NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Syllabus for

Final Year Electronics Engineering

Faculty of Engineering and Technology

TEACHER AND EXAMINER'S MANUAL

SEMESTER – VII

W.E.F 2015 – 2016

Digital Signal Processing

Teacher, Paper setter and Examiner should follow the guidelines as given below.

Unit – I

Teacher should facilitate learning of basics of discrete time signals and systems.

1		**Discrete Time Signals and Systems:**	Lecture required	Reference No.
	a	Introduction: Basic elements of Digital Signal Processing Systems, Advantage and Limitation of Digital over Analog Signal Processing	1	1
	b	Concept of frequency in continuous & discrete time signals, Sampling of Analog signals, Aliasing, Sampling Theorem.	1	1
	c	Discrete Time Signals: Representation, Standard Discrete Time Signals, Classification of Discrete Time Signals, Simple Manipulations of Discrete Time Signals	2	1
	d	Discrete Time Systems: Block diagram representation of Discrete Time Systems, Classification of Discrete Time Systems	2	1
	e	Response of LTI systems to arbitrary inputs: Convolution Sum, properties of convolution sum	2	1
	f	LTI systems characterized by constant coefficients difference equations, Solution of linear constant coefficient Difference Equation, Cross Correlation and Auto Correlation of two sequences	2	1

UNIT- II

Teacher should facilitate learning of z transform and its applications.

2		**Z Transform and its application to the analysis of LTI system:**	Lecture required	Reference No
	a	Definition of Z transform, Meaning of ROC, Properties of ROC, Properties of Z transform	2	1
	b	Inverse Z transform: Power series method, Partial fraction method	1	1
	c	Pole Zero plot of the function, Pole location and time domain behavior for causal sequences	1	1
	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	2	1
	e	The one sided Z transform, Response of the system with nonzero initial conditions, Solution of difference Equations using Z transform	2	1

Unit – III

Teacher should facilitate learning of frequency analysis of discrete time signals and systems.

3		**Frequency Analysis of Discrete Time Signals and Systems**	Lecture required	Reference No
	a	The Fourier Transform of Discrete time Aperiodic Signals and Energy Density Spectrum, Frequency response of Discrete Time Systems, Magnitude and Phase response	2	1
	b	Frequency Domain Sampling: The Discrete Fourier Transform, Inverse Discrete Fourier Transform	2	1
	c	The DFT as Linear Transformation, Twiddle factor, Properties of the DFT	1	1
	d	Use of DFT in linear filtering, Frequency analysis of signals using DFT, Magnitude spectrum of signals	1	1
	e	FFT Algorithms: Radix2 DIT and DIF algorithms to compute DFT and IDFT	2	1

UNIT- IV

Teacher should facilitate learning of design of digital filters.

4		**Design and Realization of Digital Filters:**	Lecture required	Reference No
	a	Basic Network Elements, FIR Filter Structure: Direct form, Cascade form, Frequency sampling and Linear phase structure	2	1
	b	FIR Filter Design: Fourier series method, Windowing method, Gibbs phenomenon, Frequency sampling method of design	2	1
	c	IIR Filter structure: Direct form, Cascade form, Parallel form and Transposed structures	2	1
	d	IIR Filter Design: Impulse invariance, Bilinear Transformation method of design	2	1

UNIT- V

Teacher should facilitate learning of Multirate Digital signal processing and Overview of TMS 320C6X DSPs.

5	Multirate Digital signal processing and Overview of TMS 320C6X DSPs:		Lecture required	Reference No
	a	Introduction, Decimation by factor D, Interpolation by factor I, Sampling rate conversion by a rational factor I/D	4	1
	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.	4	3

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

Teacher, Paper setter and Examiner should follow the guidelines as given below.

Unit - I

1	**Line frequency phase controlled converter**	Lecture required	Reference No.
	SCR – construction, two transistor analogy , operation	1	1,3,4
	V - I characteristics, turn on and turn off methods	1	1,3,4
	1-Φ bridge semi converter R load idealized circuit, dc side voltage and performance parameters	1	2,5,6
	1-Φ bridge semi converter R-L load idealized circuit, dc side voltage and performance parameters	1	2,5,6
	1-Φ bridge full converter R load idealized circuit, dc side voltage and performance parameters	1	2,5,6
	1-Φ bridge full converter R-L load idealized circuit, dc side voltage and performance parameters	1	2,5,6
	effect of Ls, inverter mode of operation	1	2,5,6
	3-Φ bridge semi and full converter R load idealized circuit, dc side voltage and performance parameters	1	2,5,6
	3-Φ bridge semi and full converter R-L load idealized circuit, dc side voltage and performance parameters	1	2,5,6
	Effect of Ls, inverter mode of operation.	1	2,5,6

Unit – II

2	**Dc-Dc switch mode converters**	Lecture required	Reference No.
	Block diagram of step down converter, continuous and discontinuous mode of operation	1	1,2
	boundary between continuous and discontinuous conduction	1	1,2
	Block diagram of step up converter, continuous and discontinuous mode of operation	1	1,2
	boundary between continuous and discontinuous conduction	1	1,2
	full bridge dc –dc converter with bipolar PWM	1	1,2
	full bridge dc –dc converter with unipolar PWM		1,2
	Voltage switching, ripple in output voltage	1	1,2
	SMPS – overview, block diagram.	1	1,2

Unit – III

3	Switch mode dc to ac inventers	Lecture required	Reference No.
	Parallel inverters	1	1,2
	basic concept of switch mode inverters	1	1,2
	PWM switching scheme	1	1,2
	square wave switching scheme		1,2
	single phase inverters- half bridge inverters	1	1,2
	single phase inverters- full bridge inverters	1	1,2
	three phase inverters,	1	1,2
	UPS – Black diagram and description	1	1,2

Unit – IV

4	Introduction to motor drive	Lecture required	Reference No.
	Control of motor drives, block diagram description	1	1,6
	criteria for selecting drive components	1	1,6
	match between the motor and the load	1	1,6
	match between the motor and the power electronic converter	1	1,6
	DC motor drives: block diagram description of DC motor drive	1	1,6
	power electronic converter, ripple in armature current	1	1,6
	line frequency controlled converters	1	1,6
	effect of discontinuous armature current	1	1,6

Unit V

5	Induction motor drives	Lecture required	Reference No.
	Constant speed drive, adjustable speed drive	1	1,6
	speed control for varying stator frequency and voltage, torque speed characteristics	1	1,6
	startup considerations, voltage boost required at low frequency	1	1,6
	motor capability - below and above rated speed	1	1,6
	braking in induction motors, torque pulsation	1	1,6
	variable frequency converter classification	1	1,6
	speed control circuit and current limiting circuit	1	1,6
	reduced voltage starting (“ soft start “) of motor	1	1,6

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

Teacher, Paper setter and Examiner should follow the guidelines as given below.

