, plot input and output voltage waveforms, average load voltage v/s firing angle.
3. Study of 1- ϕ full controlled Bridge converter with R and R-L load, plot input and output voltage waveforms, average load voltage v/s firing angle.

Group C

1. Study of circuit and waveforms of step-up dc –dc converter and plot output voltage v/s duty ratio and switching frequency.
2. Study of circuit and waveforms of step-down dc –dc converter and plot output voltage v/s duty ratio and switching frequency.
3. Study of SMPS.

Group D

1. Study of Series Inverter and find efficiency.
2. Study of Parallel Inverter and find efficiency.
3. Simulation of single phase full converter, development of model, plotting the waveform on figure and FFT analysis (use MATLAB/Scilab - SimPowerSystem Software).
4. Simulation of single phase full bridge inverter, development of model, obtain frequency spectrum using powergui block (use MATLAB/Scilab - SimPowerSystem Software).

Group E

1. Study and plot V-I characteristics of Diac/Triac/GTO/IGBT(any one).
2. Study of 1- ϕ AC controller with R load and measure load voltage and plot waveforms for different firing angles.
3. Study of UPS.

Text Books:

1. Ned Mohan, T. M. Undeland and W. P. Robbins- Power Electronics, converters , Application, and Design, John Wiley and sons , (3rd Edition)
2. M. D. Singh , K. B. Khanchandani - Power Electronics, TMH (3rd Edition)
3. M. H. Rashid - Power Electronics circuits, devices and applications, PHI, 3/e. Or Pearson.
4. Dr. Shailendra Jain, Modeling and simulation using MATLAB-Simulink, Wiley India
5. pvt.Ltd.

Reference Books:

1. P. C. Sen Power Electronics Tata Mc-Graw-Hill Publishing Company Limited.
2. Dr. P. S. Bimbhra, Power Electronics, Khanna Publication.
3. M Ramamurthy - An Introduction to Thyristor and their application, Second Edition,
4. M. S. Jamil Asgar, - Power Electronics, PHI, 2004, New Delhi.
5. S. K. Bhattacharya - Industrial Electronics and control , Tata Mc-Graw-Hill (TMH) Deodatta Shingare, Industrial and Power Electronics, Electrotech Pub.

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

Minor Project (Stage – I)					
LAB COURSE OUTLINE					
Course Title:	**Minor Project (Stage – I)**	**Short Title:**	**MPROJ-SI**	**Course Code:**	

Course description:

Minor project represent the culmination of study towards the Bachelor of Engineering degree. The minor project offers the opportunity to apply and extend material learned throughout the program. The emphasis is necessarily on facilitating student learning in technical, project management and presentation spheres. Societal based project will be highly preferred.

Laboratory	Hours/week	No. of weeks	Total hours	Semester credits
	6	14	84	3

End Semester Exam (ESE) Pattern: ----

Prerequisite course(s):

Course objectives:

1. To understand the basic concepts & broad principles of projects.
2. To understand the value of achieving perfection in project implementation & completion.
3. To apply the theoretical concepts to solve problems with teamwork and multidisciplinary approach.
4. To demonstrate professionalism with ethics; present effective communication skills and relate engineering issues to broader societal context.

Course outcomes:

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

1. Demonstrate a sound technical knowledge of their selected project topic.
2. Undertake problem identification, formulation and solution.
3. Design engineering solutions to complex problems utilizing a systems approach.
4. Conduct an engineering project
5. Demonstrate the knowledge, skills and attitudes of a professional engineer.

LAB COURSE CONTENT

Minor Project (Stage – I)		Semester:	V
Teaching Scheme:		**Examination scheme:**	
Practical:	**6 hours/week**	**Internal Continuous Assessment (ICA):**	**50 marks**

At third year the students shall carry out a minor project in a group of maximum up to 5 students. The project work spans both the semesters. By the end of Semester – V the students shall complete the partial work, and by the end of Semester – VI the students shall complete remaining part of the project. Assessment for the project shall also include presentation by the students. Each teacher can guide maximum 04 groups of minor projects.

The students should take project work, as specified in the curriculum, based on the knowledge acquired by the students during the degree course till Semester – IV. The project may be either fully theoretical/practical or involving both theoretical and practical work to be assigned by the Department. The work may also be Study/Survey/Design.

Minor Project (Stage – I) may involve literature survey, problem identification, design methodology, collection of data etc. The project work shall involve sufficient work so that students get acquainted with different aspects of design and analysis. Approximately more than 50% work should be completed by the end of Semester – V. Each student group should submit partial project report in the form of thermal bound at the end of Semester –V.

Each student group is required to maintain separate log book for documenting various activities of the project.

Suggestive outline for the partial project report is as follows.

Abstract

Chapter 1. Introduction

- Background
- Motivation
- Problem Definition
- Scope
- Objective
- Selection of Life cycle Model for Development
- Organization of Report
- Summary

Chapter 2. Project Planning and Management

- Feasibility Study
- Risk Analysis
- Project Scheduling
- Effort Allocation
- Cost Estimation
- Summary

Chapter 3. Analysis

- Requirement Collection and Identification
- H/w and S/w Requirement (Data, Functional and Behavioral)
- Functional and non-Functional Requirements
- Software Requirement's Specification (SRS)
- Summary

Chapter 4. Design

- System Arch
- Data Flow Diagram

- UML Diagrams (Use case ,Class, Sequence, Component,Deployment,Statechart,Activity diagram etc.)
- Summary

Chapter 5. Conclusion & Future Work

Bibliography

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Appendix

Guide lines for ICA:

The Internal Continuous Assessment (ICA) for project shall be based on continuous evaluation of students' performance, active participation, knowledge / skill acquired throughout semester and presentation by the students. The assessment shall be done jointly by the guide and departmental committee. A three-member departmental committee including guide, appointed by Head of the department, shall be constituted for the assessment. The assessment for Minor Project (stage – I) in Semester – V shall be as per the guidelines given in Table – A.

Table – A

		Assessment by Guide					Assessment by Departmental Committee		
Sr. No.	Name of the Student	Attendance / Participation	Problem Identification / Project Objectives	Literature Survey	Methodology / Design	Report	Depth of Understanding	Presentation	Total
	Marks	5	5	5	5	5	10	15	50

Constitution of India

Basic features and fundamental principles

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement, however, few critics have argued that it does not truly incorporate our ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India has played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in the world".

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

Kavayitri Bahinabai Chaudhari

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Third Year Engineering
(Electronics and Telecommunication Engineering)

Faculty of Science and Technology

'A' Grade
NAAC Re-Accredited
3rd Cycle

COURSE OUTLINE

Semester - VI

W.E.F. 2020 – 21

Control System					
COURSE OUTLINE					
Course Title:	**Control system**	**Short Title:**	**CS**	**Course Code:**	

Course description:

This course provides an introduction to feedback control system covering: basic concept of open loop and close loop system, types of control system and their components, modeling of physical system, transfer function methods. Time response of different order system. Stability method and frequency method such as bode plot, polar plot, Nyquist criterion analysis of state variables An Introduction to different types of controller which is used to improve the performance of the system.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

Knowledge of Signals and its concept.

Course objectives:

1. To gain the knowledge of open and closed loop control systems.
2. To introduce the students with the modeling and analysis of feedback control systems, concept of transfer function and different methods to determine it.
3. To introduce the students with the transient and steady state response of the system.
4. To understand the concept of time domain & frequency domain analysis.
5. To analyze the system using state space approach.

