NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Syllabus for
Final Year Electronics Engineering
Faculty of Engineering and Technology

COURSE OUTLINE
SEMESTER – VII
W.E.F 2015 – 2016

BE Semester – VII

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		
Digital Signal Processing (TH)	D	3	---	---	3	20	80	---	---	100	3
Power Electronics (TH)	D	3	---	---	3	20	80	---	---	100	3
Interdisciplinary Elective	E	3	---	---	3	20	80	---	---	100	3
Elective – I	E	3			3	20	80			100	3
Computer Communication Network (TH)	D	3			3	20	80			100	3
Digital Signal Processing (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
Power Electronics (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
LAB#	E	---	---	2	2	---	---	25	25(PR)	50	1
Project – I	D	---	---	2	2	---	---	25	25(OR)	50	2
Seminar – II	D	---	---	2	2	---	---	25	---	25	2
Industrial Visit	D	---	---	---	---	---	---	25	---	25	1
Total		15	---	10	25	100	400	150	100	750	23

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

#Lab for Elective-I

Inter Disciplinary Elective

1 Transducers and Measurement Techniques.
2 Digital Signal Processing and Image Processing.

Elective I

1 VLSI Design.
2 Digital Communication Systems.
3 Neural Network and Fuzzy Logic.
4 Object Oriented Programming.

Note 1: For branches like Chemical Engineering and Biotech Engineering, two laboratory hours can be merged to form a four hour slot.

Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.

Note 3: Interdisciplinary Elective shall be offered by the department to the students of other department. Students from one department can not register for Interdisciplinary Elective of the same department.

Note 4: At least 15 students should register for offering any elective.

BE Semester – VIII

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		
Light Wave communication (TH)	D	3	--	---	3	20	80	---	---	100	3
Process Control System (TH)	D	3	---	---	3	20	80	---	---	100	3
Elective – II	E	3	---	---	3	20	80	---	---	100	3
Elective – III	E	3	---	---	3	20	80	---	---	100	3
Light Wave communication (LAB)	D		---	2	2	---	---	25	25(OR)	50	1
Process Control System (LAB)	D	---	---	2	2	---	---	25	25(PR)	50	1
LAB#	E	---	---	2	2	---	---	25	25(PR)	50	1
Industrial Lecture*	C	---	---	1*	1	---	---	50	---	50	2
Project – II	D	---	---	4	4	---	---	75	75(OR)	150	6
Total		**12**	**---**	**11**	**23**	**80**	**320**	**200**	**150**	**750**	**23**

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

#Lab for Elective-II

*** Minimum 6 lectures to be delivered by experts from the industry in alternate weeks. Next week group discussion on the lecture delivered.**

Elective II	Elective III
1 Embedded Systems	1 Advance Power Electronics
2 Digital Image Processing	2 Antenna Theory
3 Microelectronics	3 Wireless communication
4 Multimedia Systems	4 Robotics

Note 1: For branches like Chemical Engineering and Biotech Engineering, two laboratory hours can be merged to form a four hour slot.

Note 2: Out of 3 practical ESE heads, at least 1 head should be practical.

Note 3: Interdisciplinary Elective shall be offered by the department to the students of other department. Students from one department can not register for Interdisciplinary Elective of the same department.

Note 4: At least 15 students should register for offering any elective.

Digital Signal Processing

COURSE OUTLINE

Digital Signal Processing **DSP**
Course Title Short Title Course Code

Course Description:

Course includes the understanding of Discrete Time Signals and Systems, characterization of LTI Systems. Course covers Z Transform and its application to the analysis of LTI System, Frequency analysis of Discrete Time Signals and Systems, Design and Realization of Digital Filters, Multirate Digital Signal Processing, Overview of TMS 320C6X DSPs.

	Hours / Week	No .of Weeks	Total Hours	Semester Credits
Lecture	03	14	42	03

Prerequisite Course(s): Network System & Filter Design.

COURSE CONTENT

Teaching scheme:
Lectures: 3 hrs/week

Examination scheme:
End Semester Examination (ESE): 80Marks
Paper Duration (ESE): 03 Hours
Internal Seasonal Exam (ISE): 20 Marks

UNIT I **Lectures 10, Marks 16**

Discrete Time Signals and Systems:

a) Introduction: Basic elements of Digital Signal Processing Systems, Advantage and Limitation of Digital over Analog Signal Processing

b) Concept of frequency in continuous & discrete time signals, Sampling of Analog signals, Aliasing, Sampling Theorem

c) Discrete Time Signals: Representation, Standard Discrete Time Signals, Classification of Discrete Time Signals, Simple Manipulations of Discrete Time Signals

d) Discrete Time Systems: Block diagram representation of Discrete Time Systems, Classification of Discrete Time Systems

e) Response of LTI systems to arbitrary inputs: Convolution Sum, properties of convolution sum

f) LTI systems characterized by constant coefficients difference equations, Solution of linear constant coefficient Difference Equation, Cross Correlation and Auto Correlation of two sequences

UNIT II **Lectures 8, Marks 16**

Z Transform and its application to the analysis of LTI system:

a) Definition of Z transform, Meaning of ROC, Properties of ROC, Properties of Z transform

b) Inverse Z transform: Power series method, Partial fraction method

c) Pole Zero plot of the function, Pole location and time domain behavior for causal sequences

d) Analysis of LTI Systems in Z domain: The System Function of LTI system, Response of LTI system with zero initial condition, Transient and Steady state responses, Causality and Stability of System, Pole zero cancellation

e) The one sided Z transform, Response of the system with nonzero initial conditions, Solution of difference Equations using Z transform

UNIT III **Lectures 8, Marks 16**

Frequency Analysis of Discrete Time Signals and Systems:

a) The Fourier Transform of Discrete time Aperiodic Signals and Energy Density Spectrum, Frequency response of Discrete Time Systems, Magnitude and Phase response

b) Frequency Domain Sampling: The Discrete Fourier Transform, Inverse Discrete Fourier Transform

c) The DFT as Linear Transformation, Twiddle factor, Properties of the DFT

d) Use of DFT in linear filtering, Frequency analysis of signals using DFT, Magnitude spectrum of signals

e) FFT Algorithms: Radix2 DIT and DIF algorithms to compute DFT and IDFT

UNIT IV **Lectures 8, Marks 16**

Design and Realization of Digital Filters:

a) Basic Network Elements, FIR Filter Structure: Direct form, Cascade form, Frequency sampling and Linear phase structure

b) FIR Filter Design: Fourier series method, Windowing method, Gibbs phenomenon, Frequency sampling method of design

c) IIR Filter structure: Direct form, Cascade form, Parallel form and Transposed structures

d) IIR Filter Design: Impulse invariance, Bilinear Transformation method of design

UNIT V **Lectures 8, Marks16**

Multirate Digital signal processing:

a) Introduction, Decimation by factor D, Interpolation by factor I, Sampling rate conversion by a rational factor I/D

Overview of TMS 320C6X DSPs:

b) Introduction, Features of TMS 320C62X processors, Internal Architecture, Central processing units and Data paths, Functional units & Operations, Addressing modes in C6X, Memory architecture, External memory accesses, Pipeline operation, Peripherals

References:

1. Proakis and Monolakis - Digital Signal Processing-Principles, Algorithms and Applications, Pearson Publication / PHI

2. Mitra S.K. - Digital Signal Processing, TMH Publication

3. B.Venkataramani, M.Bhaskar - Digital Signal Processor, Architecture, Programming and Applications, TMH.

4. Texas Instruments - Technical Reference Manual

5. Teaching Material for TI6000 platform from Texas Instruments

6. Thomas Cavicchi - Digital Signal Processing, Wiley

7. Ingle & Prokis – Digital Signal Processing Using MATLAS, 2nd Ed, Thomson Learning

POWER ELECTRONICS
COURSE OUTLINE

POWER ELECTRONICS **PE**
Course Title Short Title Course Code

Course Description:

Introduction to power semiconductor device SCR. This course is designed to introduce the students to the basic applications in converters like control rectifier (1 phase and 3 phase), choppers (step up and step down), inverter (1 phase and 3 phase). Course also includes introduction to DC motor drives as well as induction motor drives.

	Hours/Week	No .of Weeks	Total Hours	Semester Credits
Lecture	03	14	42	03

Prerequisite Course(s) : Electrical Machine, Basic Electronics, SSDC-I, SSDC-II

COURSE CONTENT

Teaching scheme:
Lectures: 3 hrs/week

Examination scheme:
End Semester Examination (ESE): 80Marks
Paper Duration (ESE): 03 Hours
Internal Seasonal Exam (ISE): 20 Marks

UNIT I –Line frequency phase controlled converter Lectures 10, Marks 16
SCR – construction, two transistor analogy, operation, V - I characteristics, turn on and turn off methods
Line frequency phase controlled converter– 1-Φ bridge semi converter and full converter, R, R –L, idealized circuit, dc side voltage and performance parameters, effect of Ls, inverter mode of operation. 3-Φ bridge semi converter and full converter, R, R –L load, idealized circuit, dc side voltage and performance parameters assuming highly inductive load, effect of Ls, inverter mode of operation.

UNIT II – Dc-Dc switch mode converters Lectures8, Marks16
Block diagram, step up, step down converter, continuous and discontinuous mode of operation, boundary between continuous and discontinuous conduction, full bridge dc –dc converter with bipolar and unipolar PWM. Voltage switching, ripple in output voltage. SMPS – overview, block diagram.

UNIT III – Switch mode dc to ac inventers – Lectures 8, Marks 16
Parallel inverters, basic concept of switch mode inverters, PWM switching scheme, square wave switching scheme, single phase inverters, half bridge inverters, full bridge inverters, three phase inverters, UPS – Black diagram and description.

UNIT IV -Introduction to motor drive: Lectures 8, Marks 16

Control of motor drives, block diagram description, criteria for selecting drive components, match between the motor and the load, match between the motor and the power electronic converter

DC motor drives: block diagram description of DC motor drive, power electronic converter, ripple in armature current, line frequency controlled converters, effect of discontinuous armature current

UNIT V – Induction motor drives: Lectures 8, Marks16

Constant speed drive, adjustable speed drive, speed control for varying stator frequency and voltage, torque speed characteristics, startup considerations, voltage boost required at low frequency, motor capability - below and above rated speed, braking in induction motors, torque pulsation; variable frequency converter classification; speed control circuit and current limiting circuit, reduced voltage starting (" soft start ") of motor.

References:

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.
5) P. C. Sen Power Electronics Tata Mc-Graw-Hill Publishing Company Limited.
6) Dr. P. S. Bimbhra, Power Electronics, Khanna Publication.
7) S. K. Bhattacharya - Industrial Electronics and control , Tata Mc-Graw-Hill (TMH)

Transducers and Measurement Techniques

COURSE OUTLINE

Transducers and Measurement Techniques	**TMT**	
Course Title	Short Title	Course Code

Course Description:
Course contains the study about The General measurement system and Introduction of Transducers: Resistive, Capacitive, Inductive and piezoelectric transducers. Measurement of temperature, pressure, flow and liquid level. Study various types of oscilloscopes. Analyze the working of data acquisition systems.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	3	**14**	**40**	**3**

Prerequisite Course(s): Knowledge about sensors, Operational Amplifiers, Computer Hardware.