Unit - I

1	**INTRODUCTION TO MEASUREMENT SYSTEM & ITS ELEMENTS**	Lecture required	Reference No.
	Definition and Classification of Transducers	1	1,2
	Characteristics and Choice of Transducers.	1	1,2
	Measurement system: Purpose, structure and elements. Generalized performance characteristics	1	1,2
	static characteristics of measurement system elements,	1	1,2
	Dynamic characteristics of measurement systems.	1	1,2
	Temperature Transducers: Resistance temperature detector, Thermistor, Thermocouple.	2	1,2
	Pressure Transducers: Manometers, Electrical pressure transducers.	1	1,2

Unit – II

2	**ELECTRICAL TRANSDUCERS**	Lecture required	Reference No.
	Digital transducers, Potentiometer, strain Gauge	1	2,6
	types of strain gauge, Derivation of gauge factor,	1	2,6
	Variable capacitive transducers: Capacitance principles	1	2,6
	capacitive displacement transducers, capacitive level transducers.	2	2,6
	Variable inductive transducers: Linear variable differential transformer.	1	2,6
	True Rms Responding Voltmeter	1	6
	Introduction to wheatstone's & kelvin's bridge.	1	6

Unit – III

3	**MECHANICAL TRANSDUCERS & MEASUREMENT TECHNIQUES**	Lecture required	Reference No.
	Essential Principles of fluid mechanics,	1	2,3
	measurement of velocity at a point in a fluid: piton-static tube	2	2,3
	measurement of volume flow rate: differential pressure	1	2,3
	mechanical and vortex flow meters.	1	2,3
	Level measurement: Level formulae; level sensing devices,	1	2,3
	direct level sensing, indirect level sensing	1	2,3
	level sensing devices application considerations.	1	

Unit-IV

4	**Oscilloscope**	Lecture required	Reference No.
	Introduction, principle, feature	1	6
	block diagram, CRTdiagram	1	6
	CRT basics, PDA Tubes, dual beam CRO,	2	6
	dual trace CRO, VHF oscilloscope	1	6
	VLF signal scope (analog storage and digital storage scopes),	2	6
	probes for CRO , fiber optic CRT	1	6

Unit V

5	**Data Acquisition and Transmission systems**	Lecture required	Reference No.
	Automatic bridge transmitter, interfacing transducer to electronic control	1	6
	objectives of DAS, single channel and multi channel DAS	1	6
	ATS, computer based testing of audio amplifier, radio receiver, data loggers .	2	6
	Computer aided measurements, Introduction to Data transmission systems	1	6
	advantages and disadvantages of digital over analog transmission.	1	6
	Introduction to MODEMs. Data communication System using Modems	2	6

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

Teacher, Paper setter and Examiner should follow the guidelines as given below.

Unit – I

Teacher should facilitate learning of basics of Discrete Time Signals and Systems.

1	Discrete Time Signals and Systems		Lecture required	Reference No.
	A	Introduction: Basic elements of Digital Signal Processing Systems, Advantage and Limitation of Digital over Analog Signal Processing	2	1
	B	Concept of frequency in continuous & discrete time signals, Sampling of Analog signals, Aliasing, Sampling Theorem	2	1
	C	Discrete Time Signals: Representation, Standard Discrete Time Signals, Classification of Discrete Time Signals, Simple Manipulations of Discrete Time Signals	2	1
	D	Discrete Time Systems: Block diagram representation of Discrete Time Systems, Classification of Discrete Time Systems	2	1
	E	Response of LTI systems to arbitrary inputs: Convolution Sum, properties of convolution sum	2	1

UNIT- II

Teacher should facilitate learning of basic of Z-Transforms and Discrete Fourier Transform.

2	Z-Transforms and Discrete Fourier Transform		Lecture required	Reference No
	A	Z- Transform and Properties of Z- Transform	2	1
	B	Inverse Z- Transform	2	1
	c	Discrete Fourier Transform and Inverse Discrete Fourier Transform	2	1
	d	FFT Algorithms : DIT and DIF	2	1

Unit – III

Teacher should facilitate learning of Digital Image Processing and Image Transform.

3	Digital Image Processing and Image Transform		Lecture required	Reference No
	A	Introduction, Brightness Adoption and Discrimination, Image Sampling and Quantization, Basic Pixel Relationship	2	2
	B	Image Transforms: Fourier Transform, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Slant Transform, Optimum Transform : Karhunen- Loeve Transform, Introduction to Wavelet Transform	8	2

UNIT- IV

Teacher should facilitate learning of Image Enhancement.

4	Image Enhancement		Lecture required	Reference No
	A	Image Enhancement in the Spatial domain : Spatial domain point operation and Neighbourhood Operation	2	2
	B	Gray-Level Transformation, Median Filter , Bit plane slicing , Histogram Processing, Arithmetic and Logic Operation	2	2
	C	Spatial filtering: Introduction, smoothing and sharpening filters	2	2
	D	Image Enhancement in the frequency domain: Frequency-domain filters: smoothing and sharpening filters, homomorphic filtering	2	2

UNIT- V

Teacher should facilitate learning of Image Restoration and Denoising.

5	Image Restoration and Denoising		Lecture required	Reference No
	A	Introduction, Image Degradation, Types of Image Blur	2	2
	b	Classification of image restoration Techniques , Image Restoration Model , Linear and non-Linear image restoration Technique	2	2
	C	Blind deconvolution, Image Denoising, Classification of Noise in Image, Trimmed Average Filter, Applications of Image restoration.	2	2

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

Teacher, Paper setter and Examiner should follow the guidelines as given below.

Unit – I

Teacher should facilitate learning of basics of HDL.

1	Introduction:		Lecture required	Reference No.
	a	History of HDL: Brief history of VHDL, brief history of Verilog.	1	1
	b	Structure of VHDL and Verilog module: Structure of Entity /Module, Port.	1	1
	c	Operators in VHDL and Verilog: Logical, Relational, Arithmetic Shift and Rotate Operators.	2	1
	d	Data types of VHDL and Verilog.	2	1
	e	Types of Architecture use in VHDL and Verilog: Behavioral Description, Structural Description, Switch level Description, Data-flow Description, Mixed-type Description	2	1

UNIT- II

Teacher should facilitate learning of basic of VHDL programming.

2	Data-flow Description and Behavioral Description (VHDL):		Lecture required	Reference No
	a	Structure of Data-flow Description: Signal declaration and Signal assignment statements.	1	1
	b	Concurrent Signal assignment statements, Constant declaration and assignment statements, assigning a delay to the signal assignment statements.	1	1
	c	VHDL Programming using Data-flow description and Common errors occurring during programming.	1	1
	d	Structure of Behavioral Description for VHDL	1	1
	e	VHDL variable assignment statement	1	1
	f	Sequential statements for VHDL: IF statement, Signal and variable (only for VHDL) assignment, Case statement, Loop statement	2	1
	g	VHDL Programming using Behavioral description and Common errors occur during programming.	1	1

Unit – III

Teacher should facilitate learning of NMOS and PMOS Switch.