Course outcomes:

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

1. Describe the fundamental concept and principle of feedback control system.
2. Analyze different transfer function methods
3. Gain knowledge regarding time domain analysis and stability of control system
4. Create an ability among the students to analyze control system using root locus and frequency domain methods.
5. Develop among students the concept of state space analysis method and different types of controller.

COURSE CONTENT

Control System		**Semester:**	**VI**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**
Introduction to control system		
Introduction to control problem- Industrial Control examples. Types of control system & open loop and closed loop system. Transfer function of Block diagram algebra. Masons gain formula and transfer function of signal flow graph. Conversion of Block diagram algebra to Signal flow graph.(Note: Numericals on above topic)		
Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**
Time Response Analysis and Stability		
Standard test signals.Time response of first and second order system.Steady state error and error constant.Design specifications of second order system.Transient response & its specifications. The concept of stability & Necessary condition of stability. Hurwitz stability criterion.Routh stability criterion, Relative stability analysis. (Note: Numericals on above topic)		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Root Locus Method		
General rule to draw root locus. Design of root locus. Effect of addition of open loop poles. Effect of addition of open loops zeros. Design of lead and lag compensator using root locus (Note: Numericals on above topic)		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Frequency Response Analysis and Stability		
Correlation between Time and frequency response. Basics of Magnitude and phase plot. Construction of bode plot. Introduction of lead and lag compensator using bode plot. Polar plot. Nyquist plot. Nyquist stability criterion. (Note: Numericals on above topic)		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
State Variable Analysis and Controllers		
Concept of state (State variable and state model). State model of linear system. Solution of state equation. Controllability and observability. Introduction to controller PI, PD and PID. Stepper motor. Servo motor and synchronous motor. (Note: Numericals on above topic)		
Text Books:		
1. Gopal. M & I.J.Nagrath "Control Systems: Principles and Design",4th edition Tata McGraw-Hill, 1997. 2. Kuo, B.C., "Automatic Control System", Prentice Hall, sixth edition, 1993. 3. Ogata, Katsuhiko, "Modern Control Engineering", Prentice Hall, second edition, 1991.		
Reference Books		
1. I.J. Nagrath & Gopal, "Modern Control Engineering", New Age International, New age 5th edition. 2. Ashok kumar –Control system –Tata McGraw Hill Publishing Company. 3. R. Amanda and P. Ramesh Babu- Control system Engineering- SciTech. 4. Smarajit Ghosh – Control systems second edition – PEARSON publishers.		

Electronic Measurement					
COURSE OUTLINE					
Course Title:	**Electronic Measurement**	**Short Title:**	**EM**	**Course Code:**	

Course description:

This course provides knowledge about various measuring instrument in measurement of electronics, electrical and nonelectrical quantities. The study of signal generator, signal analyzers, indicating devices like CRO is included.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	14	42	3

Prerequisite course(s):

Knowledge of Elements of Electrical & Electronics Engineering,

Course objectives:

1. To Study various analog measuring Instruments.
2. .To Study various digital measuring Instruments.
3. To introduce with Signal generator and Signal Analyzers.
4. To study the working of CRO, its type with applications.
5. To introduce with sensors and types of Data acquisition system.

Course outcomes:

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

1. Explain the principle and operation for analog instruments, like LCR Q` meter, Vector voltmeter, impedance meter.
2. Understand the principle and operation of Digital Instruments and its working.
3. Demonstrate operation and application of Signal generator & Signal Analyzers.
4. Demonstrate the detail study of voltage indicating device CRO and its applications.
5. Understand the working of different types of data acquisition system.

COURSE CONTENT

Electronic Measurement		**Semester:**	**VI**
Teaching Scheme:		**Examination scheme**	
Lectures: 03	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**

Analog Instruments:

Definition of different terms: Accuracy, precision, sensitivity, resolution, Errors: gross error, systematic error, random error, limiting errors. Q meter :- Basic Q meter circuit, Measurement methods, Direct Connection, series connection and parallel connection with circuit diagram (Derivation not Required)Sources of errors with its derivation.(Numerical on sources of errors), True RMS responding voltmeter, Vector voltmeter: - Block diagram and its explanation. Vector impedance meter: - Block diagram and its explanation. Field strength meter: - Block diagram and its explanation. Automatic bridges: - Circuit diagram and its explanation.

Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**

Digital Instruments:

Digital Frequency Meter: - Basic circuit of a Digital frequency meter, basic circuit for frequency

measurement, High frequency measurement. Digital measurement of time: - Time base selector, measurement of time (period measurement), Ratio and multiple ratio measurement.

Universal Counter, Electronic Counter:-Totalizing, Frequency mode, ratio mode, Period mode, Time interval mode. Digital tachometer, Digital Ph meter, Phase meter, Capacitance meter. Microprocessor based instruments

Unit–III:	No. of Lectures: 08 Hours	Marks: 12

Signal Generators and Analyzers

Sine wave Generator Frequency synthesized signal generator. Random noise generator Function Generator, Optical Time Domain Reflectometer (OTDR). Frequency selective wave analyzer, heterodyne wave Analyzer. Harmonic distortion analyzers – Harmonic Distortion, Tuned circuit Harmonic analyzer, Heterodyne Harmonic Analyzer, Fundamental suppression Harmonic distortion analyzer. Spectrum analyzer- Basic spectrum analyzer using Swept receiver design. Applications of spectrum analyzer.

Unit–IV:	No. of Lectures: 09 Hours	Marks: 12

Oscilloscope :

Block diagram of CRO - vertical amplifiers, horizontal deflecting systems, triggered sweep CRO, trigger pulse Circuit. Delay line – lumped parameter delay line, distributed parameter delay line. Dual beam CRO, Dual trace CRO .Sampling (VHF) oscilloscope, storage oscilloscope (for VLF signal) and digital read out oscilloscope. Probes for CRO- direct probe, passive voltage probe and active probe using FET. Digital storage oscilloscope.

Unit–V:	No. of Lectures: 08 Hours	Marks: 12

Transducers and Data Acquisition system :

Classification of Electric transducer, Selection criteria of transducer. Temperature Transducer - Thermometer and Thermocouple. Generalized Data Acquisition System, Objectives of DAS, Single channel and multichannel DAS:- (Analog multiplexed, multiplexing outputs of ample/hold, multiplexing after ADC and multiplexing low level data)Computer based testing of an Audio amplifier and a radio Receiver.

Text Books:

1. H. S. Kalsi, “Electronic Instrumentation”, TMH, 2nd Edition, 2007.
2. D. Helfric and W. D. Cooper, “Modern Electronic Instrumentation and Measurement Technique”, Pearson LPE, 3rd Edition, 2005.
3. K. Lal Kishore, “Electronic Measurement and Instrumentation”, Pearson 4th, Edition, 2012

Reference Books:

1. K. Sawhney, “Electrical and Electronics measurement and Instrumentation”, Dhanpat Rai and company, 18th Edition, 2007.
2. Oliver & Cage, “ Electronic measurements and instrumentation”,Mc Graw Hill Education
3. R.K. Rajput , “ Electronics measurement and Instrumentation”,S Chand

Electronic Design					
COURSE OUTLINE					
Course Title:	**Electronic Design**	**Short Title:**	**ED**	**Course Code:**	VI

Course description:

This course provides the students with comprehensive study of basic components and circuits of Analog Electronics. It deals with BJT, FET, OpAmp, DAC and ADC.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	03	14	42	3

Prerequisite course(s):

Knowledge of Basics of Electronics.