COURSE CONTENT

Teaching scheme:
Lectures: 3 hrs/week

Examination scheme:
End Semester Examination (ESE): 80Marks
Paper Duration (ESE): 03 Hours
Internal Seasonal Exam (ISE): 20 Marks

UNIT I: **Lectures: 8, Marks: 16**

INTRODUCTION TO MEASUREMENT SYSTEM & ITS ELEMENTS:
Definition and classification of transducers. Characteristics and Choice of Transducers.
Measurement system: Purpose, structure and elements. Generalized performance characteristics, static characteristics of measurement system elements, dynamic characteristics of measurement systems. Temperature Transducers: Resistance temperature detector, Thermistor, Thermocouple, Pressure Transducers: Manometers, Electrical pressure transducers.

UNITII: **Lectures: 08, Marks: 16**

ELECTRICAL TRANSDUCERS
Digital transducers, Variable resistance transducers: Potentiometer, strain Gauge, types of strain gauge, Derivation of gauge factor, Bridge configurations, compensation, Applications of strain gauges. Variable capacitive transducers: Capacitance principles, capacitive displacement transducers, capacitive level transducers. Variable inductive transducers: Linear variable differential transformer, True Rms Responding Voltmeter, Introduction to Wheatstone's & Kelvin's Bridge.

Unit-III: **Lectures: 08 , Marks : 16**

MECHANICAL TRANSDUCERS & MEASUREMENT TECHNIQUES

Flow measurement systems: Essential Principles of fluid mechanics, measurement of velocity at a point in a fluid: piton-static tube, measurement of volume flow rate: differential pressure, mechanical and vortex flow meters. Level measurement, Level formulae; level sensing devices, direct level sensing, indirect level sensing, and application considerations.

Unit-IV: **Lectures: 08, Marks : 16**

OSCILLOSCOPE

Introduction, principle, feature, block diagram, CRT diagram, CRT basics, PDA Tubes, dual beam CRO, dual trace CRO, VHF oscilloscope , VLF signal scope (analog storage and digital storage scopes, digital read out scopes, probes for CRO, attenuators, fiber optic CRT

Unit-V: **Lectures: 08, Marks : 16**

DATA ACQUISITION AND TRANSMISSION SYSTEMS

Automatic bridge transmitter, interfacing transducer to electronic control, objectives of DAS, single channel and multi channel DAS, ATS, computer based testing of audio amplifier, radio receiver, data loggers. Computer aided measurements, Introduction to Data transmission systems, advantages and disadvantages of digital over analog transmission. Introduction to MODEMs. Data communication System using Modems.

References:

1. Bentley J.P., Principles of measurement systems, Third Edition, Pearson education Asia pvt.ltd, 2000.
2. Doebelin, E.O., Measurement Systems, McGraw Hill Book Co., 1998
3. Patranabis D, Sensors and Transducers, Wheeler Publishing Co., Ltd. New Delhi, 1997.
4. Murthy, D.V.S., Transducers and Instrumentation, Prentice Hall of India Pvt. Ltd., New Delhi, 1995.
5. Neubert, H.K.P., Instrument Transducers, Clarenden Press, Oxford, 1988.
6. H.S.KALSI, Electronic Instrumentation

Digital Signal Processing & Image Processing

COURSE OUTLINE

Digital Signal Processing & Image Processing **DSPIP**
Course Title Short Title Course Code

Course Description:
This course emphasizes on Discrete Time Signals & Systems, Z Transform & Discrete Fourier Transform, Image Transforms, Image Enhancement, Image Restoration and Denoising.

Lecture	Hours / Week	No .of Weeks	Total Hours	Semester Credits
	03	14	42	03

COURSE CONTENT

Teaching scheme:
Lectures: 3 hrs/week

Examination scheme:
End Semester Examination (ESE): 80Marks
Paper Duration (ESE): 03 Hours
Internal Seasonal Exam (ISE): 20 Marks

UNIT I **No. of Lect. – 10, Marks: 16**
Discrete Time Signals and Systems:

a) Introduction: Basic elements of Digital Signal Processing Systems, Advantage and Limitation of Digital over Analog Signal Processing
b) Concept of frequency in continuous & discrete time signals, Sampling of Analog signals, Aliasing, Sampling Theorem
c) Discrete Time Signals: Representation, Standard Discrete Time Signals, Classification of Discrete Time Signals, Simple Manipulations of Discrete Time Signals
d) Discrete Time Systems: Block diagram representation of Discrete Time Systems, Classification of Discrete Time Systems
e) Response of LTI systems to arbitrary inputs: Convolution Sum, properties of convolution sum

UNIT II **No of Lect. – 8, Marks: 16**
Z-Transforms and Discrete Fourier Transform:

a) Z- Transform and Properties of Z- Transform
b) Inverse Z- Transform
c) Discrete Fourier Transform and Inverse Discrete Fourier Transform

d) FFT Algorithms : DIT and DIF

UNIT III **No of Lect. – 10, Marks: 16**

Digital Image Processing and Image Transform:

a) Introduction, Brightness Adoption and Discrimination, Image Sampling and Quantization, Basic Pixel Relationship
b) Image Transforms: Fourier Transform, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Slant Transform, Optimum Transform : Karhunen- Loeve Transform, Introduction to Wavelet Transform

UNIT IV **No of Lect. –8, Marks: 16**

Image Enhancement:

a) Image Enhancement in the Spatial domain : Spatial domain point operation and Neighbourhood Operation
b) Gray-Level Transformation, Median Filter , Bit plane slicing , Histogram Processing, Arithmetic and Logic Operation
c) Spatial filtering: Introduction, smoothing and sharpening filters
d) Image Enhancement in the frequency domain: Frequency-domain filters: smoothing and sharpening filters, homomorphic filtering

UNIT V **No of Lect. – 6, Marks: 16**

Image Restoration and Denoising:

Introduction, Image Degradation, Types of Image Blur

a) Classification of image restoration Techniques , Image Restoration Model , Linear and non-Linear image restoration Technique
b) Blind deconvolution, Image Denoising, Classification of Noise in Image, Trimmed Average Filter, Applications of Image restoration.

References:

1. Introduction to Digital signal processing . John G. Proakis, D.G. Manolakis (Maxwell Macmillan Int.)
2. R. C.Gonsales R.E.Woods, .Digital Image Processing.,Second edition, Pearson Education
3. TAMAL BOSE . Digital Signal and Image Processing . John Wiley & Sons , Inc.

VLSI DESIGN

COURSE OUTLINE

VLSI Design	**VLSID**	
Course Title	Short Title	Course Code

Course Description:
This course emphasizes on History of HDL, Types of Architecture use in VHDL and Verilog, Structure of all types of descriptions, VHDL Programming, Organization of structural design, Binding, NMOS and PMOS switch description, data types and packages in VHDL, Architecture of FPGA and CPLD.

Lecture	**Hours / Week**	**No .of Weeks**	**Total Hours**	**Semester Credits**
	03	**14**	**42**	**03**

Prerequisite Course(s): Digital Techniques and Application.

COURSE CONTENT

Teaching scheme:	**Examination scheme:**	
	End Semester	
Lectures: 3 hrs/week	**Examination**	**(ESE): 80Marks**
	Paper Duration	**(ESE): 03 Hours**
	Internal Seasonal Exam	**(ISE): 20 Marks**

UNIT I **No. of Lect. – 8, Marks: 16**

Introduction:

a) History of HDL: Brief history of VHDL, brief history of Verilog.
b) Structure of VHDL and Verilog module: Structure of Entity /Module, Port.
c) Operators in VHDL and Verilog: Logical, Relational, Arithmetic Shift and Rotate Operators.
d) Data types of VHDL and Verilog.
e) Types of Architecture use in VHDL and Verilog: Behavioral Description, Structural Description, Switch level Description, Data-flow Description, Mixed-type Description.

UNIT II **No of Lect. – 8, Marks: 16**

Data-flow Description (VHDL):

e) Structure of Data-flow Description: Signal declaration and Signal assignment statements.
f) Concurrent Signal assignment statements, Constant declaration and assignment statements, assigning a delay to the signal assignment statements.
g) VHDL Programming using Data-flow description and Common errors occurring during programming.

Behavioral Description (VHDL):

h) Structure of Behavioral Description for VHDL.
i) VHDL variable assignment statement.
j) Sequential statements for VHDL: IF statement, Signal and variable (only for VHDL) assignment, Case statement, Loop statement.
k) VHDL Programming using Behavioral description and Common errors occur during programming.

UNIT III **No of Lect. – 8, Marks: 16**

i) Structural Description (VHDL):

c) Organization of structural design, Binding.
d) State machines, Generic (VHDL).
e) VHDL Programming using Structural description and Common errors occurring during programming.

ii) Switch Level Description (VHDL):

f) Single NMOS and PMOS switches: NMOS and PMOS switch description for VHDL
g) Serial and parallel combinations of switches
h) Switch level description of: Primitive gates, Combinational logics, Sequential circuits
i) CMOS switch. Bidirectional switches.

iii) Procedures (VHDL) and Functions (VHDL)

UNIT IV **No of Lect. –8, Marks: 16**

Mixed type Description (VHDL):

a) Defined data types in VHDL, VHDL Packages.
b) Implementation of Arrays, and Mixed-type Description Programming.
c) Advanced HDL Description (VHDL): File processing in VHDL.VHDL record types.
d) Programming of File processing for VHDL.

UNIT V **No of Lect. – 8, Marks: 16**

a) Architecture of Xilinx 9500 series CPLD.
b) Architecture of Xilinx Spartan 4000 series FPGA.
c) Synthesis basics, Synthesis information from entity, mapping process in the hardware domain.

References:

1. John F. Wakerly - Digital Design, Principles and Practices, Pentice Hall Publication.
2. Nazeib M. Botros - HDL programming Fundamentals VHDL and Verilog , Thomson.
3. Stephen Brown and Zvonko Vranesic - Fundamentals of Digital Logic with VHDL design, McGraw Hill
4. Douglas Perry - VHDL , Tata MC-Graw Hill
5. Xilinx data manual - The Programmable Logic data Book
6. Sudhakar Yalamanchil - An Introduction to VHDL from Synthesis to Simulation
7. Bhaskar – A VHDL Primer, Pearson

DIGITAL COMMUNICATION SYSTEMS

COURSE OUTLINE

DIGITAL COMMUNICATION SYSTEMS **DCS**
Course Title Short Title Course Code

Course Description:

This course is aimed at introducing the fundamentals of digital communication to undergraduate students. The background expected includes a prior knowledge of second year course in Communication System-I. The background expected includes a prior knowledge of third year course in Communication System-II.The goals of the course are to understand the basic principle of digital communication and application in different era.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s): Communication System-I, Communication System-II.

COURSE CONTENT

Teaching Scheme
Lecture: 3 hours / week

Examination Scheme
End Semester Examination (ESE): 80 Marks
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE): 20 Marks

Unit-I: **No. of Lect.-8 Marks: 16**

Digital Baseband Modulation Techniques and Waveform Coding Techniques

a) Wave form coding, Sampling of signals,
b) Natural and flat top samples,
c) PCM, Uniform and Non uniform quantization,
d) Baseband modulation, Noise consideration in PCM systems,
e) DPCM, DM,ADM
f) LPC.

Unit II: **No. of Lect.-8 Marks: 16**

Baseband Demodulation Detection Techniques

a) Signals & noise, Data formats,
b) Synchronization and multiplexing,
c) Interference, Equalization,
d) Detection of binary signals in presence of Gaussian noise,
e) Matched and optimum filters.

Unit III: **No. of Lect.-8 Marks: 16**

Random Process

a) Introduction, Mathematical definition of a random process,
b) Stationary processes mean, correlation &covariance function,
c) Ergodic processes, transmission of a random process through a LTI filter,
d) Power spectral density, Gaussian process,
e) Noise, narrow band noise, representation of narrowband noise in terms of in phase & quadrature components,
f) Representation of narrowband noise.