3	Structural Description and Switch Level Description (VHDL)		Lecture required	Reference No
	a	Organization of structural design, Binding	1	1
	b	State machines, Generic (VHDL).	1	1
	c	VHDL Programming using Structural description and Common errors occurring during programming.	1	1
	d	Single NMOS and PMOS switches: NMOS and PMOS switch description for VHDL	1	1
	e	Serial and parallel combinations of switches	1	1
	f	Switch level description of: Primitive gates, Combinational logics, Sequential circuits	1	1
	g	CMOS switch. Bidirectional switches.	1	1
	h	Procedures (VHDL) and Functions (VHDL)	1	1

UNIT- IV

Teacher should facilitate learning of all types of description.

4	Mixed type Description (VHDL):		Lecture required	Reference No
	a	Defined data types in VHDL, VHDL Packages.	2	1
	b	Implementation of Arrays, and Mixed-type Description Programming.	2	1
	c	Advanced HDL Description (VHDL): File processing in VHDL.VHDL record types.	2	1
	d	Programming of File processing for VHDL.	2	1

UNIT- V

Teacher should facilitate learning of software Xilinx.

5	Introduction of Xilinx		Lecture required	Reference No
	a	Architecture of Xilinx 9500 series CPLD.	2	2
	b	Architecture of Xilinx Spartan 4000 series FPGA.	2	2
	c	Synthesis basics, Synthesis information from entity, mapping process in the hardware domain.	4	1

References:

1. Nazeib M. Botros - HDL programming Fundamentals VHDL and Verilog , Thomson.
2. Stephen Brown and Zvonko Vranesic - Fundamentals of Digital Logic with VHDL design, McGraw Hill
3. John F. Wakerly - Digital Design, Principles and Practices, Pentice Hall Publication.
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

Teacher, Paper setter and Examiner should follow the following guidelines.

Unit – I
Teacher should facilitate learning of Waveform Coding and Baseband Shaping for Data Transmission.

1		**Digital Baseband Modulation Techniques and Waveform Coding Techniques**	**Lecture required**	**Ref No**
	a	Wave form coding, Sampling of signals	01	02
	b	Natural and flat top samples	01	02
	c	PCM, Uniform and Non uniform quantization	02	02
	d	Baseband modulation, Noise consideration in PCM systems	01	02
	e	DPCM, DM,ADM	02	02
	f	LPC	01	02

Unit - II
Teacher should facilitate learning of Signals & noise.

2		**Baseband Demodulation Detection Techniques**	**Lecture required**	**Ref No**
	a	Signals & noise, Data formats	02	01
	b	Synchronization and multiplexing	02	01
	c	Interference, Equalization	01	01
	d	Detection of binary signals in presence of Gaussian noise	01	01
	e	Matched and optimum filters	02	01

Unit - III

Teacher should facilitate learning of Spectra, Random process.

3	Random Process		Lecture required	Ref No
	a	Introduction, Mathematical definition of a random process,	01	01 & 03
	b	Stationary processes mean, correlation &covariance function,	01	01
	c	Ergodic processes, transmission of a random process through a LTI filter,	02	01
	d	Power spectral density, Gaussian process,	01	01
	e	Noise, narrow band noise, representation of narrowband noise in terms of in phase & quadrature components,	02	01
	f	Representation of narrowband noise.	01	01

Unit – IV

Teacher should facilitate learning of fundamental of Digital Modulation Techniques.

4	Digital Band pass Modulation Technique		Lecture required	Ref No
	a	Digital band pass modulation techniques,	01	02
	b	Coherent detection, on coherent detection, complex envelope.	01	02
	c	pseudo noise sequences, a notion of spread spectrum,	01	02
	d	direct sequence spread spectrum with coherent BPSK,	02	02
	e	Spread Spectrum Techniques,	01	02
	f	Signal space dimensionality & processing gain,	01	02
	g	Frequency hop spread spectrum	01	02

Unit – V:

Teacher should facilitate learning of Information and Detection Theory.

5		Information Theory of coding techniques:	Lecture required	Ref No
	a	Measure of information, Entropy, rate, Shannon's Encoding theorem,	02	03
	b	Mutual information, variable length encoding (Shannon Fano and Hoffman coding)	01	03
	c	Shannon's theorem on channel capacity.	01	03
	d	Shannon. Hartley equation for Gaussian channel	01	03
	e	Error detection and correction: FEC and ARQ systems	01	02
	f	Error correcting and detecting, Block codes, syndrome decoding	02	02

Reference Books:

1. S. Haykin, "Digital Communications", Wiley Student Edition, ISBN 9971-51-205-X.
2. Carlson, P. Crilly and J. Rutledge, "Communication Systems- An Introduction to Signals and Noise in Electrical Communication", McGraw Hill International Edition, 4th Edition, ISBN 0-07-121028-8.
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

Unit - I

1	**INTRODUCTION TO NEURAL NETWORK**	Lecture required	Reference No.
	Introduction to neural network, basic concept of neural network, Human brain, Biological neuron,	1	1
	McCulloch-Pitts neuron model, model of an artificial neuron	1	2,1
	Neural network architectures: single layer feedforward network, multilayer feedforward network, recurrent network,	1	1
	Characteristics of neural networks, learning methods, learning rules	1	1
	History of neural network research, some application domains	1	1

Unit – II

2	**BACKPROPAGATION NETWORKS**	Lecture required	Reference No.
	Architecture of backpropagation network: The perceptron model, the solution	1	1
	single layer artificialneural network, modelofmultilayer preceptron	1	1
	Backpropagation learning: Input layer, hidden layer, output layer computation, calculation of error, training of neural network	1	1
	method of steepest descent	1	1
	effect of learning rate, adding a momentum turn,	1	1
	backpropagation algorithm Effect of tuning parameters of the backpropagation network	1	1
	Selection of various parameters in backpropagation network: number of hidden nodes, momentum coefficient α, sigmoidal gain λ , local minima, learning coefficient $\acute{\eta}$,	1	1
	Variation of standard backpropagation algorithm:Decremental iteration procedure,Adaptive backpropogation,Genetic algorithum based backpropogation	1	1
	Quick prop training, Augmented BP network, sequential learning approach for single hidden layer neural networks	1	1
	Research Directions: New topologies, better learning algorithm, better training strategies, hardware implementation, conscious networks.	1	1