Course objectives:

1. To study design of unregulated and regulated power supply.
2. To understand design of small signal amplifiers.
3. To study the design of large signal amplifier and tuned amplifier.
4. To understand design of oscillators and wave shaping circuits.
5. To study the design of analog integrated circuits.

Course outcomes:

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

1. Design and implement power supply.
2. Design and implement small signal amplifiers.
3. Design various power amplifiers and tuned amplifier.
4. Design of oscillators and wave shaping circuits for various practical applications.
5. Design of various analog integrated circuits using analog IC.

COURSE CONTENT

Electronic Design		**Semester**	**VI**
Teaching Scheme:		**Examination Scheme:**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**
Design of Power Supplies		
Design of unregulated power supply (full wave rectifier with capacitor and inductor filters), Design of Series Voltage Regulator (with error amplifier), fold back protection circuit, Improvement of Stabilization factor by using Darlington pair for regulator, Design of three terminal IC based voltage regulator circuits, design of dual tracking power supply using with unregulated power supply, Design of SMPS and switching regulators using IC LM 2575 / 2577 (buck and boost regulators – fixed and adjustable output voltage)		
Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**
Design of Small Signal Amplifiers using BJT / FET		
Design of single stage CE / CS amplifier with biasing circuit, Design of single stage CB / CG amplifier with biasing circuit, Design of Single stage CC/ CD amplifier with biasing circuit, Design of feedback amplifiers using BJT / JFET(Current series and Voltage shunt)		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Power and Tuned Amplifiers		
Design of Class A Amplifier (resistive load and transformer coupled load), Design of Class B amplifier, Design of Class AB amplifier, Design of power amplifier using IC LM380, Design of single tuned amplifiers BJT / FET		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Design of Oscillators and wave shaping circuits		
Design RC and LC Oscillators – RC Phase shift oscillator, Hartley, Colpitts and Clapp oscillator using BJT/FET, Design of collector coupled Astable multivibrator and collector coupled Monostable multivibrator using BJT/FET, Design of UJT relaxation Oscillator, Design of Schmitt trigger using BJT.		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Design using Analog Integrated Circuits		
Design of single supply ac inverting and non-inverting amplifier using IC324, Design of ASK/FSK modulator using IC555, Design of ramp generator using IC555, Design of V/F and F/V converters using TC9400, Design of VCO, IC 565 PLL & Applications, IC 8038 Waveform generator, Design of active Butterworth filters, Sallen Key filters using opamp 741.		
Text Books:		
1. M.M. Shah - Design of Electronics Circuits and Computer Aided Design, New Age Int. 2. Michael Jacob - Application and Design with Analog Integrated Circuits, PHI 2		
Reference Books:		
1.Bell - Electronics Devices and Circuits, PHI or Pearson 4/e 2. Goyal, Khetan - Monograph on Electronics Design Principles, Khanna Pub. 3. Rashid – Microelectronics Circuits Analysis and Design, Cenage Learning, 2/e. 4.Sergio Franco – Design with OP-AMP and Analog Integrated Circuits, TMH, 3/e 5.IC datasheets.		

CMOS DESIGN
(Professional Elective Course – II)

COURSE OUTLINE

Course Title:	**CMOS DESIGN**	Short Title:	*CMD*	Course Code:	

Course description:

The scope of the course covers both digital and analog design based standard or custom cells development. Layout fundamentals, both digital & analog analysis (passive components, variations, mismatches etc.).
Design levels: Logic, circuit and layout. Simple cells design.

Lecture	Hours/week	No. of weeks	Total hours	Semester credits
	3	*14*	*42*	*3*

Prerequisite course(s):

1. Basic Electronics ,
2. Semiconductor Devices
3. Introduction to Analog Electronics
4. Introduction to Digital Electronics

Course objectives:

1. To understand different CMOS logic families and their circuit layout.
2. To understand various VLSI design methodologies.
3. To learn how to model, analyze digital integrated circuits.
4. To learn how to simulate digital integrated circuits.
5. To design digital integrated circuits.

Course outcomes:

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

1. Understand the basic theory of MOS transistors..
2. Understand the basic steps of fabrication.
3. Analyze Combinational Circuit using CMOS.
4. Develop Sequential Circuit using CMOS.
5. Acquire knowledge to Design of Data Processing Elements using VHDL.

COURSE CONTENT

CMOS DESIGN		**Semester:**	**VI**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I	**No. of Lectures: 09 Hours**	**Marks: 12**

Introduction to CMOS Technology MOS Transistors, MOS Transistors Switches. CMOS Logic: The Inverter, Combinational Logic, The NAND Gate, NOR Gate, Compound Gates, Multiplexers, Memory-Latches and Registers

Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**

CMOS Processing Technology Silicon Semiconductor Technology: An overview: Wafer Processing, Oxidation, Epitaxy, Deposition, Ion-Implantation, and Diffusion. The silicon Gate Process. Basic CMOS Technology: A basic n-well CMOS Process, The p-well process, Twin – Tub Process, Circuit Elements: Resistors, Capacitors:.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Combinational Circuit Design Comparison of Circuit families: Static CMOS, Rationed Circuits, Cascode Voltage Switch Logic. Dynamic Circits and Dual- Rail Domino Multiple Output Domino Logic. BiCMOS Circuits: BiCMOS NAND Gate.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Sequential Circuit Design Sequencing Static Circuits. Design of latches and flip flops. Conventional CMOS Latches, Pulsed Latches. Conventional CMOS Flip-Flops , Resettable Latches and Flip Flops, Enabled Latches and Flip Flops .		
Unit–V :	**No. of Lectures: 08 Hours**	**Marks: 12**
VHDL Behavioral Modeling With Concurrent Signal Assignments. Bitwise Operators. Comments and white space. Other Operator. Conditional Signal Assignment Statements. Selected Signal Assignment Statements. Basic Constructs: Blocks ,Entities and Architecture..Hierarchy, Types. Library and Use Clauses. Tri-states.		
Text Books:		
1. N.H.E. Weste and D.M. Harris, CMOS VLSI design: A Circuits and Systems Perspective 4th Edition, Pearson Education India, 2011. 2. N.H.E. Weste and Kamran Eshraghian ,Principles of CMOS VLSI Design, A Systems Perspective, 4th Edition, Pearson Education India, 2011		
Reference Books:		
1.Basics of CMOS Cell Design by Etienne Sicard and Soniya Delmas Bendhia ,Tata McGraw – Hill Professional 2. Design of Analog CMOS Integrated Circuits, B. Razavi, Tata McGraw-Hill. 3. Introduction To VLSI Design by Eugene D.Fabricius ,McGraw-Hill International Edition 4.CMOS/BiCMOS ULSI LOW VOLTAGE ,LOW POWER By Kiat-Seng Yeo/Samir S Rofail /Wang-Ling Goh. Asia Pearson Education, Low Price Edition		

Wavelets
(Professional Elective Course – II)

COURSE OUTLINE

Course Title:	**Wavelets**	**Short Title:**	**Wavelet**	**Course Code:**	

Course description:

Wavelet has established itself as an important tool in modern signal processing as well as in applied mathematics. Students of Electronics and Telecommunication engineering must require fundamental concepts of Signal & System ,Signal Processing and application of it. Students also must understand theory and importance of wavelet transform for signal processing applications.

	Hours/week	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

Understanding of discrete time signals and systems.