Unit IV: **No. Of Lect.-8 Marks: 16**

Digital Band pass Modulation Technique

a) Digital band pass modulation techniques,
b) Coherent detection, on coherent detection, complex envelope.
c) Spread Spectrum Techniques,
d) pseudo noise sequences, a notion of spread spectrum,
e) direct sequence spread spectrum with coherent BPSK,
f) Signal space dimensionality & processing gain,
g) Frequency hop spread spectrum.

UNIT V: Information **No. Of Lect.-8 Marks: 16**

Theory of coding techniques:

a) Measure of information, Entropy, rate, Shannon's Encoding theorem,
b) Mutual information, variable length encoding (Shannon Fano and Hoffman coding), c)Shannon's theorem on channel capacity.
d)Shannon. Hartley equation for Gaussian channel.
e) Error detection and correction: FEC and ARQ systems,
f) Error correcting and detecting, Block codes, syndrome decoding,

Reference Books:

1) S. Haykin, "Digital Communications", Wiley Student Edition, ISBN 9971-51-205-X.
2) A. Carlson, P. Crilly and J. Rutledge, "Communication Systems- An Introduction to Signals
and Noise in Electrical Communication", McGraw Hill International Edition, 4th Edition, ISBN0-07-121028-8.
3) H. Taub, D. Schilling, "Principles of Communication Systems", Tata McGraw Hill, 2nd Edition,2005, ISBN 0-07-462456-3.

Neural Network and Fuzzy Logic

COURSE OUTLINE

Neural Network and Fuzzy Logic **NNFL**
Course Title Short Title Course Code

Course Description: Course contains basics of neural network and fuzzy logic. It also has applications related to both. It also contains genetic algorithms and hybrid systems.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	4	12	47	3

Prerequisite Course(s) : Biological neuron and human brain, various operations on sets and details of set theory.

COURSE CONTENT

Teaching scheme:
Lectures: 3 hrs/week

Examination scheme:
End Semester Examination(ESE): 80 Marks
Paper Duration (ESE): 3 Hours
Internal Seasonal Exam (ISE): 20 Marks

UNIT I: **Lectures: 7, Marks: 16**

INTRODUCTION TO NEURAL NETWORK:
Introduction to neural network, basic concept of neural network, Human brain, Biological neuron, McCulloch-Pitts neuron model, model of an artificial neuron, Neural network architectures: single layer feed-forward network, multilayer feed forward network, recurrent network, Characteristics of neural networks, learning methods, learning rules, history of neural network research, some application domains.

UNIT II: **Lectures: 10, Marks: 16**

BACKPROPAGATION NETWORKS:
Architecture of back propagation network: The perceptron model, the solution, single layer artificial neural network, model of multilayer perceptron, Back propagation learning: Input layer, hidden layer, output layer computation, calculation of error, training of neural network, method of steepest descent, effect of learning rule, adding a momentum turn, back propagation algorithm Effect of tuning parameters of the back propagation network, Selection of various parameters in back propagation network: number of hidden nodes, momentum coefficient α, sigmoidal gain λ , local minima, learning coefficient $\acute{\eta}$, Variation of standard back propagation algorithm, Research Directions: New topologies, better learning algorithm, better training strategies, hardware implementation, conscious networks.

Unit-III: **Lectures: 12, Marks: 16**

BIDIRECTIONAL ASSOCIATIVE MEMORY:
Memory architecture, Association encoding and decoding, stability considerations, memory examples and performance evaluation, improved coding of memories multidirectional Associative memory.

APPLICATIONS OF NEURAL ALGORITHM AND SYSTEMS:
Linear programming modeling network, character recognition networks: multilayer feedforward network for printed, character classification, handwritten digit recognition, recognition based on handwritten character skeletonization, recognition of handwritten character based on error, Neural networks control applications: overview of control system concepts, process identification, basic non dynamic learning control architectures, Network for kinematics: overview of robot kinematics problems, solution of the forward and reverse kinematics problems, comparison of architectures.

Unit-IV: **Lectures: 12, Marks: 16**

FUZZY SET THEORY:
Fuzzy versus Crisp, crisp sets: operation on Crisp sets, properties of Crisp Sets, Partition and covering, Fuzzy sets: Membership function, Basic fuzzy set operation, properties of fuzzy sets, Crisp Relation: Cartesian Product, other crisp relation, operation on relations, Fuzzy relations: Fuzzy Cartesian product, operations on fuzzy relations.

FUZZY SYSTEMS: Crisp logic: laws of propositional logic, inference in propositional logic, Predicate logic: Interpretation of predicate logic formula, inference in predicate logic, Fuzzy logic: fuzzy quantifiers, fuzzy inference, Fuzzy rule based system, Defuzzification Methods, Air conditioner controller application

Unit-V: **Lectures: 6, Marks: 16**

GENETIC ALGORITHMS:
Genetic algorithm: history, basic concepts, creation of offsprings, working principle, encoding: binary, octal, hexadecimal, permutation, value, tree encoding.

HYBRID SYSTEMS: Hybrid systems: Sequential, Auxiliary, Embedded hybrid systems, Neuro-fuzzy, Neuro-genetic, fuzzy-genetic hybrids, Genetic algorithm based back propagation network, Fuzzy back propagation network, simplified fuzzy ARTMAP, fuzzy associative memory.

References:

1. Rajasekharan and Pai, “Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications” – PHI Publication.
2. Jacek M. Zuarda, “Introduction to Artificial Neural Systems”, Jaico Publishing House, 1997.

Object Oriented Programming

COURSE OUTLINE

Object Oriented Programming Systems **OOPS**
Course Title Short Title Course Code

Course Description:
This course emphasizes on Introduction object oriented programming systems, functions, objects and classes, Constructors and destructor, operator overloading and type converson, Inheritance, Pointer, Virtual functions and polymorphism, Managing console I/O operations, Working with files, templates and expection handling.

Lecture	Hours / Week	No .of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s) : Knowledge of C Programming Language**.**

COURSE CONTENT

Teaching scheme:
Lectures: 3 hrs/weeks

Examination scheme:
End Semester Examination(ESE): 80Marks
Paper Duration (ESE): 3 Hours
Internal Seasonal Exam(ISE) : 20 Marks

UNIT I- **Lectures 9, Marks 16**

Object oriented programming concepts

a) Object oriented methodology, basic concepts of object oriented programming language,
b) Features, advantages and Applications of OOPS
c) Introduction to C++: what is c++, a simple c++ program, structure of c++ program, creating the source file, compiling and linking
d) Tokens, keywords, identifiers and constants, basic data types, user defined data types, storage classes, derived data types, symbolic constants, type compatibility
e) Declaration of variables, dynamic initialization of variables, reference variables, operators in c++, manipulators
f) Expressions and their types, special assignment expressions, implicit conversion, operator overloading, operator precedence, control structure

UNIT II - **Lectures 8, marks16**

Fuctions, Object and Classes

a) Introduction, the main function, function prototyping, Call by reference, Return by reference,

b) Function overloading and default arguments, Inline function, Static class members, Friend functions.

c) Specifying a class, defining member function, a c++ program with class, making a outside Function inline, nesting of member function, private member function
d) Array within class, memory allocation for objects, static data members, static member Functions, array of objects, objects as a function arguments
e) Friendly function, returning objects, const member functions, pointer to members, local classes**.**

UNIT III – Lectures 8, Marks 16

Constructors, destructor, operator overloading and type conversion
a) Introduction, constructors, parameterized constructors, multiple constructors in a class, constructors With default arguments
b) Dynamic initialization of objects, copy constructors, dynamic constructors, constructing two dimensional arrays, const objects, destructors.
c) Defining operator overloading, overloading binary operators, overloading unary operators
d) Overloading binary operators with friends, manipulations of strings using operators
e) Rules for overloading operators, type conversions

UNIT IV – Lectures 9, Marks 16

Inheritance, Pointer, Virtual functions and polymorphism
a) Introduction, defining derived classes, single Inheritance, making a private member inheritable
b) Multilevel Inheritance, multiple Inheritances
c) Hierarchical Inheritance, hybrid Inheritance
d) Virtual base classes, abstract classes, constructors in derived classes, member classes: nesting of classes.
e) Introduction, pointers, pointer to objects, this pointer, pointers to derived classes
f) Virtual functions, pure virtual functions, virtual constructors and destructors.

UNIT V – Lectures 8, Marks16

Managing console I/O operations
a) C++ streams, c++ stream classes
b) Unformatted I/O operations, formatted console I/O operations,
c) Managing output with manipulators,
d) Working with files,
e) Templates and exception handling

References:

1RobertLafore- Object Oriented Programming with C++, Fourth Edition, Pearson Education
2 E. Balagurusamy- Object Oriented Programming with C++, TMH
3. Herbert Shildth-The Complete Reference C++,TMH.

COMPUTER COMMUNICATION NETWORK

COURSE OUTLINE

Computer Communication Network **CCN**
Course Title Short Title Course Code

Course Description:
This course is aimed at introducing the fundamentals of Computer Networking to Undergraduate students. The objective of the course is to understand the basics and Knowledge about the Computer Network concepts and different protocols.

	Hours per Week	No. of Weeks	Total Hours	Semester Credits
Lecture	**3**	**14**	**42**	**3**

Prerequisite Course(s): Communication systems I, Communication system II.

COURSE CONTENT

Teaching Scheme
Lecture: 3 hours / week

Examination Scheme
End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE): 20 Marks

Unit I **08 Hours, 16marks**

Introduction to Computer Network, Switching and Data link control
OSI model, network models, Arpanet, NSFNET, Internet. Network Topologies: LAN, WAN, MAN
Switching. : ISDN, Narrowband ISDN, ISDN services, System architecture, Interface. Broadband ISDN: Virtual switching, Circuit switching.
Data link control: point-to-point and multi-point links, flow control, sliding window protocol, Various ARQ technique for error control and their comparison and performance analysis, HDLC as a bit oriented link control protocol.

Unit II **08 Hours, 16 marks**

Data Link layer , Internetworking
Data Link layer: Data Link layer design issues, Elementary data link layer protocols, window protocols, Data Link Layer switching, Bridges 802.x to 802.y, Local inter-networking, Spanning tree and remote bridges. Review of network connecting devices and multiple access protocols.
Internetworking: The network layer in the internet: IP Protocol, IP Address, Subnet, Internet control Protocols, Internet multicasting, IPv4: Datagram, Fragmentation, Checksum, Options, IPv6: Advantages, Packets Formats Extension Headers. Address Resolution Protocol (ARP), RARP, DHCP.

Unit III **08 Hours, 16 marks**

Network layer, routing algorithm

Network layer: Design Issue: Internal Organization, Virtual circuit and Datagram subnets, routing algorithm: Shortest Path Routing, Flooding, Hierarchical Routing, Broad Cast Routing, Routing for mobile host, Multicast routing, Congestion Control

Algorithms: Congestion Prevention Policies, Control in virtual Circuits Subnets, choke Packets, Load Shedding.

UNIT IV **08 Hours, 16 marks**

Transport layer, ATM Transport layer: The Internet Transport Protocols; TCP: Services, Features, Segments, Connections, Flow control, Error Control, congestion Control, UDP. QOS (Quality of Services) ATM AAL layer protocol.

UNIT V **08 Hours, 16 marks**

Application layer, WAN and Ad Hoc Wireless Networks

Application layer: Network security, Domain Name system, SNMP, Electronic Mail; the World Wide Web, Multi media. Introduction to WAN packet switching technologies such as ATM and Frame relay. Ad Hoc Wireless Networks: Introduction, Issues in Ad Hoc Wireless Networks, Ad Hoc Wireless Internet Routing Protocols for Ad Hoc Wireless Networks: Introduction, Issues in Designing a Routing Protocol for Ad Hoc Wireless Networks.