Unit – III

3	**BIDIRECTIONAL ASSOCIATIVE MEMORY**	Lecture required	Reference No.
	Memory architecture, Association encoding and decoding	1	2
	stability considerations, memory examples and performance evaluation	1	2
	improved coding of memory	1	2
	multidirectional Associative memory	1	2
	Linear programming modelling network,	1	2
	character recognition networks: multilayer feed forward network for printed, character classification	2	2
	handwritten digit recognition, recognition based on handwritten character skeletonization,	1	1
	recognition of handwritten character based on error, Neural networks control applications: overview of control system concepts	1	2
	process identification	1	2
	basic nondynamic learning control architectures,	1	2
	Network for kinematics: overview of robot kinematics problems	1	2
	solution of the forward and reverse kinematics problems	1	2
	comparison of architectures.	1	2

Unit-IV

4	**FUZZY SET THEORY**	Lecture required	Reference No.
	Fuzzy versus Crisp, crisp sets:	1	2
	operation on Crisp sets, properties of Crisp Sets	1	2
	Partition and covering, Fuzzy sets	1	2
	Membership function, Basic fuzzy set operation	2	2
	Crisp Relation: Cartesian Product,	1	2
	other crisp relation ,operation on relations,	1	2
	, Fuzzy relations: Fuzzy Cartesian product, operations on fuzzy relations	1	2
	Crisp logic,laws of propositional logic	1	2
	inference in propositional logic, Predicate logic:	1	2
	Interpretation of predicate logic formula, inference in predicate logic	1	2
	Fuzzy logic: fuzzy quantifiers,	1	2
	fuzzy inference, Fuzzy rule based system,	1	2
	Defuzzification Methods, Air conditioner controller application.	1	2

Unit V

5	**GENETIC ALGORITHMS and HYBRID SYSTEMS**	Lecture required	Reference No.
	history, basic concepts, creation of offsprings	1	1
	working principle, encoding: binary,	1	1
	hexadecimal, permutation, value, tree encoding.	1	1
	Hybrid systems: Sequential, Auxiliary, Embedded hybrid systems, Neuro-fuzzy,		
	Genetic algorithm based backpropagation network, Fuzzy backpropagation network, simplified fuzzy ARTMAP, fuzzy associative memory	1	1

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

Teacher, Paper setter and Examiner should follow the guidelines as given below.

Unit - I

Teacher should facilitate learning introduction to object oriented programming concepts.

1	**Object oriented programming concepts**		Lecture required	Reference No
	a	Object oriented methodology, basic concepts of object oriented programming language,	1	1,2,3
	b	Features, advantages and Applications of OOPS	1	1,2,3
	c	Introduction to C++: what is c++?, a simple c++ program, structure of c++ program, creating the source file, compiling and linking	1	1,2,3
	d	tokens,keywords,identifiers and constants,basic data types,user defined data types,storageclasses,derived data types. symbolic constants,type compatibility	2	1,2,3
	E	declaration of variables,dynamic initialization of variables,referencevariables,operators in c++,manipulators	2	1,2,3
	f	expressions and their types,special assignment expressions,implicitconverson,operatoroverloading,operatorprecedence,control structure	2	1,2,3

UNIT- II

Teacher should facilitate learningfunctions,functionoverloading,object and classes

2	**Fuctions ,Object and Classes**		Lecture required	Reference No
	a	Introduction,the main function,function prototyping, Call by reference, Return by reference	1	1,2,3
	b	Function overloading and default arguments, Inline function, Static class members, Friend functions.	1	1,2,3
	c	Specifying a class,defining member function,ac++ program with class,makinga outside function inline,nesting of member function,private member function	2	1,2,3
	d	array within class,memory allocation for objects,static data members,static member functions,array of objects,objects as a function arguments	2	1,2,3
	e	friendlyfunction,reternungobjects,const member functions,pointer to members,local classes.	2	1,2,3

Unit – III

Teacher should facilitate learning of constuctors,destructors,operator overloading and type conversion

3	**Constructors ,destructor ,operator overloading and type converson**		Lecture required	Reference No
	a	Introduction,constructors,parameterizedconstructors,multiple constructors in a class, constructors With default arguments	1	1,2,3
	b	Dyanmic initialization of objects,copyconstructors,dynamic constructors, constructing two dimentional arrays, constobjects,destructors.	2	1,2,3
	c	Defining operator overloading,overloading binary operators,overloading unary operators	2	1,2,3
	d	overloading binary operators with friends,manipulations of strings using operators	2	1,2,3
	e	rules for overloading opeartors, type conversons	1	1,2,3

UNIT- IV

Teacher should facilitate learning of inheritance,pointer,virtual functions and polymorphism

4	**Inheritance, Pointer, Virtual functions and polymorphism**		Lecture required	Reference No
	a	Introduction,defining derived classes,singleInheritance,making a private member inheritable	2	1,2,3
	b	multilevel Inheritance,multiple Inheritance	1	1,2,3
	c	hierarchicalInheritance,hybrid Inheritance	2	1,2,3
	d	virtual base classes,abstractclasses,constructors in derived classes,memberclasses:nesting of classes.	2	1,2,3
	e	Introduction,pointers,pointer to objects,thispointer,pointers to derived classes	1	1,2,3,
	f	virtual functions,pure virtual functions,virtual constructors and destructors	1	1,2,3

UNIT- V

Teacher should facilitate learning of console I/O operations,working with files,templates and exception handling.

5	**Managing console I/O operations**		Lecture required	Reference No
	a	C++ streams,c++ stream classes	1	1,2,3
	b	unformatted I/O operations,formatted console I/O operations	2	1,2,3
	c	Managing output with manipulators	2	1,2,3
	d	Working with files,	1	1,2,3
	e	templates and expection handling	2	1,2,3

R**eferences:**

1 Robert Lafore - 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

Teacher, Paper setter and Examiner should follow the following guidelines.

Unit - I

Teacher should facilitate learning of Introduction to Computer Network, Switching and Data link control concepts.

1	Introduction to Computer Network, Switching and Data link control		Lecture required	Reference No
	a	OSI model, network models, Arpanet, NSFNET, Internet. Network Topologies: LAN, WAN, MAN	02	1&2
	b	**Switching.** : ISDN: Narrowband ISDN: ISDN services, System architecture, Interface. Broadband ISDN: Virtual switching, Circuit switching	02	1&2
	c	**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	04	1&2

Unit - II

Teacher should facilitate learning Data Link layer, Internetworking concepts.