Course objectives:

1. To introduce students to the various types of transforms
2. To understand the continuous Wavelet Transform.
3. To understand the discrete Wavelet Transform.
4. To understand the multiresolution analysis
5. To study the various applications of wavelet

Course outcomes:

At the end of this course students will demonstrate the ability to

1. Classify various wavelet transform and explain importance of it.
2. Describe Continuous Wavelet Transform (CWT) and Discrete Wavelet Transform (DWT).
3. Explain the properties and application of wavelet transform.
4. Develop and realize computationally efficient wavelet based algorithms for signal and image processing.
5. Explain brief features and strength of transform in various application.

COURSE CONTENT

Wavelet		**Semester:**	**VI**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**

Introduction: Stationary and non-stationary signals, Signal representation using basis and frames, Brief introduction to Fourier transform and Short time Fourier transform, Time-frequency analysis, Bases of time frequency: orthogonal, Filter banks, Multi resolution formulation: Wavelets from filters, Classes of wavelets: Haar, Daubechies, bi-orthogonal

Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**

Continuous Wavelet Transform: Continuous wavelet transform (CWT), Time and frequency resolution of the continuous wavelet transform, Construction of continuous wavelets: Spline, orthonormal, bi-orthonormal, Inverse continuous wavelet transform, Redundancy of CWT, Zoom property of the continuous wavelet transform, Filtering in continuous wavelet transform domain.

Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Discrete Wavelet Transform And Filterbanks Orthogonal and bi-orthogonal two-channel filter banks, Design of two-channel filter banks, Tree-structured filter banks, Discrete wavelet transform, Non-linear approximation in the Wavelet domain, multi resolution analysis, Construction and Computation of the discrete wavelet transform, the redundant discrete wavelet transform.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Multi Resolution Analysis Multirate discrete time systems, Parameterization of discrete wavelets, Bi-orthogonal wavelet bases, Two dimensional, wavelet transforms and Extensions to higher dimensions, wave packets		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
Applications: Signal and Image compression, Detection of signal changes, analysis and classification of audio signals using CWT, Wavelet based signal de-noising and energy compaction, Wavelets in adaptive filtering, Adaptive wavelet techniques in signal acquisition, coding and lossy transmission, Digital Communication and Multicarrier Modulation, Trans multiplexers , Image fusion, Edge Detection and object isolation.		
Text Books:		
1. A Wavelet Tour of Signal Processing, 2nd edition, S. Mallat, Academic Press, 1999. 2. Wavelets and Sub band Coding, M. Vetterli and J. Kovacevic, Prentice Hall, 1995. 3. Wavelet transforms: Introduction, Theory and applications, Raghuveer rao and Ajit S. Bopardikar, Pearson Education Asia, 2000. 4. RaguveerM.Rao and AjitS.Bopardikar-Wavelet Transforms –Introduction and applications-Pearson Education, 2008 5. K.P Soman, K.I.Ramachandran –Insight into Wavelets from Theory to practice, PHI2006		
Reference Books:		
1. Fundamentals of Wavelets: Theory, Algorithms, and Applications, J.C. Goswami and A.K. Chan, 2nd ed., Wiley, 2011. 2.Wavelets and their Applications, Michel Misiti, Yves Misiti, Georges Oppenheim, Jean-Michel Poggi, John Wiley & Sons, 2010 . 3. A premier on Wavelets and their scientific applications, J S Walker, CRC press, 2002. 4. Wavelets and signal processing: An application based introduction, Stark, Springer, 2005. 5. A friendly guide to Wavelets, Gerald keiser, Springer, 2011. 6. Multirate Systems and Filter Banks, P. P. Vaidyanathan, Pearson Education, 2004. 7. Wavelets : from math too practice, Desanka.P.Radunovik, springer, 2009. 8. Insight into wavelets from theory to practice, K P Soman and KL Ramachandran, PHI, 2008.		

Micro Electro Mechanical Systems (Professional Elective Course – II)					
COURSE OUTLINE					
Course Title:	**Micro Electro Mechanical Systems**	**Short Title:**	MEMS	**Course Code:**	

Course description:

Micro electro mechanical systems (MEMS), devices and technologies. Micro-machining and microfabrication techniques, including planar thin- film processing, silicon etching, wafer bonding, photolithography, deposition and etching. Transduction mechanisms and modeling in different energy domains.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

1. Semiconductor Devices
2. Knowledge of fundamentals of Electrical Engineering,
3. Knowledge of fundamentals of Material Science and Electronic circuits knowledge

Course objectives:

1. To make students to gain basic knowledge on overview of MEMS .
2. To understand the fabrication of MEMS
3. To familiarize with the MEMS manufacturing technologies.
4. To understand the operation of micro devices, micro systems and their applications.
5. to design the micro devices, micro systems using the MEMS fabrication process.

Course outcomes:

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

1. To provide knowledge of semiconductors and solid mechanics to fabricate MEMS devices.
2. To educate on the rudiments of Micro fabrication techniques.
3. To introduce various sensors and actuators
4. To introduce different materials used for MEMS
5. To educate on the applications of MEMS to disciplines beyond Electrical and Mechanical engineering

COURSE CONTENT

Micro Electro Mechanical Systems		**Semester:**	VI
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I: :	**No. of Lectures: 09 Hours**	**Marks: 12**

INTRODUCTION Intrinsic Characteristics of MEMS – Energy Domains and Transducers- Sensors and Actuators – Introduction to Micro fabrication – Silicon based MEMS processes – New Materials – Review of Electrical and Mechanical concepts in MEMS – Semiconductor devices – Stress and strain analysis .

Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**

SENSORS AND ACTUATORS-I Electrostatic sensors – Parallel plate capacitors – Applications – Interdigitated Finger capacitor – Comb drive devices – Micro Grippers – Micro

Motors – Thermal Sensing and Actuation – Thermal expansion – Thermal couples – Thermal resistors – Thermal Bimorph – Applications – Magnetic Actuators – Micromagnetic components		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
SENSORS AND ACTUATORS-II Piezoresistive sensors – Piezoresistive sensor materials – Stress analysis of mechanical elements – Applications to Inertia, Pressure, Tactile and Flow sensors – Piezoelectric sensors and actuators – piezoelectric effects – piezoelectric materials – Applications to Inertia , Acoustic, Tactile and Flow sensors.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
MICROMACHINING Silicon Anisotropic Etching – Anisotrophic Wet Etching – Dry Etching of Silicon – Plasma Etching – Deep Reaction Ion Etching (DRIE) – Isotropic Wet Etching – Gas Phase Etchants – Case studies – Basic surface micro machining processes – Structural and Sacrificial Materials – Acceleration of sacrificial Etch – Striction and Antistriction methods .		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
FABRICATION PROCESS Substrates - single crystal silicon wafer formation – Photolithography – Ion implantation – Diffusion – Oxidation – CVD - Physical vapor deposition - Deposition epitaxy - etching process.		

Text Books:

1. Chang Liu, 'Foundations of MEMS', Pearson Education Inc., 2012.
2. Stephen D Senturia, 'Microsystem Design', Springer Publication, 2000.
3. Tai Ran Hsu, "MEMS & Micro systems Design and Manufacture" Tata McGraw Hill, New Delhi, 2002.