References:

1. Andrew S Tanebaum - Computer Networks, 4th Ed. PHI/ Pearson education.
2. Behrouz A Forouzan - Data Communication and Networks, 3rd Ed. TMH.
3. S. Keshav - An Engineering approact to Computer Networks, 5th Ed. Pearson.
4. W.A. Shay - Understanding communication and Networks, Thomson.
5. Irvine Olifer - Computer Networks: Principles, Technology and Protocols, Wiley India.
6. William Stalling – Data and Computer communications, 7th Ed. PHI
7. Hardy, Inside networks, PHI
8. Glover and Grant, Digital Communication, PHI

Digital Signal Processing LAB

COURSE OUTLINE

Digital Signal Processing	**DSP**	
Course Title	Short Title	Course Code

Course Description:

In this Course emphasis is on basic signal processing concepts like operations on discrete time signals, characterization of LTI systems, sampling and aliasing, frequency response of systems, digital filter design and use of DSPs.

Laboratory	**Hours/Week**	**No. Of Weeks**	**Total Hours**	**Semester Credits**
	2	**10**	**20**	**1**

ICA: Internal Continuous Assessment-25 ESE: End Semester Examination – 25(PR)

LAB COURSE CONTENT

List of Practicals:

1. Basic operations on sequences of equal and unequal lengths.
2. Sampling of continuous time signal and aliasing effect.
3. Convolution of two sequence\ Impulse response.
4. Spectrum of signals using DFT.
5. Frequency response of LTI Discrete time system.
6. Designing of FIR Filter.
7. Designing of IIR Filter.
8. Sampling audio signal at different sampling rate using DSP kit.
9. Interfacing with DSP Kit.
10. Implementation of digital filter using DSP Kit.
11. Using ADC and DAC for signal acquisition and play back after processing.

Note: Minimum **EIGHT** practicals are to be performed (At least **TWO** on any DSP platform).

Guidelines for ICA:

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

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

POWER ELECTRONICS LAB
COURSE OUTLINE

Course Title	Short Title	Course Code
POWER ELECTRONICS Lab	**PE Lab**	

Course Description:

In this Course emphasis is on SCR, Line frequency phase controlled converter, Dc-Dc switch mode converters, Switch mode dc to ac inventers, DC motor drives and AC motor drives

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	2	**10**	**20**	**1**

ICA: Internal Continuous Assessment-25 ESE: End Semester Examination – 25(PR)

LAB COURSE CONTENT

(Minimum **EIGHT** practical's are to be performed)

List of Practical's:

1. Study of R, RC triggering circuits of SCR
2. Study of 1 - ϕ Half controlled Bridge rectifier with R and RL Load
3. Study of circuit and waveforms of step-up dc –dc converter
4. Study of circuit and waveforms of step-down dc –dc converter
5. Study of SMPS
6. Study of Parallel Inverter
7. Study of 3- ϕ Inverter
8. DC motor drives(Using DC-DC converter)
9. DC motor drives(Using UJT triggering circuit)
10. AC motor drive(VFD based)

Guidelines for ICA:

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

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

VLSI DESIGN LAB
COURSE OUTLINE

VLSI Design Course Title	**VLSI Design** Short Title	Course Code

Course Description:

In this Course emphasis is on basic of data types, operators, in VHDL.

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	2	10	20	1

ICA: Internal Continuous Assessment-25 ESE: End Semester Examination – 25(PR)

LAB COURSE CONTENT

List of Practicals:

1. Write VHDL code to realize all the logic gates
2. Write a VHDL program for the following combinational designs
   a. 2 to 4 decoder
   b. 8 to 3 (encoder without priority & with priority)
   c. 8 to 1 multiplexer
   d. 4 bit binary to gray converter
   e. Multiplexer, demultiplexer, comparator
3. Write a VHDL code to describe the functions of a Full Adder Using following modeling styles.
4. Develop the VHDL codes for the following flip-flops, SR, D, JK, T.
5. Design and Implement 4 bit binary counters.
6. Design and Implement ALU.
7. Design and Implement Shift Register.
8. Design and Implement Stepper motor.

Guidelines for ICA:

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

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

DIGITAL COMMUNICATION SYSTEMS LAB
COURSE OUTLINE

Digital Communication Systems DCS
Course Title Short Title Course Code

Course Description:

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	2	**10**	**20**	**1**

ICA: Internal Continuous Assessment-25 ESE: End Semester Examination – 25(PR)

LAB COURSE CONTENT

List of Practicals:

Group-A

1. To generate and detect PCM signal.
2. To understand waveform of Delta Modulation and Demodulation.
3. To understand waveform of Adaptive Delta Modulation and Demodulation.
4. To generation and detection of FSK i/p and o/p waveform.
5. To generation and detection of PSK i/p and o/p waveform.
6. To generation and detection of ASK i/p and o/p waveform.

Group-B

7. To generation and detection of QPSK/QAM i/p and o/p waveform.
8. To Study different line codes (NRZ, RZ, polar RZ, bipolar(AMI),Manchester)
9. Noise analysis using any software tool (use of any discrete distribution).Find response by changing parameters.(use any open source software)
10. Noise analysis using any software tool (use of any continuous distribution).Find response by changing parameters.(use any open source software)
11. Execute Shannon fanon algorithm by using any software tool.(use any open source software)
12. Execute Huffman coding by using any software tool.(use any open source software)

Note: Minimum FOUR Experiments from each group.

Guidelines for ICA:

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

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Neural Network and Fuzzy Logic Lab

COURSE OUTLINE

Neural Network and Fuzzy Logic **NNFL**
Course Title Short Title Course Code

Course Description:

This Course gives emphasis on simulation of basic concepts in Neural Network, Fuzzy Logic and hybrid systems.

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	2	10	20	1

ICA: Internal Continuous Assessment-25 ESE: End Semester Examination – 25(PR)

LAB COURSE CONTENT

List of Practicals:

1. To fit a multilayer preceptron network on the data generated by Hump's function by trying different network sizes and different teaching algorithm.
2. To fit a multilayer preceptron network on the data generated by Radial basis function by trying different network sizes and different teaching algorithm.
3. Design a neural network which will fit the data for any surface function. Study different alternatives and test the final results by studying filter error.
4. To demonstrate back propagation network to approximate first order basal function.
5. To simulate hybrid systems for different initial conditions.
6. To simulate program for basic operations on fuzzy sets.
7. To simulate program to find reflexivity, symmetry of matrices .
8. To simulate program to find Transitivity, equivalence of matrices .

Guidelines for ICA:

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

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Object Oriented Programming Lab
COURSE OUTLINE

Object Oriented Programming Systems **OOPS**
Course Title Short Title Course Code

Course Description:

This Course gives emphasis on object oriented programming language using classes and objects.

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	2	**10**	**20**	**1**

ICA: Internal Continuous Assessment-25 ESE: End Semester Examination – 25(PR)

LAB COURSE CONTENT

List of Practicals:

1. Write a program for a simple class and object
2. Write a program for parameterized constructor.
3. Write a program for overloading constructors
4. Write a program to find the area of rectangle, triangle and sphere using function overloading
5. Write a program to overload binary operator using member function.
6. Write a program for arrays of pointers to objects
7. Write a program using single inheritance, multiple inheritance and hierarchical inheritance
8. Write a program for virtual base classes
9. Write a program to format output using manipulators
10. Write a program using class template
11. Write a program for the copy constructor
12. Write a program for run time polymorphism using virtual functions.

Note:

1. Minimum **EIGHT** practical's are to be performed

Guidelines for ICA:

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

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Project-I

Project-I
Course Title Short Title Course Code

Course Description:
The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

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

COURSE CONTENT

Project-I **Semester-VII**

Lab: 2 Hrs/Week **Examination Scheme**

Total Semester Credits: 02
Internal Continuous Assessment (ICA): 25 Marks
End Semester Examination(ESE)-Oral:25 Marks
Total: 50Marks

1. It is expected that the broad area of Project-I shall be finalized by the student in the beginning of the VII semester / extension of Minor project undertaken may be Project-I.
2. A group of Minimum 3 and Maximum 5 students shall be allotted for Project-I and same project group for Project-II.
3. Exhaustive survey of literature based on a clear definition of the scope and focus of the topic should be carried out by the students. The **Synopsis/Abstract** on the selected topic, after detail literature survey should be submitted to the Project coordinator appointed by Head of the department.
4. Project-I may involve literature survey, problem identification, work methodology preparing specification and material procurement, collection of data , conduction of experiments and analysis. The project work shall involve sufficient work so that students get acquainted with different aspects of fabrication, design or analysis.
5. Approximately more than 50% work should be completed by the end of VII semester.
6. Each student group is required to maintain log book for documenting

various activities of Project-I and submit group project report in the form of thermal bound at the end of semester –VII. Submit the progress report in following format:

a. *Title*
b. *Abstract*
c. *Introduction*
d. *Problem identification and project objectives*
e. *Literature survey*
f. *Case study/Analysis/Design Methodology*
g. *Work to be completed (Progress status)*
h. *Expected result and conclusion*
i. *References.*

7. Evaluation Committee comprising of the Guide, Project Coordinator and Expert appointed by the Head of the department will award the marks based on the work completed by the end of semester and the presentation based on the project work.

Guide lines for ICA : The Internal Continuous Assessment shall be based on the active participation of the students in the Project work and knowledge / skill acquired. Assessment of the project-I for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-A.**

Guide lines for ESE: The End Semester Examination for Project shall consist of demonstration if any, presentation and oral examinations based on the project report**.**

Assessment of Project-I

Name of the Project: _____

Name of the Guide: _____

Table-A

SN	Name of Student	Problem Identification and project objectives	Literature Survey	Project Methodology/ Design/PCB/ hardware/ simulation/ programming	Progress Status	Present ation	Total
		5	**5**	**5**	**5**	**5**	**25**

Seminar-II

COURSE CONTENT

Seminar-II
Course Title Short title Course Code

Course Description: The course explores the knowledge of presentation and effective communication. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

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

COURSE CONTENT

Seminar-II
Semester-VII

Practical : 2 Hrs/Week

Examination Scheme

Total Semester Credits: 02

Internal Continuous Assessment (ICA): 25 Marks

1. Each Student shall select a topic for seminar which is not covered in curriculum. Seminar topic should not be repeated and registration of the same shall be done on first come first serve basis.
2. Topic of Seminar shall be registered within a three weeks from commencement of VII Semester and shall be approved by the committee.
3. The three-member committee appointed by Head of the department shall be constituted for finalizing the topics of Seminar-II. Seminar shall be related state of the art topic of his choice approved by the committee.
4. Each student should deliver a seminar in scheduled period (Specified in time table or time framed by department) and submit the seminar report (paper bound copy/Thermal bound)in following format:
    a. *Title*
    b. *Abstract*

c. *Introduction*
d. *Literature survey*
e. *Concept*
f. *Functional and Technical Details*
g. *Applications*
h. Comparison with similar topics / methods
i. *Future scope*
j. *References*

ASSESSMENT OF SEMINAR-II

Guide lines for ICA: ICA shall be based on topic selection , presentation and Seminar-II report submitted by the student in the form of thermal bound. Assessment of the Seminar-II for award of ICA marks shall be done jointly by the guide and a departmental committee, as per the guidelines given in **Table- B**

Name of Guide: _____

Table-B

SN	Name of Student	Seminar Topic	Topic Selection	Literature survey	Report writing	Depth of under-standing	Presentation	Total
			5	**5**	**5**	**5**	**5**	**25**

Industrial Visit

Industrial Visit
Course Title Short Title Course Code

Course Description: The course explores the knowledge industry organization, new trends in manufacturing, maintenance and safety. The industrial visit provide the practical visualization of theoretical study of various engineering subject.