2	Data Link layer , Internetworking		Lecture required	Reference No
	a	**Data Link layer**: Data Link layer design issues, Elementary data link layer protocols, Sliding window protocols, Data Link Layer switching	02	1&2
	b	Bridges 802.x to 802.y, Local inter-networking, Spanning tree and remote bridges. Review of network connecting devices and multiple access protocols.	02	1&2
	c	**Internetworking**: The network layer in the internet: IP Protocol, IP Address, Subnet, and Internet control Protocols, Internet multicasting, IPv4: Datagram, Fragmentation, Checksum, Options, IPv6: Advantages, Packets Formats Extension Headers. Address Resolution Protocol (ARP), RARP, DHCP.	04	1&2

Unit – III

Teacher should facilitate learning of Introduction to Computer Network, Switching and Data link control concepts.

3	Network layer, routing algorithm		Lecture required	Reference No
	a	**Network layer:** Design Issue: Internal Organization, Virtual circuit and Datagram subnets	02	1&2
	b	**Routing algorithm:** Shortest Path Routing, Flooding, Hierarchical Routing, Broad Cast Routing, Routing for mobile host, Multicast routing, Congestion Control	02	1&2
	c	**Algorithms**: Congestion Prevention Policies, Control in virtual Circuits Subnets, choke Packets, Load Shedding.	04	1&2

Unit – IV

Teacher should facilitate learning of Transport layer, ATM concepts.

4	Introduction to Computer Network, Switching and Data link control		Lecture required	Reference No
	a	**Transport layer:** The Internet Transport Protocols: TCP: Services, Features, Segments, Connections	04	1&2
	b	Flow control, Error Control, congestion Control, UDP. QOS (Quality of Services)	02	1&2
	c	ATM AAL layer protocol.	02	1&2

Unit – V

Teacher should facilitate learning of Application layer, WAN and Ad Hoc Wireless Networks concepts.

5		Introduction to Computer Network, Switching and Data link control	Lecture required	Reference No
	a	**Application layer:** Network security, Domain Name system, SNMP, Electronic Mail; the World Wide Web, Multi media.	02	1&2
	b	Introduction to WAN packet switching technologies such as ATM and Frame relay.	02	1&3

References:

1.	1. Andrew S Tanebaum - Computer Networks, 4th Ed. PHI/ Pearson education.
2.	Behrouz A Forouzan - Data Communication and Networks, 3rd Ed. TMH.
3.	Matthew S. Gast, "802.11 Wireless Networks: The Definitive Guide", O'Reilly, Second Edition.

Digital Signal Processing Lab

Teacher should facilitate learning of following lab experiments:

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

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

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

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

Teacher should facilitate learning of following lab experiments:

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

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)

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:

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VLSI Design Lab

Teacher should facilitate learning of following lab experiments:

	Title of Experiments	Lab hours Required
1	Write VHDL code to realize all the logic gates.	2
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	2
3	Write a VHDL code to describe the functions of a Full Adder Using following modeling styles.	2
4	Develop the VHDL codes for the following flip-flops, SR, D, JK, T.	2
5	Design and Implement 4 bit binary counters.	2
6	Design and Implement ALU.	2
7	Design and Implement Shift Register.	2
8	Design and Implement Stepper motor.	2

References:

1. Nazeib M. Botros - HDL programming Fundamentals VHDL and Verilog , Thomson.
2. Stephen Brown and Zvonko Vranesic - Fundamentals of Digital Logic with VHDL design, McGraw Hill
3. John F. Wakerly - Digital Design, Principles and Practices, Pentice Hall Publication.
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

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:

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DIGITAL COMMUNICATION SYSTEMS LAB

Teacher should facilitate learning following lab experiments:

Group-A		Lab hours required
1	To generate and detect PCM signal.	02
2	To understand waveform of Delta Modulation and Demodulation.	02
3	To understand waveform of Adaptive Delta Modulation and Demodulation.	02
4	To generation and detection of FSK i/p and o/p waveform.	02
5	To generation and detection of PSK i/p and o/p waveform.	02
6	To generation and detection of ASK i/p and o/p waveform.	02
	Group-B	Lab hours required
7	To generation and detection of QPSK/QAM i/p and o/p waveform.	02
8	To Study different line codes (NRZ, RZ, polar RZ, bipolar(AMI),Manchester)	02
9	Noise analysis using any software tool (use of any discrete distribution).Find response by changing parameters.(use any open source software)	02
10	Noise analysis using any software tool (use of any continuous distribution).Find response by changing parameters.(use any open source software)	02
11	Execute Shannon fanon algorithm by using any software tool.(use any open source software)	02
12	Execute Huffman coding by using any software tool.(use any open source software)	02

Note: Minimum FOUR Experiments from each group.

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, ISBN 0-07-121028-8.
3. H. Taub, D. Schilling, "Principles of Communication Systems", Tata McGraw Hill, 2nd Edition, 2005, ISBN 0-07-462456-3.

Guidelines for ICA:

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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

(Note: Two practicals should belong to neural network and two should be from fuzzy logic and practical of hybrid system should be made compulsory)

Sr. No.	Name of the Experiments	Lab Hours
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
2.	To fit a multilayer preceptron network on the data generated by Radial basis function by trying different network sizes and different teaching algorithm.	2
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.	2
4.	To demonstrate back propogation network to approximate first order basal function.	2
5.	To simulate hybrid systems for different initial conditions.	2
6.	To simulate program for basic operations on fuzzy sets.	2
7.	To simulate program to find reflexivity, symmetry of matrices .	2
8.	To simulate program to find Transitivity, equivalence of matrices .	2

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.

Guidelines for ICA:

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Object Oriented Programming Lab

Teacher should facilitate learning following lab experiments

Sr. No.	Name of the Experiments	Lab Hours
1.	Write a program for a simple class and object	2
2.	Write a program for parameterized constructor	2
3.	Write a program for overloading constructors	2
4.	Write a program to find the area of rectangle, triangle and sphere using function overloading	2
5.	Write a program to overload binary operator using member function	2
6.	Write a program for arrays of pointers to objects	2
7.	Write a program using single inheritance, multiple inheritance and hierarchical inheritance	2
8.	Write a program for virtual base classes	2
9.	Write a program to format output using manipulators	2
10.	Write a program using class template	2
11.	Write a program for the copy constructor	2
12.	Write a program for run time polymorphism using virtual functions	2

Note:

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

References:

1. Robert Lafore- 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.

Guidelines for ICA:

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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.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Syllabus for
Final Year Electronics Engineering
Faculty of Engineering and Technology

TEACHER AND EXAMINER'S MANUAL

SEMESTER – VIII

W.E.F 2015 – 2016

LIGHT WAVE COMMUNICATION

Teacher, paper setter and examiner should follow the guidelines as given below.

UNIT – I

Teacher should facilitate learning basics of block diagram and explanation of optical fiber communication system along with advantages and disadvantages. It includes Ray theory types of rays. It also includes types of fiber and components of fiber.