Reference Books:

1. Nadim Maluf," An Introduction to Micro Electro Mechanical System Design", Artech House, 2000.
2. Mohamed Gad-el-Hak, editor, " The MEMS Handbook", CRC press Baco Raton, 2001.
3. Julian w. Gardner, Vijay K. Varadan, Osama O.Awadelkarim, Micro Sensors MEMS and Smart Devices, John Wiley & Son LTD, 2002.
4. James J.Allen, Micro Electro Mechanical System Design, CRC Press Publisher, 2005.
5. Thomas M.Adams and Richard A.Layton, "Introduction MEMS, Fabrication and Application," Springer, 2010.

Wireless Sensor Network (Open Elective Course-II)					
COURSE OUTLINE					
Course Title:	**Wireless Sensor Network**	**Short Title:**	**WSN**	**Course Code:**	

Course description:

The main focus of the course is on open research issues related to wireless industrial monitoring and control networks. The key topics discussed in the context of wireless sensor networks are energy efficiency, scalability, robustness, security, and predictable performance and security.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	14	42	3

Prerequisite course(s):

Knowledge of basic Computer Networking and its concept.

Course objectives:

The objective of this course is to make the students

1. To understand the basic WSN technology and supporting protocols, with emphasis placed on standardization basic sensor systems and provide a survey of sensor technology.
2. Understand the medium access control protocols
3. and address physical layer issues.
4. Learn key routing protocols for sensor networks and main design issues.
5. Learn transport layer protocols for sensor networks, and design requirements.

Course outcomes:

At the end of the course students will able to

1. Describe the sensor network, sensor networks
2. Analyse the Localization and Synchronization
3. Describe the MAC layer issues
4. Describe the Network layer issues and protocols
5. Describe the day to day life application of wireless network.

COURSE CONTENT

Wireless Sensor Network		**Semester:**	**VI**
Teaching Scheme:		**Examination scheme**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 09 Hours**	**Marks: 12**
Introduction to Sensor Network Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Types of wireless sensor networks, Difference between Cellular &Adhoc wireless network		
Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**
Mobile Ad-hoc Networks (MANETs) Mobile Ad-hoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks. Issues and challenges in wireless sensor networks. Characteristics of an ideal routing protocol for Adhoc wireless network.		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
Routing Protocol Routing protocols, Reactive and proactive protocols & Hybrid routing Protocol, MAC protocols: Classification of MAC Protocols, IEEE 802.15.4 standard and ZigBee.		
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**
Issues in Dissemination protocol Dissemination protocol for large sensor network. Data dissemination, data gathering, and data fusion; Quality of a sensor network; Real-time traffic support and security protocols, Multicast Routing in Adhoc Wireless Network, Issues in designing a multicast Routing Protocol		
Unit–V:	**No. of Lectures: 08 Hours**	**Marks: 12**
WSNs & Gateway Design Principles for WSNs, Gateway Concepts Need for gateway, WSN to Internet Communication, and Internet to WSN Communication. Single-node architecture, Hardware components & design constraints,		
Text Books:		
1. WaltenegusDargie , Christian Poellabauer, "Fundamentals Of Wireless Sensor Networks Theory And Practice", By John Wiley & Sons Publications ,2011 2. Sabrie Soloman, "Sensors Handbook" by McGraw Hill publication. 2009 3.C.Siva Ram Murthy, B. S. Manoj "Adhoc Wireless Networks Architectures & Protocols", by Pearson Education.		
Reference Books:		
1.Feng Zhao, Leonidas Guibas, "Wireless Sensor Networks", Elsevier Publications,2004 2.Kazem Sohrby, Daniel Minoli, "Wireless Sensor Networks": Technology, Protocols and Applications, Wiley-Inter science		

Project Management (Open Elective Course – II)					
COURSE OUTLINE					
Course Title:	**Project Management**	**Short Title:**	**PM**	**Course Code:**	
Course description:					
This course develops a foundation of concepts and solutions that supports the project planning & management concepts. Describe how to managing development of project by applying project management concepts. Project risk management provides students with an organized approach for managing the uncertainties that can lead to undesirable project outcomes. Course topics include: Project procurement management and post project analysis.					
Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**	
	3	**14**	**42**	**3**	
Prerequisite course(s):					
Course objectives:					
1. To learn the concepts of project management. 2. To understand the concept of project planning &scheduling tools. 3. To understand project risk management. 4. To know the project procurement management..					
Course outcomes:					
After successful completion of this course the student will be able to:					
1. Use and explain different stages of project management. 2. Use of project planning and scheduling tools. 3. Demonstrate knowledge of project management terms and techniques. 4. Apply project risk management for controlling risk. 5. Use of project budget for controlling cost.					
COURSE CONTENT					
Project Management		**Semester:**	**VI**		
Teaching Scheme:		**Examination scheme:**			
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**		
		Duration of ESE:	**03 hours**		
		Internal Sessional Exams (ISE):	**40 marks**		
Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**			
Introduction to project management: definition and objectives of project management, understanding the organization, project life cycle, project planning process, project management frame work.					
Unit–II:	**No. of Lectures: 09 Hours**	**Marks: 12**			
Project time management: the importance of project schedules, planning schedule management, project scheduling with resource constraints: resource leveling and resource allocation, project scheduling and planning tools: work breakdown structure, LRC, Gantt charts, CPM/PERT networks.					
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**			
Project cost estimation and budgeting: Importance of project cost management, project cash flow analysis, cost estimation tools and techniques, determining the budget, controlling cost, time cost trade off: crashing heuristic.					
Unit–IV:	**No. of Lectures: 08 Hours**	**Marks: 12**			
Project risk management: the importance of project risk management, planning risk					

management, identifying risks, performing qualitative risk analysis, performing quantitative risk analysis, planning risk responses, controlling risks.
Project implementation: project monitoring and controlling with PERT/Cost, computers applications in project management.

Unit–V:	**No. of Lectures: 09 Hours**	**Marks: 12**

Project procurement management: the importance of project management, planning procurement management, contract management, tools and techniques for planning procurement management, procurement management plan, procurement documents conducting procurement, controlling procurement, closing procurement.
Post–project analysis.

Text Books:

1. Shtub, Bard and Globerson, Project Management: Engineering, Technology, and Implementation, Prentice Hall, India. 4th Edition.
2. Kathy Schwalbe, Information technology project management, CENGAGE Learning 7th Edition.

Reference Books:

1. John M Nicholas, Project Management for Business and Technology: Principles and Practice, Prentice Hall,India, 2002. 3rdEdition.
2. Rangwala, Estimation, Costing and Valuation, Charotar Publishing House.
3. N. J. Smith (Ed), Project Management, Blackwell Publishing, 2002. 2ndEdition.
4. Ashish K. Bhattacharya, Principles & Practices of Cost Accounting, A. H. Wheeler publisher, 3rdEdition.
5. Jack R Meredith and Samuel J Mantel, Project Management: A Managerial Approach, John Wiley, 2009. 7thEdition.

Cyber Law and Ethics (Open Elective Course –II)					
COURSE OUTLINE					
Course Title:	**Cyber Law and Ethics**	**Short Title:**	**CLE**	**Course Code:**	

Course description:

This course introduces basics of cyber laws and computer ethics encompassing user behavior and what computers are programmed to do, and how this affects individuals and society. Emphasis is given on the ethical issues that arise as a result of increasing use of computers and the responsibilities of people who work with computers and provides new dimension to look towards their day to day computer activities.

Lecture	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	3	**14**	**42**	**3**

Prerequisite course(s):

Course objectives:

1. Describe need for cyber laws.
2. Identify objectives and scope of IT act.
3. Understand the concept of e-commerce issues.
4. Understand ethical issues.
5. Understand and dissect information system and security.