COURSE CONTENT

Semester-VII **Examination Scheme**

Total Semester

Credits: 01

Internal Continuous Assessment (ICA): 25 Marks

1. Industry visits to minimum two industries shall be carried out by each student preferably/college shall arrange the industrial visit during the vacation period otherwise during the regular VII semester.
2. The student should obtain appropriate certificates of visit from the concerned organizations just after the visits.
3. Every Student should submit Industrial Visit report individually at the end of Semester-VII(First Term of Final Year)
4. The report(Thermal Bound) should contain information about the following points:
   a. *The organization - activities of organization and administrative setup technical personnel and their main duties.*
   b. *The project / industry brief description with sketches and salient technical information.*
   c. *The work / processes observed with specification of materials, products, equipments etc. and role of engineers in that organization.*
   d. *Suggestions (if any) for improvement in the working of those organizations.*
5. The evaluation of the report of technical visits will be made by panel of three teachers appointed by Head of the department based on following points:

Guide lines for ICA : ICA shall be based on knowledge gain by student and Industrial Visit Report submitted by the student in the form of Thermal bound. Assessment of the Industrial Visit for award of ICA marks shall be done jointly by

industrial visit coordinators departmental committee based on viva -voce as per the guidelines given in **Table- C**

Table-C

SN	Name of Student	Name of Industry	Report writing	Depth of Under-standing	Total
			15	**10**	**25**

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Syllabus for

Final Year Electronics Engineering

Faculty of Engineering and Technology

COURSE OUTLINE

SEMESTER – VIII

W.E.F 2015 – 2016

LIGHT WAVE COMMUNICATION

COURSE OUTLINE

Course Description:

Overview of optics, Fiber-Optic Transport, sources and photo-detectors, optical couplers and switches, design of fiber-optic links, and an in-depth discussion of wavelength multiplexing. Review of switching theory and photonic switching including photonic switching devices. Review of intensity modulation. Types of losses in fiber, advance systems and techniques, optical networks such as SONET/SDH.

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

Prerequisite course(s): Communication System-I, Communication System-II.

COURSE CONTENTS

Teaching scheme:
Lectures: 3 hrs /week

Examination scheme:
End Semester Exam (ESE): 80
Paper Duration (ESE): 3 Hours
Internal Sessional Exam (ISE): 20

UNIT – I: **Lectures 09, Marks 16**

Introduction to Optical Fiber Communication system

a) Block diagram of optical fiber communication system, advantages and disadvantages of optical fiber communication system,

b) Ray theory of transmission and concept of acceptance angle, numerical aperture (mathematical treatment) Meridonial and skew ray theory of optical propagation.

c) Cut of wavelength, group velocity, group delay.

d) Types of fibers according to materials, refractive index profile, mode of propagation. Different propagation modes: calculation of 'v' number.

e) Components of fiber system: splices, connectors, couplers, directional coupler.

UNIT-II: **Lectures 09, Marks 16**

Light sources and detectors

a) Sources: Characteristics of light sources, Types: LED, Laser diode. Surface Emitter LED, Edge Emitter LED. Operating characteristics, modulation bandwidth: 3db electrical and optical bandwidth, radiation patterns (Surface emitter and Edge emitter LEDs).

b) Laser diode: working principle, characteristics, radiation pattern.

c) Detectors: characteristics of light detector, types: p-n photo diode, pin photo diode, APD.

d) Detector parameters: quantum efficiency, responsivity, speed of response (numerical based on these)

UNIT-III: **Lectures 09, Marks 16**

Modulation: noncoherent /coherent

a) Intensity modulation: LED modulations and circuits (analog and digital)
b) Analog modulation formats, AM/IM sub carrier modulation, FM/IM sub carrier modulation,
c) Digital modulation formats: PCM, RZ, NRZ, Manchester, Bipolar codes. Other digital formats: PPM, PDM, OOK, FSK, PSK.
d) Detection: (coherent detection/heterodyne/homodyne detection) : optical heterodyne receivers, optic frequency division multiplexing(OFDM).
e) Analog and digital optical fiber links.

UNIT-IV: **Lectures 08, Marks 16**

Losses in fibers

a) Absorption, scattering and bending losses.
b) Signal distortion in optical fiber, material dispersion, waveguide dispersion, intermodal dispersion.
c) Fiber optics system design: optical power budgeting, rise-time budget.
d) Optical fiber measurements: measurement of attenuation, dispersion, refractive index and field . Optical time domain reflectometry (OTDR)

UNIT – V: **Lectures 07, Marks 16**

Advanced systems and techniques

a) Wavelength division multiplexing, DWDM
b) Optical amplifiers, optical filters, integrated optics ,
c) Optical networks: SONET/SDH, photonic switching,
d) Applications of optical fiber for displacement, pressure, level, voltage and current measurement.

Reference books:

1) John M. Senior "Optical fiber communications Principles and practice" Pearson Education.
2) Gerd Keiser, "Optical fiber communications" Tata McGraw Hill Education.
3) Govind P. Agrawal "Fiber optic communication systems by" WILEY – INTERSCIENCE publication.

PROCESS CONTROL SYSTEM
COURSE OUTLINE

Process Control System	**PCS**	
Course Title	Short Title	Course Code

Course Description:

Course contains the study about basics of process control systems & study of various elements of process control system.It also provide in depth study of Controller modes and various complex control schemes.It also contains study about computer aided process control systems.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	3	14	42	3

Prerequisite Course(s): Knowledge about sensors, Operational Amplifiers, Computer Hardware.

COURSE CONTENT

Teaching scheme:
Lectures: 3 hrs/week

Examination scheme:
End Semester Examination (ESE): 80 Marks
Paper Duration (ESE): 3 Hours
Internal Seasonal Exam (ISE): 20 Marks

UNIT I: **Lectures: 8, Marks: 16**

INTRODUCTION TO PROCESS CONTROL:

Process control principles, Block diagram of process control (Process measurement, error detector, controller, control element, feedback loop), control system evaluation (Stability, Regulation, Transient Regulation, Evaluation criteria), Time Response (First order response, second order response), Voltage to current & current to voltage converters, current to pressure converter, Pneumatic, hydraulic, electric actuators.

UNIT II: **Lectures: 08, Marks: 16**

PROCESS CONTROL ELEMENTS AND CONTROLLER PRINCIPLES:

Mechanical and Electrical elements, fluid valve, control valve principles, control valve types & their characteristics, control valve sizing, Process characteristics, Control system parameters, Discontinuous controller modes, two position modes, neutral zone, multi position mode, floating control mode, etc.

Unit-III: **Lectures: 09 , Marks : 16**

CONTINUOUS CONTROL MODES:

Introduction to continuous control mode, Proportional Control Mode, Integral Control Mode, Derivative Control Mode, Composite Control Modes (PI, PD, PID), electronic controllers, Pneumatic controllers, Tuning of Proportional controllers, Tuning of PI controllers, Tuning of PD controllers, Tuning of PID controllers.

Unit-IV: **Lectures: 09, Marks: 16**

COMPLEX CONTROL SCHEMES

Feedback and feed forward control system, cascade control system, predictive control system, multivariable control system, adaptive control system, Intelligent control systems, Simple instrumentation schemes for Heat exchanger, Boiler, compressor, distillation column, reactors, dryer, evaporator etc.

Unit-V: **Lectures: 08, Marks: 16**

COMPUTER AIDED PROCESS CONTROL:

Role of computers in process control, Elements of computer aided process control system, classification of computer aided process control system, Batch or Sequential control processes, continuous control processes, Supervisory computer control processes, direct digital control processes, Computer aided process control architecture, centralized computer control systems, distributed computer control systems, Hierarchical computer control system, Data acquisition system.

References:

1 Shinskey - process control system, application, design and tuning, MGH
2 Curtis Johnson - Process control Instrumentation technology, JOHN WILEY
3 Liptak - : Hand Book of Process Instrumentation
4 S.K.Singh-Process Control, Concepts, Dynamics & Applications, PHI.
5 Harriot P - Process control, TMH

EMBEDDED SYSTEMS

COURSE OUTLINE

EMBEDDED SYSTEMS	**ES**	
Course Title	Short Title	Course Code

Course Description:
This course emphasizes on Introduction to the Embedded Systems, optimizing design metrics, Processor technology,, Design Technology, The ARM Architecture, ARM instruction set, Thumb instruction set, Timers, Counters, watchdog timers, embedded C programs, communication basics ,basic protocol concepts, RTOS concepts.

	Hours / Week	No .of Weeks	Total Hours	Semester Credits
Lecture	03	14	42	03

Prerequisite Course(s): Digital Electronics**,** Microcontroller, Operating Systems**.**

COURSE CONTENT

Teaching scheme:
Lectures: 3 hrs/weeks

Examination scheme:
End Semester Examination (ESE): 80Marks
Paper Duration (ESE): 3 Hours
Internal Seasonal Exam (ISE) : 20 Marks

UNIT I – Lectures 9, Marks 16

Embedded System Introduction

a) Embedded System overview, Design Challenges-optimizing design metrics, common design metrics, the time-to market design metric, The NRE and unit cost design metrics, the performance design metric.

b)Processor technology, general purpose processors-software, single purpose processors-hardware.

c) Application specific processors, IC technology, Full-Custom/VLSI, Semicustom ASIC (gate array and standard cell), PLD, Trends.

d)Design Technology, compilations/Synthesis, Libraries/IP, Test, verifications ,more productivity improvers, Trends, Trade-offs, Design productivity gap.

UNIT II – Lectures 8, Marks 16

The ARM System Architecture

a) The ARM RISC machine, Architectural inheritance.
b) The ARM programming model, ARM development tools
c) 3-stage pipeline ARM organization, 5-stage pipeline ARM organization.
d) ARM instruction set
e) Thumb instruction set

f) The advanced microcontroller bus architecture (AMBA)

UNIT III – Lectures 8, Marks 16

Peripherals and Programming

a) Introduction, Timers, Counters, watchdog timers
b) UART, pulse width modulators, LCD controllers.
c) Keypad controllers, stepper motor controllers, analog to digital convertors, real time clocks,
d) Basic embedded C programs for on-chip peripherals

UNIT IV – Lectures 8, Marks 16

Interfacing

a) Introduction, communication basics: basic terminology, basic protocol concepts microprocessor interfacing: I/O addressing, port and bus-based I/O, memory mapped I/O and standard I/O, interrupts
b) Direct Memory Access Arbitration: Priority arbiter, Daisy-Chain Arbitration, network-oriented arbitration methods
c) Multilevel bus architecture, advanced communication principles, parallel communication, serial communication, wireless communication, layering, error detection and correction
d)serial protocol,I2C,CAN,FireWire,USB, parallel protocols, PCI bus, ARM bus, Wireless protocols, IrDA, Bluetooth, IEEE 802.11

UNIT V – Lectures 9, Marks16

Real Time Systems

a) Foreground/Background Systems, Critical Section of Code, Resource, Shared Resource, Multitasking, Task, Context Switch, Kernel, Scheduler, Non-Preemptive Kernel, Preemptive Kernel, Reentrancy, Round Robin Scheduling,
b) Task Priority, Static Priorities, Dynamic Priorities, Priority Inversions, Assigning Task Priorities, Mutual Exclusion, Disabling and enabling interrupts, Test-And-Set, Disabling and enabling the scheduler,
c) Semaphores, Deadlock, Synchronization, Event Flags, Inter task Communication, Message Mailboxes, Message Queues, Interrupts, Interrupt Response, Interrupt Recovery, Interrupt Latency, Response, and Recovery, ISR Processing Time, Non-Maskable Interrupts,
d) Memory Requirements, Advantages and Disadvantages of Real-Time Kernels,
e) Introduction to Ucos II RTOS, study of kernel structure of Ucos II, porting of RTOS

References:

1) Steve Furber – ARM System on-chip Architecture, Second Edition, Pearson Education.
2) Frank Vahid, Tony Givargis- Embedded System Design : A Unified Hardware / Software Introduction, 3rd Edition, Wiley India
3) Jean J Labrose - Micro C / OS-II, Indian Low Price Edition
4) Rajkamal - Embedded Systems-Architecture, programming and design,2nd Edition,TMH

DIGITAL IMAGE PROCESSING

COURSE OUTLINE

DIGITAL IMAGE PROCESSING **DIP**
Course Title Short Title Course Code

Course Description:

Introduction, Fundamental Steps in Digital Image Processing, Image Enhancement, Image Coding and Compression, Image Restoration and Color Image Processing, Image Segmentation.