1	**Introduction to Optical Fiber Communication system**		Lectures required	Reference no.
	a)	Block diagram of optical fiber communication system, advantages and disadvantages of optical fiber communication system.	02	1
	b)	Ray theory of transmission and concept of acceptance angle, numerical aperture (mathematical treatment) Meridonial and skew ray theory of optical propagation.	02	1
	c)	Cut of wavelength, group velocity, group delay.	01	1
	d)	Types of fibers according to materials, refractive index profile, mode of propagation. Different propagation modes: calculation of 'v' number.	02	1,2
	e)	Components of fiber system: splices, connectors, couplers, directional coupler.	02	3,1

UNIT – II

Teacher should facilitate learning basics of light sources and detectors their characteristics. It includes performance parameters of detectors.

2	**Light sources and detectors**		Lectures required	Reference no.
	a)	Sources: Characteristics of light sources, Types: LED, Laser diode. Surface emitter LED, Edge emitter LED. Operating characteristics, modulation bandwidth:3 db electrical and optical bandwidth, radiation patterns (Surface emitter and Edge emitter LEDs).	02	3,1
	b)	Laser diode: working principle, characteristics, radiation pattern.	02	2
	c)	Detectors: characteristics of light detector, types: p-n photo diode, pin photo diode, APD.	01	2
	d)	Detector parameters: quantum efficiency, responsivity, speed of response(numerical based on these)	02	2

UNIT – III

Teacher should facilitate Intensity modulation, Analog and digital modulation. It includes Analog and digital optical fiber links.

3		**Modulation: noncoherent /coherent**	Lectures required	Reference no.
	a)	Intensity modulation: LED modulations and circuits (analog and digital)	02	1
	b)	Analog modulation formats, AM/IM sub carrier modulation, FM/IM sub carrier modulation,	02	1
	c)	Digital modulation formats: PCM, RZ, NRZ, Manchester, Bipolar codes. Other digital formats: PPM, PDM, OOK, FSK, PSK.	02	1,3
	d)	Detection: (coherent detection/heterodyne/homodyne detection) : optical heterodyne receivers, optic frequency division multiplexing(OFDM).	02	1
	e)	Analog and digital optical fiber links.	01	2

UNIT – IV

Teacher should facilitate losses in fibers, fiber optic system design. It also include optical fiber measurements.

4		**Losses in fibers**	Lectures required	Reference no.
	a)	Absorption, scattering and bending losses.	01	1,3
	b)	Signal distortion in optical fiber, material dispersion, waveguide dispersion, intermodal dispersion.	02	1
	c)	Fiber optics system design: optical power budgeting, rise-time budget.	02	2
	d)	Optical fiber measurements: measurement of attenuation, dispersion, refractive index and field . Optical time domain reflectometry (OTDR)	03	1

UNIT – V

Teacher should facilitate Intensity modulation, Analog and digital modulation. It includes Analog and digital optical fiber links.

5		**Advanced systems and techniques**	Lectures required	Reference no.
	a)	Wavelength division multiplexing, DWDM	02	1.2
	b)	Optical amplifiers, optical filters, integrated optics .	02	2
	c)	Optical networks: SONET/SDH, photonic switching.	01	1
	d)	Applications of optical fiber for displacement, pressure, level, voltage and current measurement.	02	1

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

Teacher, Paper setter and Examiner should follow the guidelines as given below.

Unit - I

1	**INTRODUCTION TO PROCESS CONTROL**	Lecture required	Reference No.
	Process control principles, Block diagram of process control	1	2,4,5
	Process measurment,error detector, controller	1	2,5
	control element, feedback loop	1	2
	control system evaluation , Stability,Regulation	1	2
	Transient Regulation,Evaluatin criteria	1	2
	Time Response(First order response,second order response)	1	2
	Voltage to current & current to voltage converters, current to pressure converte	1	2
	Pneumatic, hydraulic, electric actuators.	1	2,4

Unit – II

2	**PROCESS CONTROL ELEMENTS AND CONTROLLER PRINCIPLES**	Lecture required	Reference No.
	Mechanical and Electrical elements	1	2
	fluid valve, control valve principles	1	2,,45
	control valve types & their characteristics	1	2,4,5
	control valve sizing,Process characteristics	1	2
	Control system parameters,	1	2
	Discontinuous controller modes	1	2,
	two position modes, neutral zone, multi position mode	1	2
	floating control mode, etc.	1	2

Unit – III

3	CONTINUOUS CONTROL MODES	Lecture required	Reference No.
	Introduction of continuous control modes,	1	2
	Propotional Control Mode,Integral Control Mode	1	2
	Derivative Controm Mode, Composite Control Modes	1	2,4,5
	PI,PD control mode	1	2,4,5
	PID control mode	1	2,4,5
	electronic controllers	1	2
	Pneumatic controllers,	1	2
	Tuning of Propotional controllers,Tuning of PI controllers	1	4
	Tuning of PD controllers, Tuning of PID controllers.	1	4

Unit-IV

4	COMPLEX CONTROL SCHEMES	Lecture required	Reference No.
	Feedback and feed forward control system, cascade control system	2	1,2,4,5
	predictive control system, multivariable control system	1	1,4
	adaptive control system, Intelligent control systems,	1	1,4
	Simple instrumentation schemes for Heat exchanger	1	1,5
	Instrumentation for Boiler	1	1
	Instrumentation for compressor, distillation column	1	1,5
	reactors, dryer, evaporator.	2	1,5

Unit V

5	COMPUTER AIDED PROCESS CONTROL	Lecture required	Reference No.
	Role of computers in process control,Elements of computer aided process control system	1	4,2
	classification of computer aided process control system, Batch or Sequential control processes	1	4
	continuous control processes,	1	4
	Supervisory computer control processes,direct digital control processes	1	4
	Computer aided process control architecture,centralized computer control systems	1	4
	distributed computer control systems	1	4
	Hierarchical computer control system.	1	4
	Data acquisition system	1	2

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

Teacher, Paper setter and Examiner should follow the guidelines as given below.