Course outcomes:

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

1. Describe fundamentals of cyber laws, its scope and intellectual property issues.
2. Analyze and identify patent and copyright issues.
3. Apply issues in e-commerce security issues.
4. Illustrate ethical issues in data and software privacy.
5. Summarize the importance of information security.

COURSE CONTENT

Cyber Law and Ethics		**Semester:**	**V**
Teaching Scheme:		**Examination scheme:**	
Lectures:	**3 hours/week**	**End semester exam (ESE):**	**60 marks**
		Duration of ESE:	**03 hours**
		Internal Sessional Exams (ISE):	**40 marks**

Unit–I:	**No. of Lectures: 08 Hours**	**Marks: 12**
History of Internet, Introduction to Indian Cyber Law, Need for Cyber Laws, Jurisprudence of Cyber Law, Objective and Scope of the IT act 2000, Uncitral Model Law, ISP Guideline, Intellectual Property Issues, Overview of Intellectual Property Related Legislation in India, Rationale behind Intellectual Property, Underlying Premises of IP, Balancing the Rights of the Owner of IP and the Society, Enforcement of IRPS, IP and Constitution of India		
Unit–II:	**No. of Lectures: 08 Hours**	**Marks: 12**
Patent: The Patent System, Patentable Invention, Non patentable Procedure for Obtaining Patent, Copyright, Trademark Law, Law related to Semiconductor Layout and Design E-Commerce in India, Scope of E-Commerce in India, E-Commerce and the Government of India, Specifying Guidelines to Enter E-Marketplace, E-Agreement, Legal Recognition of Electronic and Digital Records, Legal Recognition of Digital Signatures		
Unit–III:	**No. of Lectures: 08 Hours**	**Marks: 12**
E-Commerce Issues of Privacy, Security Threats to E-Commerce **Physical Security:** Incidents of Physical Security Violations, Disaster and Controls, Basic Tenets of Physical Security, Challenges in Ensuring Physical Security, Physical Entry Controls, Steps to Perform after Physical Security Breach		
Unit–IV:	**No. of Lectures: 09 Hours**	**Marks: 12**
Cybercrime, Cyber/Resource Theft, Types of Cyber Crimes/Frauds, Cyber Frauds in India, Cyber Jurisdiction, Dealing with Cybercrime in Various Countries **Ethical Issues in Data and Software Privacy:** Plagiarism, Pornography, Tampering Computer Documents/System Hacking, Data Privacy and Protection, Software Privacy, Social Engineering and Fishing, Types of Social Engineering, Exploring Methods of Phishing, Issues in Ethical Hacking, Cyber Crime Forensic		
Unit–V:	**No. of Lectures: 09 Hours**	**Marks: 12**
Information Systems, IS Components, Trends in IS, Classification of IS, Framework of IS in an Organization, IS and Business Organization, Human Body as an Information System, IS Failures and Causes, Role of Security in Internet and Web Services, Securing Web Services, Principles of Information Security, An Overview of Information Security Management System(ISMS), Benefits of ISMS, Classification of Threats and Attacks, Information Classification and their Roles, Roles and Responsibilities of Information Authority		
Text Book:		
1. FaiyazAhamad, "Cyber Law and Information Security", Dreamtech Press		
Reference Books:		
1. Sanjeev Kumar Sharma , Ankur Shree Aggarwal and AnuradhaTyagi, "Information Security and Cyber Laws" 2. Pavan Duggal, "Cyber Security Law"		

Electronics Design Lab					
LAB COURSE OUTLINE					
Electronic Design Lab		**Semester:**	**VI**		
Teaching Scheme:		**Examination scheme**			
Practical:	**2 hours/week**	**End semester exam (ESE):**		**25 marks**	
		Internal Continuous Assessment (ICA):		**25 marks**	
List of Practical as Per Syllabus (Any Six practical's from the list)					
Electronic Design Lab					
LAB COURSE OUTLINE					
Course Title:	**Electronic Design Lab**	**Short Title:**	**EDL**	**Course Code:**	
Course description:					
In this laboratory course emphasis is on the hand on design practice and implementation and testing of various circuits (discrete and IC based) in laboratory.					
Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**	
	02	14	28	1	
End Semester Exam (ESE) Pattern:		**Practical (PR)**			
Prerequisite course(s):					
Basic knowledge of Electronics,					
Course objectives:					
1. To understand identification, testing and working of semiconductor components. 2. To familiarize the students to perform the frequency analysis of any analog electronics circuit. 3. To learn the design of power supply and switching circuits. 4. To empower students to understand the design of BJT / FET amplifiers, oscillators and analog integrated circuits. 5. To learn the fabrication of circuit on PCB.					
Course outcomes:					
Upon successful completion of lab Course, student will be able to:					
1. Acquire basic knowledge to design, implement and troubleshoot analog circuits. 2. Develop the ability to design power supply and small signal amplifiers. 3. Able to design and implement oscillators and wave shaping circuits 4. Able to design and test the analog filters. 5. Able to design and fabricate the circuit on PCB.					
LAB COURSE CONTENT					
Electronic Design Lab		**Semester:**	**VI**		
Teaching Scheme:		**Examination scheme**			
Practical:	**2 hours/week**	**End semester exam (ESE):**		**25 marks**	

	Internal Continuous Assessment (ICA):	**25 marks**

List of Practical as Per Syllabus (Any Five practical's from Sr. No.1 to 8 and Sr.No.9 is compulsory).

1. Design of Regulated power supply.

a) Transformer selection. b) Rectifier (Bridge) c) Filter Designing (Capacitor)

d) Transistor series Regulator (Feedback type) with current protection circuit

OR

Design of Regulated power supply using IC LM 340 series.

2. Design of switching regulator circuit using switching Regulator IC LM1577 / 2577.
3. Design of single stage amplifier circuits using BJT / FET

a) Inverting / non inverting amplifier.

b) Self bias for FET and potential divider for BJT.

c) Calculation of Performance parameters like Av , Ri and Ro and Bandwidth

4. Design Test and verify the negative feedback amplifier circuits using BJT / FET

a) Design biasing network

b) Feedback network

c) Calculation of performance parameters like Avf, Ri f and Rof

5. Design and Testing of monolithic power amplifier using IC

a) Designing of External Components required.

b) Measurement of output power.

6. Design the single stage tuned amplifier using BJT / FET for given center frequency.

a) Design of biasing circuit

b) Designing of tuned circuit

c) Calculations and verification of f o and Bandwidth.

7. Design of Astable multivibrator using BJT

a) Selection of Transistor

b) Design of all external components.

c) Calculation and verification of desired output frequency and amplitude of output voltage.

8. Design and test a sallen - key second order low pass / high pass filter for given specifications.

OR

Design and test a sallen - key second order band pass filter for given specifications.