Lecture	**Hours / Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	03	14	42	03

Prerequisite Course(s): Matlab

COURSE CONTENT

Teaching Scheme
Lecture: 3 hours / week

Examination Scheme
End Semester Examination (ESE): 80 Marks
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam (ISE): 20 Marks

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

Introduction:

a) Introduction, Examples of Fields that use Digital Image Processing
b) Fundamental Steps in Digital Image Processing, Components of Image Processing Systems.
c) Image Sensing and Acquisition, Image Sampling and Quantization, Representing Digital Images.
d) Spatial and Gray level Resolution, Basic pixel relationship, Distance Measures.
e) Statistical Properties: Histogram, Mean, Standard Deviation, Introduction to DCT, Walsh, Hadamard, and Wavelet Transform.

UNIT II **No of Lect. – 9, Marks: 16**

Image Enhancement:

a) Enhancement in Spatial Domain: Basic Gray Level Transformations, Histogram Processing.

b) Enhancements using arithmetic and logical operations, Basics of Spatial Filtering.
c) Smoothening and Sharpening Spatial filters.
d) Enhancement in Frequency Domain: Smoothening and Sharpening frequency Domain Filters.

UNIT III **No of Lect. – 9, Marks: 16**

Image Coding and Compression:

a) Image Coding Fundamentals, Image Compression Model, Error Free Compression, VLC.
b) Huffman, Arithmetic, RLC, Lossless Predictive Coding; Lossy-Compression.
c) Predictive Coding, Transform Coding, Discrete Cosine Transform.
d) Image Compression Standards, JPEG Baseline Coder Decoder.

UNIT IV **No of Lect. – 9, Marks: 16**

Image Restoration and Color Image Processing:

a) Image Degradation Model, Noise Models, and Restoration in Presence of Noise in spatial Domain
b) Linear Filtering, Inverse Filter, Wiener Filter, Constrained Least Square Restoration
c) Geometric Transformation, Spatial Transformation, and Grey Level Transformation.
d) Color Image Processing, Color Image Fundamentals, Color models, RGB to HIS and vice versa, Color Transforms, Smoothing and Sharpening

UNIT V **No of Lect. – 9, Marks: 16**

Image Segmentation:

a) Image Segmentation: Point, line, Edge detection, Canny Edge Detection
b) Second Order Derivative, Hough Transform, Thresholding, Region Based Segmentation,
c) Region Growing, Region Splitting and Merging, Image Representation
d) Chain Codes, Signature, Texture, Use of Principal Component for Description.

References:

1. Gonzalez and Woods - Digital Image Processing, Pearson Education / PHI
2. Arthur Weeks Jr - Fundamentals of Digital Image Processing, PHI.
3. A. K. Jain - Digital Image Processing , PHI
4. Pratt - Digital Image Processing, Wiley
5. Castleman - Digital Image Processing, Pearson

MICROELECTRONICS

COURSE OUTLINE

Course Description:
The course deals with the analysis and design of integrated circuits in CMOS technologies with emphasis on analog circuits. It will cover both fundamentals as well as practice of analog circuit design, with emphasis on circuit performance evaluations using hand calculations and simulations. Topics include BJT/FET operation.

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

Prerequisite course(s): SSDC-I, SSDC-II, ECD and background in basic electronics and circuit theory.

COURSE CONTENTS

Teaching scheme:
Lectures: 3 hrs /week

Examination scheme:
End Semester Exam(ESE): 80
Paper Duration (ESE) : 03 Hours
Internal Sessional Exam(ISE): 20

UNIT – I: **Lectures 09, Marks 16**

Introduction to Electronics
a) History of Electronics: from vacuum tubes to ultra-Large-Scale Integration, classification of Electronic signals, notational conventions.
b) Important concepts from circuit theory, frequency spectrum of Electronic signal, Amplifiers.
c) Solid state Electronic materials, drift currents in semiconductors, covalent bond model, mobility.
d) Resistivity of intrinsic silicon, impurities in semiconductors.
e) Electron and hole concentrations in doped semiconductors, Energy band model, Mobility and resistivity in doped semiconductors, diffusion and total current.

UNIT-II: **Lectures 09, Marks 16**

Solid-state diodes and diode circuits
a) The p-n junction diode, the i-v characteristics of diode, the diode equation: mathematical model for diode.
b) Diode characteristics under reverse zero and forward bias, diode temperature coefficient, diode breakdown under reverse bias.
c) p-n junction capacitance, Schottky barrier diode, diode circuit analysis, multiple diode circuits, analysis of diodes operating in breakdown region.
d) Half wave rectifier circuits, full wave rectifier circuits, full wave bridge rectification, rectifier comparison and design tradeoffs.

e) dc to dc converters, wave shaping circuits, dynamic switching behavior of diode, photo diodes, solar cells and light emitting diodes.

UNIT-III: **Lectures 09, Marks 16**

Bipolar junction transistors

a) Physical structure of Bipolar transistor, the transport model for n-p-n transistor, the p-n-p transistor.
b) The equivalent circuit representations for transport models. The operating regions of bipolar transistor, the i-v characteristics of bipolar transistor.
c) Minority carrier transport in base region, simplified model for cut off region, for forward active region and for reverse active region.
d) Modeling operation in saturation region, the early effect and early voltage, biasing the BJT, tolerances in bias circuits.

UNIT-IV: **Lectures 08, Marks 16**

Field effect transistors

a) Characteristics of MOS capacitor, structure, qualitative i-v behavior and linear region characteristics of NMOS transistor,
b) Saturation of i-v characteristics, channel length modulation.
c) Transfer characteristics and depletion mode MOSFET, body effect or substrate sensitivity.
d) PMOS transistors, MOSFET circuit symbol and model summary.
e) Biasing of MOSFET, capacitances in MOS transistors, Junction Field Effect transistor (JFET).

UNIT – V: **Lectures 07, Marks 16**

Integrated circuit fabrication

a) Monolithic integrated circuit (Microelectronic) technology, the planar processes.
b) Bipolar transistor fabrication, fabrication of FETs.
c) CMOS technology, monolithic diodes, metal semiconductor contact.
d) Integrated circuit resistors, capacitors, packaging.
e) Characteristic of integrated circuit components, Microelectronic circuit layout.

Reference Books:

1. Richard C. Jaeger “Microelectronic circuit design” International Education.
2. Jacob Millman “Microelectronics” Tata McGraw-Hill Education.

Multimedia Systems
COURSE OUTLINE

Multimedia Systems	**MMS**	
Course Title	Short Title	Course Code

Course Description:
This course emphasizes on Multimedia Data & Interactions, Compression & Decompression, Video, Audio, Sound, Storage Requirements.

Lecture	Hours / Week	No .of Weeks	Total Hours	Semester Credits
	03	**14**	**42**	**03**

COURSE CONTENT

Teaching scheme:
Lectures: 3 hrs/week

Examination scheme:
End Semester Examination (ESE): 80Marks
Paper Duration (ESE): 03 Hours
Internal Seasonal Exam (ISE): 20 Marks

UNIT I Introduction: **No of Lect. – 7, Marks: 16**

a) What is multimedia, Properties of multimedia systems: Independency, computer support, communication systems, Global structure,
b) Multimedia system Architecture:- IMA, workstation ,
c) network architecture Evolving Technologies, Applications of multimedia

UNIT II Multimedia data and interactions: **No of Lect. – 7, Marks: 16**

Data Streams:-Elements of multimedia systems, Objects of multimedia systems, Types: Traditional Vs Continuous,

a) Medium**:** perception, representation, presentation, storage, transmission, information exchange
b) Multimedia communication system Model:- Interpersonal communication, Interactive application over internet, Entertainment and application Requirements : User, network Architectural Issues
c) Multimedia communication subsystems :- Application subsystem, Transport subsystem, QoS and resource management, basic concepts establishing and closing multimedia call ,Managing resources during multimedia transmission

UNIT III Compression & Decompression: No of Lect. – 7, Marks: 16

Introduction to digitization principle -text, image, audio, video, File formats. RTF, TIFF,RIFF,

a) Need , types of data compression , Binary (Text) compression scheme, Pack bit encoding (RLE), CCITT group 3 1D,3 21D and 4 2D compression,
b) Color Image, PEG methodology, JPEG 2000 standard, Performance comparison of JPEG and JPEG2000

UNIT IV Video, Audio/Sound: No of Lect. – 12, Marks: 16

Introduction to digital video: Types. Chroma sub sampling, CCIR, HDTV Computer Video format,

a) Video compression: Based on motion compression Motion vector search technique: Sequential, 2D logarithmic, Hierarchal search,
b) Standards used- H.261, Comparison of MPEG and H.264, MPEG 1,2,4,7 and File formats. DVI
c) Basic sound concepts :Computer representation of sound, Audio formats- MIDI,WAV
d) Music: MIDI concepts, MIDI Devices, MIDI Messages, MIDI SMPTE timing standard MIDI Software: Speech, Speech Generation, Speech Analysis, Speech Transmission
e) Audio Compression: ADPCM in speech coding, MPEG audio

UNIT V Storage Requirements: No of Lect. – 7, Marks: 16

a) Basic technology: Video Disk: Audio data rate. SNR wrt VCD player , CD player, DVD, Juke box,
b) Peripherals and databases required for multimedia Input devices :- Electronic pen, Scanner, digital camera , Output devices :- Printers (Inkjet, laser) , plotters
c) Multimedia database system :Characteristics, Data structures Operations, Models : Object oriented, relational databases

References:

1) Multimedia: Computing, Communications and Applications, Steinmetz Ralf and Nahrstedt Klara, Pearson Education
2) Multimedia System design, Prabhat K. Andheigh, Kiran Thakrar
3) Multimedia Systems, Koegel Buford, Pearson Education
4) Fundamentals of Multimedia, Ze-Nian Li, Mark.S.Drew
5) Multimedia Communication Systems: Techniques, standards and networks, K.R.Rao, D.Milovanovic

ADVANCE POWER ELECTRONICS
COURSE OUTLINE

ADVANCED POWER ELECTRONICS	**APE**	
Course Title	Short Title	Course Code

Course Description:

This course includes power semiconductor-based devices such as GTO, IGBT and MOSFET. This course is designed to introduce to the students to the basic principles and applications of power semiconductor devices. This course emphasizes on Introduction to Gate and base drive circuit, Snubber circuit.