Unit - I

Teacher should facilitate learning introduction to embedded systems

1	**Embedded System Introduction**		Lecture required	Reference No
	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	2	2
	B	Processor technology, gerenral purpose processors-software, single purpose processors-hardware	2	2
	C	Application specific processors, IC technology, Full-Custom/VLSI, Semicustom ASIC(gate array and standard cell),PLD, Trends	2	2
	D	DesignTechnology,compilations/Synthesis,Libraries/IP,Test,verifications,more productivity improvers, Trends, Trade-offs, Design productivity gap	3	2

UNIT- II

Teacher should facilitate learning ARM architecture and ARM and Thumb instruction set

2	**The ARM System Architecture**		Lecture required	Reference No
	a	The ARM RISC machine,Architectural inheritance.	1	1,2
	b	The ARM programming model,ARM development tools	1	1,2
	c	3-stage pipeline ARM organization,5-stage pipeline ARM organization	2	1,2
	d	ARM instruction set	2	1,2
	e	Thumb instruction set	1	1,2
	f	The advanced microcontroller bus architecture(AMBA)	1	

Unit – III

Teacher should facilitate learning of timer,counter and basic Embedded C programs

3	**Peripherals and Programming**		Lecture required	Reference No
	a	Introduction,Timers,Counters,watchdog timers	2	1,2
	b	UART,pulse width modulators,LCD controllers	2	1,2
	c	Keypad controllers,stepper motor controllers,analog to digital convertors,real time clocks,	2	1,2
	d	Basic embedded C programs for on-chip peripherals	2	1,2

UNIT- IV

Teacher should facilitate learning of communication protocols

4	**Interfacing**		Lecture required	Reference
	a	Introduction,communicationbasics:basicterminology,basic protocol concepts microprocessor interfacing:I/O addressing,port and bus-based I/O,memory mapped I/O and standard I/O,interrupts	2	1,2
	b	Direct Memory Access Arbitration: Priority arbiter,Daisy-Chain Arbitration,network-oriented arbitration methods	2	1,2
	c	Multilevel bus architecture,advanced communication principles,parallelcommunication,serialcommunication,wireles scommunication,layering,error detection and correction	2	1,2
	d	serial protocol,I2C,CAN,FireWire,USB, parallel protocols,PCIbus,ARMbus,Wirelessprotocols,IrDA,Bluetooth,IE EE 802.11	2	1,2,4

UNIT- V

Teacher should facilitate learning of RTOS,UCOS/II RTOS

5	**Real Time Systems**		Lecture required	Reference No
	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	2	3,4
	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,	2	3,4
	C	Semaphores, Deadlock, Synchronization, Event Flags, Intertask Communication, Message Mailboxes, Message Queues, Interrupts, Interrupt Response, Interrupt Recovery, Interrupt Latency, Response, and Recovery, ISR Processing Time, Non-Maskable Interrupts	3	3,4
	D	Memory Requirements, Advantages and Disadvantages of Real-Time Kernels	1	3,4
	E	Introduction to Ucos II RTOS, study of kernel structure of Ucos II, porting of RTOS	1	3,4

References:

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

Digital Image Processing

Teacher, Paper setter and Examiner should follow the guidelines as given below.

Unit – I

Teacher should facilitate learning of basics of Digital Image.

1		Introduction:	Lecture required	Reference No.
	A	Introduction, Examples of Fields that use Digital Image Processing	1	1, 2,3
	B	Fundamental Steps in Digital Image Processing, Components of Image Processing Systems	2	1,2,3
	C	Image Sensing and Acquisition, Image Sampling and Quantization, Representing Digital Images	2	1,2,3
	D	Spatial and Gray level Resolution, Basic pixel relationship, Distance Measures	2	1,2,3
	E	Statistical Properties: Histogram, Mean, Standard Deviation, Introduction to DCT, Walsh, Hadamard, and Wavelet Transform	2	1,2,3

UNIT- II

Teacher should facilitate learning of basic of digital filter.

2		Image Enhancement	Lecture required	Reference No
	A	Enhancement in Spatial Domain: Basic Gray Level Transformations, Histogram Processing	2	1,3
	B	Enhancements using arithmetic and logical operations, Basics of Spatial Filtering	2	1,3
	C	Smoothening and Sharpening Spatial filters	2	1,3
	D	Enhancement in Frequency Domain: Smoothening and Sharpening frequency Domain Filters	3	1,3

Unit – III
Teacher should facilitate learning of encoding-decoding.

3	Image Coding and Compression		Lecture required	Reference No.
	A	Image Coding Fundamentals, Image Compression Model, Error Free Compression, VLC	2	1,3
	B	Huffman, Arithmetic, RLC, Lossless Predictive Coding; Lossy-Compression	2	1,3
	C	Predictive Coding, Transform Coding, Discrete Cosine Transform	2	1,3
	D	Image Compression Standards, JPEG Baseline Coder Decoder	2	1,3

UNIT- IV
Teacher should facilitate learning of color and noise fundamentals.

4	Image Restoration and Color Image Processing		Lecture required	Reference No
	A	Image Degradation Model, Noise Models, and Restoration in Presence of Noise in spatial Domain.	2	1,3
	B	Linear Filtering, Inverse Filter, Wiener Filter, Constrained Least Square Restoration.	2	1,3
	C	Geometric Transformation, Spatial Transformation, and Grey Level Transformation	2	1,3
	D	Color Image Processing, Color Image Fundamentals, Color models, RGB to HIS and vice versa, Color Transforms, Smoothing and Sharpening	2	1,3

UNIT- V
Teacher should facilitate learning of basic of edge detection.

5	Image Segmentation		Lectures Required	Reference No.
	A	Image Segmentation: Point, line, Edge detection, Canny Edge Detection	2	1,3
	B	Second Order Derivative, Hough Transform, Thresholding, Region Based Segmentation	3	1,3
	C	Region Growing, Region Splitting and Merging, Image Representation	2	1,3

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

Teacher, paper setter and examiner should follow the guidelines as given below.

UNIT – I

Teacher should facilitate history of Electronics, Important concepts from circuit theory.

1		**Introduction to Electronics**	Lectures required	Reference no.
	a)	History of Electronics: from vacuum tubes to ultra-Large-Scale Integration, classification of Electronic signals, notational conventions.	02	1
	b)	Important concepts from circuit theory, frequency spectrum of Electronic signal, Amplifiers.	02	1
	c)	Solid state Electronic materials, drift currents in semiconductors, covalent bond model, mobility.	01	1
	d)	Resistivity of intrinsic silicon, impurities in semiconductors.	02	1
	e)	Electron and hole concentrations in doped semiconductors, Energy band model, Mobility and resistivity in doped semiconductors, diffusion and total current.	02	1

UNIT – II

Teacher should facilitate learning basics of The p-n junction diode, Diode characteristics. It also includes multiple diode circuits, rectifier circuits & wave shaping circuits.

2		**Solid-state diodes and diode circuits**	Lectures required	Reference no.
	a)	The p-n junction diode, the i-v characteristics of diode, the diode equation: mathematical model for diode.	01	1
	b)	Diode characteristics under reverse, zero and forward bias, diode temperature coefficient, diode breakdown under reverse bias.	02	1
	c)	p-n junction capacitance, Schottky barrier diode, diode circuit analysis, multiple diode circuits, analysis of diodes operating in breakdown region.	01	1
	d)	Half wave rectifier circuits, full wave rectifier circuits, full wave bridge rectiication, rectifier comparison and design tradeoffs.	02	1
	e)	dc to dc converters, wave shaping circuits, dynamic switching behavior of diode, photo diodes, solar cells and light emitting diodes.	01	1

UNIT – III

Teacher should facilitate Physical structure of Bipolar transistor, The equivalent circuit representations for transport models. It also includes biasing the BJT.