9. Design and fabricate any one circuit from Syllabus

a. Select the circuit from syllabus (only from Electronic Circuit Design and other than laboratory experiments).

b. Design the circuit.

c. Implement and test the designed circuit on Printed Circuit Board. [Maximum group size to conduct this experiment is Four. Implementation must be on PCB. Students have to write report (design, fabrication method and testing results) in their regular Laboratory manual]

All experiments (Except Experiment No 9), must perform using breadboard only.
Text Books:
1. M.M. Shah - Design of Electronics Circuits and Computer Aided Design, New Age Int. 2. Michael Jacob - Application and Design with Analog Integrated Circuits, PHI 2
Reference Books:
1.Bell - Electronics Devices and Circuits, PHI or Pearson 4/e 2. Goyal, Khetan - Monograph on Electronics Design Principles, Khanna Pub. 3. Rashid – Microelectronics Circuits Analysis and Design, Cenage Learning, 2/e. 4.Sergio Franco – Design with OP-AMP and Analog Integrated Circuits, TMH, 3/e 5.IC datasheets.
Guide lines for ICA:
Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.
Guidelines for ESE:
ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

Electronic Measurement Lab

LAB COURSE OUTLINE

Course Title:	Electronic Measurement Lab	Short Title:	EM LAB	Course Code:	

Course description:

In this laboratory course emphasis is on the understanding of different instruments front panel of Q meter, true RMS meter, Universal Counter, CRO, DSO, Data logger and Distortion factor meter etc. The students can perform different measurements using these instruments.

Laboratory	Hours/week	No. of weeks	Total hours	Semester credits
	2	14	28	1

End Semester Exam (ESE) Pattern:	Practical (PR)

Prerequisite course(s):

Knowledge of Elements of Electrical & Electronics Engineering.

Course objectives:

1. Students will understand fundamental principle of digital measurement.
2. Student will learn measurement of RMS signal amplitude, frequency and time on CRO.
3. Students will learn the signal analysis using harmonic analyzer and spectrum analyzer.
4. Student will gain knowledge about measurement with digital instrument.

Course outcomes:

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

1. Students will demonstrate knowledge about fundamental principles in electronics measurement.
2. Students will able to make the measurement of amplitude, frequency and time on CRO.
3. Students will able to analyze the signal with harmonic analyzer and spectrum analyzer.
4. Students will able to apply the knowledge of digital measurement for measuring physical quantity

LAB COURSE CONTENT

Electronic Measurement Lab		Semester:	VI
Teaching Scheme:		Examination scheme	
Practical:	2 hours/week	End semester exam (ESE):	25 marks
		Internal Continuous Assessment (ICA):	25 marks

(Note: Minimum FOUR Experiments from each group.)

Group A

1. Measurement of reactive and resistive components with LCR-Q meter..
2. Measurement of Vrms signal with true RMS meter / DMM.To determine transient response of RLC network
3. Measurement of frequency and Time with the help of frequency counter.
4. Measurement of motor speed using Digital Tacho meter.
5. Measurement of Phase angle with the help of Digital Phase Meter.

Group B

6. Measurement of frequency and phase shift using Lissajous pattern and testing of different components using CRO
7. Measure and store the frequency and amplitude with the help of DSO.
8. Measurement of distortion and nature of distortion by Harmonic distortion analyzer.
9. Computerized analysis of radio receiver and measurement of power with it.
10. Analysis of test signal with the help of Spectrum analyzer

Text Books:

1. H. S. Kalsi, "Electronic Instrumentation", TMH, 2nd Edition, 2007.
D. Helfric and W. D. Cooper, "Modern Electronic Instrumentation and Measurement Technique", Pearson LPE, 3rd Edition, 2005

Reference Books:

1. A.K. Sawhney, "Electrical and Electronics measurement and Instrumentation", Dhanpat Rai and company, 18th Edition, 2007.

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

Control System Lab					
LAB COURSE OUTLINE					
Course Title:	**Control System Lab**	**Short Title:**	**CSL**	**Course Code:**	

Course description:

In this laboratory course student will be familiar with electrical network, motor and lead and lag controller. Also simultaneously student will be familiar about how to find out the Bode, polar & Nyquist plot with the help of MATLAB.

Laboratory	Hours/week	No. of weeks	Total hours	Semester credits
	2	14	28	1

End Semester Exam (ESE) Pattern:

Prerequisite course(s):

Knowledge of Signals and their concept.

Course objectives:

1. To acquire the practical concepts in order to performance of motor and controllers
2. To prepare students to design the Bode plot
3. To prepare students to design Polar Plot
4. To prepare students to design Nyquist plot.
5. To understand the fundamentals of control system

Course outcomes:

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

1. Determine transfer functions of the system.
2. Describe the response of different frequency domain and time domain systems.
3. Design different types of Controller.
4. Design a Bode Plot
5. Design a Nyquist & Polar plot

LAB COURSE CONTENT

Control System Lab		**Semester:**	**VI**
Teaching Scheme:		**Examination scheme**	
Practical:	**2 hours/week**	**---**	**---**
		Internal Continuous Assessment (ICA):	**25 marks**

Concerned faculty member should suitably frame Eight laboratory assignments from the following list.

1. Study synchros to observe angular displacement.
2. Study of flow control using PID controller.
3. To determine transient response of RLC network
4. Study of Stepper motor.
5. Find ξ, Wn & Mp of the response to unit step i/p for given system using Matlab.
6. Obtain the unit step response of second order system using Matlab.
7. Sketch the Bode plot for the given transfer function (Unity f/b/ system) using Matlab
8. Sketch the Nyquist plot for the given system using Matlab

9. To Plot the magnitude & phase plot of lag electrical network.
10. Sketch the polar plot of (Unity f/b system)

Text Books:

1. Gopal. M & I.J.Nagrath "Control Systems: Principles and Design",4th edition Tata McGraw-Hill, 1997.
2. Kuo, B.C., "Automatic Control System", Prentice Hall, sixth edition, 1993.

Reference Books:

1. Ogata, Katsuhiko., "Modern Control Engineering", Prentice Hall, second edition, 1991.
2. I.J. Nagrath & Gopal, "Modern Control Engineering", New Age International, New age 5th edition.

Guide lines for ICA:

Students must submit ICA in the form of journal. Each assignment should be well documented. Faculty in charge will assess the assignments continuously and grade or mark each assignment on completion date declared for each assignments.

Guidelines for ESE:

ESE will be based on the laboratory assignments submitted by the students in the form of journal. Evaluation will be based on the understanding and execution.

Minor Project					
LAB COURSE OUTLINE					
Course Title:	**Minor Project**	**Short Title:**	**MPROJ**	**Course Code:**	

Course description:

Minor project represent the culmination of study towards the Bachelor of Engineering degree. The minor project offers the opportunity to apply and extend material learned throughout the program. The emphasis is necessarily on facilitating student learning in technical, project management and presentation spheres.

Laboratory	**Hours/week**	**No. of weeks**	**Total hours**	**Semester credits**
	6	**14**	**84**	**3**

End Semester Exam (ESE) Pattern:	**Oral (OR)**

Prerequisite course(s):

Course objectives:

1. To understand the basic concepts & broad principles of projects.
2. To understand the value of achieving perfection in project implementation & completion.
3. To apply the theoretical concepts to solve problems with teamwork and multidisciplinary approach.
4. To demonstrate professionalism with ethics; present effective communication skills and relate engineering issues to broader societal context.

Course outcomes:

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

1. Demonstrate a sound technical knowledge of their selected project topic.
2. Undertake problem identification, formulation and solution.
3. Design engineering solutions to complex problems utilizing a systems approach.
4. Conduct an engineering project
5. Demonstrate the knowledge, skills and attitudes of a professional engineer.