Lecture	Hours / Week	No .of Weeks	Total Hours	Semester Credits
	03	14	42	03

Prerequisite Course(s) : Electrical Machine.

COURSE CONTENT

Teaching scheme:
Lectures: 3 hrs

Examination scheme:
End Semester Examination (ESE): 80Marks
Paper Duration (03Hrs)
Internal Seasonal Exam (ISE) : 20 Marks

UNIT I –Power Devices: **Lectures 9, Marks 16**

GTO – basic structure, V - I characteristics, turn on and turn off operation, switching characteristics, inclusion of snubber and drive circuits. Turn on and turn off transients, minimum on and off state times, maximum controllable anode current, .over current protection.
IGBT - basic structure , V – I characteristics , device operation, blocking state and on state operation, latching in IGBT, causes and avoidance of latch ups, switching characteristics, turn on and turn off transients.
MOSFET - basic structure, V - I characteristics, inversion layers and field effect gate control of drain current , switching characteristics, switching waveforms , voltage break down , on state conduction losses

UNIT II – Gate and base drive circuit: **Lectures 8, Marks 16**

preliminary design considerations, dc coupled drive circuits with unipolar output, with bipolar output, optocoupler drive circuits, transformer isolated drive circuits providing both signal and power, cascade drive circuit for normally on power devices, Thyristor drive circuits - gate current pulse requirements gate pulse amplifiers, commutation circuit power

device protection in drive circuit, over current protection, blanking times for bridge circuit, “smart” drive circuits for snuberless switching; circuit layout consideration, minimizing stray inductance in drive circuit - shielding and partitioning of drive circuit, reduction of stray inductance in bus bars, current measurement, capacitor selection aluminum electrolytic capacitors, metalized polypropylene capacitors and ceramic capacitors.

UNIT III – Snubber circuit **Lectures 8, Marks 16**

Function and types, diode snubber, capacitive snubber, effect of adding a snubber resistance, implementation, snubber circuit for thyristors, need for snubber with transistors- turn-off snubber; over voltage snubber, turn on snubber, snubber for bridge circuit configurations, GTO snubber considerations, component temp control and heat sinks: control of semiconductor device temperature, heat transfer by conduction, thermal resistance; heat sinks; heat transfer by radiation and convection; heat sink ambient calculation.

UNIT IV Resonant Converters **Lectures 9, Marks 16**

Zero voltage and / or zero current switching, switch mode inductive current switching, classification of resonant converters, Undamped series resonant circuit capacitor parallel load circuit, frequency characteristics, load resonant converters SLR, PLR Operation, steady state characteristics and control, current source parallel resonant dc-ac inverter for induction heating, class – E resonant converter, ZCS and ZVS Resonant switch converters.

UNIT V – **Lectures 8, Marks16**

Power supply and other applicators / Residential and Industrial application : High frequency fluorescent lighting, Induction heating, Electric welding, High voltage dc transmission, Twelve pulse line frequency converters, Reactive power drawn by converters, rectifier mode of operation, Inverter mode of operation, control of HVDC converters, Harmonic filter and power factor correction, capacitors static VAR compensators, Thyristor controlled inductor / Capacitor, converters with minimum energy storage elements, optimizing the utility interface with power electronic systems, generation of current harmonics, harmonics and power factor, harmonic standards and recommended practices, need for improved utility interface improved single phase utility interface, passive circuits, Active shaping of the input line current.

References:

1) Ned Mohan, T. M. Undeland and W. P. Robbins- Power Electronics, converters ,Applications, 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.

ANTENNA THEORY
COURSE OUTLINE

Course Description:

This course is a continuation to the first course on Electromagnetic Engineering. This includes antenna fundamentals, the different types of antenna and their operation.

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

Prerequisite course(s): Electromagnetic engineering.

COURSE CONTENT

Teaching scheme:
Lectures: 3 hrs /week

Examination scheme:
End Semester Exam(ESE): 80
Paper Duration 3 Hours
Internal Sessional Exam (ISE): 20

UNIT – I: Lectures 09, Marks 16

ANTENNA FUNDAMENTALS
Radiation intensity, Directive gain, Directivity, Power gain beam width Band width Gain and radiation resistance of current element Half wave dipole and folded dipole Reciprocity principle Effective length and effective area Relation between gain, effective length and radiation resistance. Loop Antennas - Normal mode and axial mode operation. Antenna Arrays, Uniform linear array Method of pattern multiplication Binomial array End-fire array.

UNIT-II: Lectures 09, Marks 16

Wave Propagation
Fundamental equations for free space propagation, Friis transmission equation. Attenuation over reflecting surface, effect of earth's curvature. Ground, sky & space wave propagations. Structure of atmosphere. Characteristics of ionized regions. Effects of earth's magnetic field. Virtual height, MUF, Skip distance. Ionospheric abnormalities. Multi-hop propagation. Space link geometry. Characteristics of Wireless Channel: Fading, Multipath delay spread, Coherence Bandwidth, and Coherence Time.

UNIT-III: Lectures 08, Marks 16

Reflector antennas
Parabolic reflector, paraboloid reflector, aperture Pattern of large circular apertures with uniform illumination, off axis operation of paraboloid reflectors , Cassegrain feed system. Slot antenna, horn antenna.

UNIT-IV: **Lectures 08, Marks 16**

TRAVELLING WAVE (WIDEBAND) ANTENNAS

Helical antenna, Normal axial mode helix. Rhombic antenna- Design, Yagi-Uda antenna (numericals), Log periodic antenna. Spiral antennas. Radiation mode and from an elemental area of a plane wave (Huygen's source).

UNIT – V: **Lectures 08, Marks 16**

aperture – Beam width and effective area – Reflector type of antennas (dish antennas). dielectric lens and metal plane lens antennas – Luxemberg lens – Spherical waves and biconical antenna. Micro strip antenna – it's application, design of antenna. Rectangular patch antenna- geometry, parameters.

Reference books:

1. Jordan E. C. and Balmain, —Electro Magnetic Waves and Radiating Systems||, PHI, 1968, Reprint 2003
2. Collins R. E., —Antennas and Radio Propagation||, TMH, 1987.
3. C. A. Balanis, Harper Antenna Theory||, 2nd Edition, John Wiley & Sons, 2003.
4. Stutzman and Thiele, "Antenna Theory and Design", 2ndEd, John Wiley and Sons Inc.
5.Kraus,"Antennas", McGrawHill, TMH, 3"Edition, 2003

WIRELESS COMMUNICATION

COURSE OUTLINE

Course Description:

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

Prerequisite course(s): Communication System-I, Communication System-II.

COURSE CONTENT

Teaching scheme:
Lectures: 3 hrs /week

Examination scheme:
End Semester Exam(ESE): 80
Paper Duration (3 Hours)
Internal Sessional Exam (ISE): 20

UNIT – I: **Lectures 09, Marks 16**

a) Different types of communication systems.
b) Wired Vs wireless communication systems.
c) Different types of wireless systems.
d) Requirements in wireless communication.
e) Wireless network architecture and classification. WBAN,WPAN, WLAN,WMAN,WWAN
f) Wireless communication problems.

UNIT-II: **Lectures 09, Marks 16**

a) Wireless network topology.
b) Cellular topology: Concept, Hierarchy.
c) Cell fundamentals- Reuse of frequency, Handoff.
d) Signal to interference ratio calculation.
e) Capacity expansion- cell splitting, cell sectoring, channel allocation methods. (Fixed channel, channel borrowing, dynamic channel)
f) Trunking and Grade of service.

UNIT-III: **Lectures 09, Marks 16**

a) Wideband modulation techniques- SSM, PN sequence.
b) DS-SS, FH-SS, OFDM, Time Hopping.
c) Diversity techniques and types- Space, frequency, Time.
d) Multiple access techniques- TDMA,FDMA,CDMA,SDMA.

UNIT-IV: **Lectures 08, Marks 16**

a) Broadcast networks: Introduction, Digital audio broadcasting, Digital radio mondiale(DRM), HD radio technology, Digital video broadcasting(DVB), DTH.
b) GSM system, GPRS, EDGE, WLL, UMTS.

UNIT – V: **Lectures 07, Marks 16**

a) Introduction to Bluetooth, Wi-Max standard, Wireless sensor network, ultra wideband technology, IEEE 802.15.4 and Zigbee.
b) 4G Technologies: Multicarrier modulation, smart antenna technologies, OFDM-MIMO systems, software defined radio and cognitive radio, applications of 4G.

Reference books:

1) Upena Dalal, "Wireless communication", Oxford Higher Education.
2) Kaveh Pahlavon, "Principles of wireless network," LPE Pearson.
3) Dr.Sunil Kumar S.Manui, "Wireless and mobile network concepts and protocols," Wiley India.
4) Vijay Garg, "Wireless communication and networking," Elsevier.
5) P.Mathu, "Wireless Communication" EEE-PHI.

Text Books:

6) T.S.Rappaport,"Wireless communication principle and practice,"2 e, Pearson publication.

Robotics

COURSE OUTLINE

Robotics	**Robotics**	
Course Title	Short Title	Course Code

Course Description:

This course familiarizes students with the concepts and techniques in robot manipulator control and in hardware components for automation like Programmable Logic Controllers and also confident enough to evaluate, choose and incorporate robots and PLC in engineering systems.

Lecture	Hours / Week	No. Of Weeks	Total Hours	Semester Credits
	3	**14**	**42**	**3**

Prerequisite Course(s): Matrix Algebra Fundamentals of Image Processing Fundamentals of Controllers.

COURSE CONTENT

Teaching scheme:
Lectures: 3 hrs/week

Examination scheme:
End Semester Examination (ESE): 80Marks
Paper Duration (ESE): 03 Hours
Internal Sessional Exam (ISE): 20 Marks

UNIT I: Introduction And Direct Kinematics: Lectures: 8, Marks: 16

Automation and Robots, Classification, Application, Specifications, Notations. Dot and cross products, Co-ordinate frames, Rotations, Homogeneous Coordinates, Link co-ordinates, Arm equation ((Three axis, Four axis, and Five axis robots)

UNIT II: Inverse Kinematics & Workspace Analysis: Lectures: 08, Marks: 16

General properties of solutions, Tool configuration, Inverse Kinematics of Three axis, Four axis and Five axis robots Workspace analysis of Four axis and Five axis robots, Work envelope, Workspace fixtures.

UNIT III: Trajectory Planning and Task Planning: Lectures: 09, Marks: 16

Trajectory planning, Pick and place operations, Continuous path motion, Interpolated motion, Straight-line motion. Task level programming, Uncertainty, Configuration space,

Gross motion planning, Grasp planning, Fine-motion Planning, Simulation of Planar motion, Source and goal scenes, Task planner simulation.

UNIT IV: Robot Vision: **Lectures: 09, Marks: 16**

Image representation, Template matching, Polyhedral objects, Shape analysis, Segmentation, Iterative processing, Perspective transformation, Structured Illumination.

Unit-V: Programmable Logic Controller: **Lectures: 08, Marks: 16**

Discrete-State Process Control, Relay Controllers background, hardwired control system definition, Ladder Diagram Elements and examples, Relay Sequencers, advantages of Programmable Logic Controller (PLC), Evolutions of PLCs, Block diagram of PLC system. symbols used. relays and PLC Software Functions, logic functions . OR, AND, Comparator, Counters review, PLC Design, PLC Operation, Programming of PLCs. different methods. Ladder STL and CSF, ladder programming of simple system like traffic light controller, conveyers, list of various PLCs available.