LAB COURSE CONTENT

Minor Project		**Semester:**	**VI**
Teaching Scheme:		**Examination scheme:**	
Practical:	**6 hours/week**	**End semester exam (ESE): (OR)**	**25 marks**
		Internal Continuous Assessment (ICA):	**50 marks**

In continuation with Minor Project (Stage – I) at Semester – V, by the end of Semester – VI, the student should complete implementation of ideas as formulated in Minor Project (Stage – I). It may involve coding, experimentation, data analysis within realistic constraints such as economic, environmental, social, ethical, health and safety, and sustainability. It may also include testing, results and report writing. Each student group should submit complete project report at the end of Semester-VI in the form of Hard bound. Assessment for the project shall also include presentation by the students.

Each student group is required to maintain separate log book for documenting various activities of the project.

Suggestive outline for the complete project report is as follows.

Abstract

Chapter 1. Introduction

- Background
- Motivation
- Problem Definition
- Scope
- Objective
- Selection of Life cycle Model for Development
- Organization of Report
- Summary

Chapter 2. Project Planning and Management

- Feasibility Study
- Risk Analysis
- Project Scheduling
- Effort Allocation
- Cost Estimation
- Summary

Chapter 3. Analysis

- Requirement Collection and Identification
- H/w and S/w Requirement (Data, Functional and Behavioral)
- Functional and non-Functional Requirements
- Software Requirement's Specification (SRS)
- Summary

Chapter 4. Design

- System Arch
- Data Flow Diagram
- UML Diagrams (Use case, Class, Sequence, Component, Deployment, Statechart ,Activity diagram etc.)
- Summary

Chapter 5. Coding/Implementation

- Algorithm/Steps
- Software and Hardware for development in detail
- Modules in Project

Chapter 6. Testing

- Black Box/White Box testing
- Manual/Automated Testing
- Test Cases Identification and Execution (Test case ID, Input, Output, Expected Output, Actual Output, Result (Pass/Fail) etc.)

Chapter 7. Results and Discussion

Chapter 8. Conclusion & Future Work

Bibliography

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Appendix

Guide lines for ICA:

The Internal Continuous Assessment (ICA) for project shall be based on continuous evaluation of students' performance, active participation, knowledge / skill acquired throughout semester and presentation by the students. The assessment shall be done jointly by the guide and departmental committee. A three-member departmental committee including guide, appointed by Head of the department, shall be constituted for the assessment. The assessment for Minor Project in Semester – VI shall be as per the guidelines given in Table – B.

Table – B

		Assessment by Guide				Assessment by Departmental Committee			
Sr. No.	Name of the Student	Attendance / Participation	Implementation	Results	Report	Depth of Understanding	Presentation	Demonstration	Total
	Marks	5	5	5	5	10	10	10	50

Guidelines for ESE:

In End Semester Examination (ESE), the student may be asked for presentation / demonstration and questions on Project. Evaluation will be based on answers given by students in oral examination.

Internship

Internship is a mandatory and non-credit course. It is mandatory for all admitted students to undergo Internship during the degree course. The course shall be of THREE weeks duration during summer vacation after Semester - VI. Following are the intended objectives of internship training:

- Will expose Technical students to the industrial environment, which cannot be simulated in the classroom and hence creating competent professionals for the industry.
- Provide possible opportunities to learn understand and sharpen the real time technical / managerial skills required at the job.
- Exposure to the current technological developments relevant to the subject area of training.
- Experience gained from the 'Industrial Internship' will be used in classroom discussions.
- Create conditions conducive to quest for knowledge and its applicability on the job.

Students shall choose to undergo Internship / Innovation / Entrepreneurship related activities for Internship. Students shall choose either to work on innovation or entrepreneurial activities resulting in start-up or undergo internship with industry/ NGO's/ Government organizations / Micro / Small / Medium enterprises / academic institutions / research institutions. In case student want to pursue their family business and don't want to undergo internship, a declaration by a parent may be submitted directly to the Department Head / TPO.

During the last year of FOUR year Bachelor of Engineering course the student should take project work, as specified in the curriculum, based on the knowledge acquired by the student during the degree course and during Internship. The project work provides an opportunity to build a system based on area where the student likes to acquire specialized skills. The work may also be on specified task or project assigned to the student during Internship.

The internship activities and list of sub-activities for Internship are as under.

- Innovation / Entrepreneurship:
- Participation in innovation related Competitions for eg. Hackathons Robocon, Baha, IIT TechFest, Chemcon, Dipexetc
- Development of new product/ Business Plan/ registration of start-up
- Participation in Entrepreneurship Program of THREE weeks duration
- Online certification courses by SWAYAM, NPTEL, QEEE etc.
- Working for consultancy/ research project within the institutes
- Training on Software (As per the need of respective branch);
- Field Survey / Case Study
- Work experience at family business
- Internship:
- Internship with Industry/Govt. / NGO/ PSU/ Any Micro/ Small/ Medium enterprise/ academic institutions / research institutions
- Online Internship
- Rural Internship
- Any Long Term Goals may be carried out by students in teams:

- Prepare and implement plan to create local job opportunities.
- Prepare and implement plan to improve education quality in village.
- Prepare an actionable DPR for doubling the village Income.
- Developing Sustainable Water Management system.
- Prepare and Improve a plan to improve health parameters of villagers.
- Developing and implementing of Low Cost Sanitation facilities.
- Prepare and implement plan to promote Local Tourism through Innovative Approaches.
- Implement/Develop Technology solutions which will improve quality of life.
- Prepare and implement solution for energy conservation.
- Prepare and implement plan to Skill village youth and provide employment.
- Develop localized techniques for Reduction in construction Cost.
- Prepare and implement plan of sustainable growth of village.
- Setting of Information imparting club for women leading to contribution in social and economic issues.
- Developing and managing efficient garbage disposable system.
- Contribution to any national level initiative of Government of India. For eg. Digital India/ Skill India/ Swachh Bharat Internship etc.

Faculty Mentor/Supervisors have to play active roles during the internship and minimum 20 students are to be supervised by each faculty mentor or as per the departmental strength. Mentor shall be responsible for selection of Internship activities by the student under his/her supervision and shall avoid repetition of activities by the student. The college / Institute shall facilitate internship for the students.

Every student is required to prepare a file for Internship containing documentary proofs (daily training diary, comprehensive report and completion certificate) of the activities done by him/her. The students should record in the daily training diary the day to day account of the observations, impressions, information gathered and suggestions given, if any. It should contain the sketches & drawings related to the observations made by the students. The daily training diary should include Date, Time of Arrival, Time of Departure, Main points of the day. The daily training diary should be signed after every day by the supervisor/ in charge of the section where the student has been working.

After completion of Internship, the student should prepare a comprehensive report to indicate what he / she has observed and learnt in the training period. The report should include Internship Objectives (in measurable terms), Internship Activities, and Internship Outcome.

The completion certificate should be signed by the supervisor / in charge of the section where the student has been working with performance remark as Satisfactory / Good / Excellent.

The evaluation of Internship shall be in Semester – VII. The evaluation shall be done by expert committee constituted by the concerned department including Department Head/ TPO/ faculty mentor or guide. It should be evaluated on the basis of the following criteria:

- Regularity in maintenance of the diary.
- Adequacy & quality of information recorded.
- Originality.
- Adequacy and purposeful write-up.
- Practical applications, relationships with basic theory and concepts taught in the course.
- Skill / knowledge acquired

Hence the satisfactory completion of Internship shall be submitted to the university at the end of Semester - VIII of FOUR year Bachelor of Engineering course. Only after successfully completion of Internship, Internship should be printed in the final year mark sheet as COMPLETED.