References:

1. Staughard, Robotics and AI, Prentice Hall of India
2. Grover, Wiess, Nagel, Oderey, .Industrial Robotics., McGraw Hill
3. Walfram Stdder, Robotics and Mechatronics,
4. Niku, Introduction to Robotics, Pearson Education
5. Klafter, Chmielewski, Negin, Robot Engineering, Prentice Hall of India
6. Mittal, Nagrath, Robotics and Control, Tata McGraw Hill publications
7. George L Balten Jr., Programmable Controllers , Tata McGraw Hill Publications
8. Robert Shilling, Fundamentals of Robotics-Analysis and control, Prentice Hall of India
9. Fu, Gonzales and Lee, Robotics, McGraw Hill
10. J.J, Craig, Introduction to Robotics, Pearson Education
11. Curtis D. Johnson, Process Control Instrumentation Technology, PHI Publication, Eighth Edition

LIGHT WAVE COMMUNICATION LAB

LAB COURSE OUTLINE

Light Wave Communication Lab **LWCS**

Course Title Short Title Course Code

Course Description:

In this laboratory course emphasis is on the hand on implementation and testing of various parameters of optical fiber communication.

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

ICA: Internal Continuous Assessment-25 ESE: End Semester Examination – 25(PR)

LAB COURSE CONTENTS

(Note: Minimum eight experiments to be perform)

1. Electrical (I-V) characteristics of different types of LED/LD.
2. Photometric characteristics of LED/LD. (Polar plot, Intensity measurement)
3. Numerical Aperture measurement for single or multimode, graded/step index fiber.
4. Attenuation measurement for optical fiber.
5. Fiber optic A/D transmitter/receiver parameter measurement.
6. Spectral characteristics of LED/LD.
7. Spectral response of optical fiber.
8. Multiplexing in fiber optic system.
9. Various faults measurement in fiber optic system.
10. Measurement of pulse spreading.
11. Design optical fiber link (optical power budget) for following requirements (mention requirements) Loss limited length for given margin, maximum bit rate, dispersion limited length etc.

All experiments must be performed using practical trainer kit (except no. 11) only.

Guidelines for ICA:

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

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Process Control System Lab

LAB COURSE OUTLINE

Process Control System	**PCS**	
Course Title	Short Title	Course Code

Course Description:

In this lab course, the emphasis is on demonstrating & learning the actual control systems with their applications for temperature, pressure and to learn other control system components.

Laboratory	**Hours per Week**	**No. of Weeks**	**Total Hours**	**Semester Credits**
	2	**14**	**28**	**1**

ICA: Internal Continuous Assessment-25 ESE: End Semester Examination – 25 (PR)

LAB COURSE CONTENT

(Minimum **EIGHT** practical's are to be performed)

List of Practicals:

1.Study of voltage to frequency and frequency to voltage converter.
2. To plot characteristics of different control valves and calculation of Cv.
3. To study Temperature control system using PID controller
4. To study Pressure control system using PID controller
5. To study Heat Exchanger
6. To study the Pneumatic Actuator
7. To study Hydraulic Actuator
8. To study the calibration of RTD & Thermocouple
9. To Study SCADA system.

Guidelines for ICA:

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

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

EMBEDDED SYSTEMS LAB
COURSE OUTLINE

Embedded Systems	**ES**	
Course Title	Short Title	Course Code

Course Description:

In this Course emphasis is on ARM 7 embedded C programming

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	2	**10**	**20**	**1**

ICA: Internal Continuous Assessment-25 ESE: End Semester Examination – 25(PR)

LAB COURSE CONTENT

List of Practicals:

1. Interfacing of LED with ARM7
2. Interfacing of LCD with ARM7.
3. Interfacing of key with ARM7
4. Interfacing of seven segment display
5Interfacing of matrix keyboard with ARM7
6. Interfacing of Stepper motor with ARM7
7. Interfacing of RF communication with ARM7
8.Program to implement AT commands and interface of GSM modem with ARM7
9. Implementation of uCOS II services
10. Implementation of semaphore

Note:

1. Minimum **EIGHT** practical's are to be performed

Guidelines for ICA:

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

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Digital Image Processing Lab
COURSE OUTLINE

Digital Image Processing	**DIP**	
Course Title	Short Title	Course Code

Course Description:

In this Course emphasis is on basic of Image Processing.

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	2	10	20	1

ICA: Internal Continuous Assessment-25 ESE: End Semester Examination – 25(PR)

LAB COURSE CONTENT

List of Practical:

1. Study of different file formats e.g. BMP, TIFF and extraction of attributes of BMP.
2. Study of statistical properties- mean, standard deviation, profile, variance and Histogram plotting.
3. Histogram equalization and modification of the image.
4. Gray level transformations such as contrast stretching, negative, power law transformation etc.
5. Spatial Domain filtering- smoothing and sharpening filters.
6. DCT / IDCT of given image.
7. Edge detection using Sobel, Prewitt and Roberts operators.
8. Converting color image to B / W image and vice versa
9. Creating noisy image and filtering using MATLAB

Guidelines for ICA:

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

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical

MICROELECTRONICS LAB

COURSE OUTLINE

Microelectronics	**ME**	
Course Title	Short Title	Course Code

Course Description:

In this Course emphasis is on circuit performance evaluations using hand calculations and simulations.

Laboratory	**Hours/Week**	**No. Of Weeks**	**Total Hours**	**Semester Credits**
	2	**10**	**20**	**1**

ICA: Internal Continuous Assessment-25 ESE: End Semester Examination – 25(PR)

LAB COURSE CONTENT

List of Practicals

1. To simulate and analyze i-v characteristics of p-n junction diode.
2. To simulate and analyze voltage regulator using zener diode.
3. To simulate and analyze Half wave and full wave rectifiers.
4. To simulate and analyze wave shaping circuits.
5. To simulate and analyze i-v characteristics of Bipolar transistor.
6. To simulate and analyze biasing of Bipolar transistor.
7. To simulate and analyze i-v characteristics of Field Effect transistor.
8. To simulate and analyze biasing of Field Effect transistor.
9. To simulate and analyze CMOS digital circuits.
10. To simulate and analyze combinational and sequential logic gates.

NOTE: Any 8 Experiments should be performed from the list of above Experiments.

Guidelines for ICA:

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

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Multimedia Systems Lab

COURSE OUTLINE

Multimedia Systems	**MMS**	
Course Title	Short Title	Course Code

Course Description:

In this Course emphasis is on Multimedia software.

Laboratory	Hours/Week	No. Of Weeks	Total Hours	Semester Credits
	2	**10**	**20**	**1**

ICA: Internal Continuous Assessment-25 ESE: End Semester Examination – 25(PR)

LAB COURSE CONTENT

List of Practicals:

1. Study of MAYA software
2. Study of FLASH software
3. Creating a banner
4. Creating a ghost (unshaped) 2D object
5. Create animation using experiment 3,4
6. Add sound to above experiment (with play button)
7. Create moving objects (using experiment 5)
8. Create a game using action script
9. Create a flash based presentation (4/5 frames) with UI controls
10. Study of VLC player, its setting, streaming and non streaming techniques.

NOTE: Any 8 Experiments should be performed from the list of above Experiments.

Guidelines for ICA:

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

Guide lines for ESE:

ESE will be based on practical assignment submitted by the student in the form of journal. In ESE the student may be asked to perform any one practical out of 8. Evaluation will be based on paper work and performance in the practical.

Industrial Lecture

COURSE CONTENT

Industrial Lecture
Course Title Short Title Course Code

Course Description:
The gap between industry's needs and the academic community's aspirations appears to be considerably large. There exists a strong feeling, at least in the academic circles, that unless technology driven initiatives find a surer place in the industrial sector in this country, the academia-industry interaction is likely to remain confined to developmental activities with limited exploratory or research-based content As institutes committed primarily to creation and growth of technological knowledge, technical institutes have an important role to play in the industrial sector of the country's economy. This fact by way of encouraging mechanisms to foster interaction between the academia and industry. Typically, academic interest in the multidimensionality of a problem leads to a tendency to explore a variety of options to arrive at a solution. This industrial lecture develops ability of student for expectations of the industrialists from the fresh engineers.

	Hours per Week	No. Of Weeks	Total Hours	Semester Credits
Lecture	**1**	**15**	**15**	**2**

COURSE CONTENT

Semester-VIII **Examination Scheme**
Total Semester Credits: 02
Internal Continuous Assessment (ICA): 50 Marks

1. There is a need to create avenues for a close academia and industry interaction through all the phases of technology development, starting from conceptualization down to commercialization.
2. List of renowned persons from industry shall be prepared by the committee appointed by Head of the department. After approval from the Principal, Minimum five Industrial lectures in alternate week shall be arranged, which shall be delivered by the experts/Officials from Industries/Govt. organizations/ Private Sectors/Public Sectors / R&D Labs covering the various aspects.

3. Topics of Industrial Lectures shall be Technical in nature and should not be the specific contents from the curriculum.
4. Students shall submit the report based on minimum five lectures giving summary of the lecture delivered.
5. The summary should contain brief resume of the expert, brief information of his organization and brief summary of the lecture in bullet point form.

Guide lines for ICA : Assessment of the Industrial Lecture for award of ICA marks shall be done jointly by departmental committee as per attendance in industrial lecture, report submitted by student and overall performance in semester as per the guidelines given in **Table- D**

Table-D

SN	Name of Student	Attendance (05 Marks per Lecture)	Dept of Understanding (03 Marks per Lecture)	Report Writing	Total
		25	**15**	**10**	**50**

Project-II

Project-II
Course Title Short Title Course Code

Course Description:
The course explores the knowledge of design, experiment and analysis of data. The course develops ability to work on multidisciplinary teams, Identify, formulate, and solve engineering problems in view of economic, environmental and societal context.

Laboratory	Hours per Week	No. of Weeks	Total Hours	Semester Credits
	4	15	60	6

COURSE CONTENT

Semester-VIII

Examination Scheme
Total Semester Credits: 06
Internal Continuous Assessment (ICA): 75 Marks
End Semester Examination (ESE):75 Marks
Total:150Marks

1. Project-I work decided in VII semester shall be continued as Project-II
2. Students should complete implementation of ideas given in synopsis/Abstract, so that project work should be completed before end of semester.
3. Project-II may involve fabrication, design , experimentation , data analysis within realistic constraints such as economic, environmental, social, ethical, health and safety, manufacturability, and sustainability. The stage also includes testing , possible results and report writing
4. Each students project group is required to maintain log book for documenting various activities of Project-II and submit group project report at the end of Semester-VIII in the form of Hard bound.
    a. *Title*
    b. *Abstract*
    c. *Introduction*
    d. *Problem identification and project objectives*
    e. *Literature survey*
    f. *Case study/Analysis/Design Methodology*

g. Project design and implementation details
h. Result and conclusion
i. Future scope
j. references.

Guide lines for ICA : ICA shall be based on continuous evaluation of students performance throughout semester in project-II and report submitted by the students project group in the form Hard bound. Assessment of the project-II for award of ICA marks shall be done jointly by the guide and departmental committee as per the guidelines given in **Table-D.**

Guide lines for ESE:-
In ESE the student may be asked for demonstration and questions on Project. Evaluation will be based on answers given by students in oral examination.

Assessment of Project-II

Name of the Project: _____
Name of the Guide: _____

Table-D

		Assessment by Guide (50 Marks)				Assessment by Committee (25 Marks)		
SN	**Name of Student**	**Attendance , Participa-tion and team work**	**Material procurement / assembling/Designing/Programming**	**Case study/ Execution**	**Project Report**	**Dept of Understan-ding**	**Presentation**	**Total**
Marks		**10**	**15**	**15**	**10**	**10**	**15**	**75**