3		**Bipolar junction transistors.**	Lectures required	Reference no.
	a)	Physical structure of Bipolar transistor, the transport model for n-p-n transistor, the p-n-p transistor.	02	1
	b)	The equivalent circuit representations for transport models, The operating regions of bipolar transistor, the i-v characteristics of bipolar transistor.	03	1
	c)	Minority carrier transport in base region, simplified model for cut off region, for forward active region and for reverse active region.	02	1
	d)	Modeling operation in saturation region, the early effect and early voltage, biasing the BJT, tolerances in bias circuits.	02	1

UNIT – IV

Teacher should facilitate Transfer characteristics and depletion mode MOSFET, PMOS transistors, MOSFET circuit symbol and model summary & Biasing of MOSFET.

4		**Field effect transistors**	Lectures required	Reference no.
	a)	Characteristics of MOS capacitor, structure, qualitative i-v behavior and linear region characteristics of NMOS transistor.	01	2
	b)	Saturation of i-v characteristics, channel length modulation.	02	2
	c)	Transfer characteristics and depletion mode MOSFET, body effect or substrate sensitivity.	02	2
	d)	PMOS transistors, MOSFET circuit symbol and model summary.	01	2
	e)	Biasing of MOSFET, capacitances in MOS transistors, Junction Field Effect transistor(JFET).	02	2

UNIT – V

Teacher should facilitate Monolithic integrated circuit (Microelectronic) technology, BJT & FET fabrication, CMOS technology. Also includes IC resistors, capacitors & packaging.

5	**Integrated circuit fabrication**		Lectures required	Reference no.
	a)	Monolithic integrated circuit (Microelectronic) technology, the planar processes.	02	2
	b)	Bipolar transistor fabrication, fabrication of FETs.	01	2
	c)	CMOS technology, monolithic diodes, metal semiconductor contact.	01	2
	d)	Integrated circuit resistors, capacitors, packaging.	02	2
	e)	Characteristic of integrated circuit components, Microelectronic circuit layout.	01	2

Reference Books:

1. Richard C. Jaeger "Microelectronic circuit design" International Education.

2. Jacob Millman "Microelectronics" Tata McGraw-Hill Education.

Multimedia Systems

Teacher, Paper setter and Examiner should follow the guidelines as given below.

Unit – I

Teacher should facilitate learning of basics of Multimedia Systems.

1		Introduction:	Lecture required	Reference No.
	a	What is multimedia, Properties of multimedia systems: Independency, computer support, communication systems, Global structure,	3	1,2
	b	Multimedia system Architecture:- IMA, workstation ,	2	1,2
	c	network architecture Evolving Technologies, Applications of	2	1,2

Unit – II

Teacher should facilitate learning of Multimedia data and interaction.

2		Multimedia data and interactions:	Lecture required	Reference No.
	a	Data Streams:-Elements of multimedia systems, Objects of multimedia systems, Types: Traditional Vs Continuous,	1	1,2
	b	Medium**:** perception, representation, presentation, storage, transmission, information exchange	2	1,2
	c	Multimedia communication system Model:- Interpersonal communication, Interactive application over internet, Entertainment and application Requirements : User, network Architectural Issues	2	1,2
	d	Multimedia communication subsystems :- Application subsystem, Transport subsystem, QoS and resource management, basic concepts establishing and closing multimedia call ,Managing resources during multimedia transmission	2	1,2

Unit – III

Teacher should facilitate learning of Compression & Decompression.

3		Compression & Decompression:	Lecture required	Reference No.
	a	Introduction to digitization principle -text, image, audio, video, File formats. RTF, TIFF,RIFF,	2	4
	b	Need , types of data compression , Binary (Text) compression scheme, Pack bit encoding (RLE), CCITT group 3 1D,3 21D and 4 2D compression,	3	4
	c	Color Image, PEG methodology, JPEG 2000 standard, Performance comparison of JPEG and JPEG2000	2	4

Unit – IV

Teacher should facilitate learning of Video, Audio/Sound.

4		Video, Audio/Sound:	Lecture required	Reference No.
	a	Introduction to digital video: Types. Chromasub sampling, CCIR, HDTV Computer Video format,	2	3,4
	b	Video compression: Based on motion compression Motion vector search technique: Sequential, 2D logarithmic, Hierarchal search,	3	3,4
	c	Standards used- H.261, Comparison of MPEG and H.264, MPEG 1,2,4,7 and File formats. DVI	2	3,4
	d	Basic sound concepts :Computer representation of sound, Audio formats- MIDI,WAV	1	3,4
	e	Music: MIDI concepts, MIDI Devices, MIDI Messages, MIDI SMPTE timing standard MIDI Software: Speech, Speech Generation, Speech Analysis, Speech Transmission	2	3,4
	f	Audio Compression: ADPCM in speech coding, MPEG audio	2	3,4

Unit – V

Teacher should facilitate learning of Storage Requirements.

5		Storage Requirements:	Lecture required	Reference No.
	a	Basic technology: Video Disk: Audio data rate. SNR wrt VCD player , CD player, DVD, Juke box,	2	4,5
	b	Peripherals and databases required for multimedia Input devices :- Electronic pen, Scanner, digital camera , Output devices :- Printers (Inkjet, laser) , plotters	3	4,5
	c	Multimedia database system :Characteristics, Data structures Operations, Models : Object oriented, relational databases	2	4,5

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

Teacher, Paper setter and Examiner should follow the guidelines as given below.

Unit - I

1	**Power Devices**	Lecture required	Reference No.
	GTO – basic structure, V - I characteristics, turn on and turn off operation	1	1,2
	Switching characteristics, inclusion of snubber and drive circuits. Turn on and turn off transients	1	1,2
	Minimum on and off state times, maximum controllable anode current, .over current protection.	1	1
	IGBT - basic structure , V – I characteristics , device operation	1	1,2
	blocking state and on state operation, latching in IGBT,	1	1,2
	Causes and avoidance of latch ups, switching characteristics, turn on and turn off transients.	1	1
	MOSFET - basic structure, V - I characteristics, inversion layers	1	1,2
	field effect gate control of drain current , switching characteristics	1	1
	switching waveforms , voltage break down , on state conduction losses	1	1

Unit – II

2	**Gate and base drive circuit**	Lecture required	Reference No.
	Preliminary design considerations, dc coupled drive circuits with unipolar output, with bipolar output	2	1
	transformer isolated drive circuits providing both signal and power, cascade drive circuit for normally on power devices	2	1
	Thyristor drive circuits - gate current pulse requirements gate pulse amplifiers, commutation circuit power device protection in drive circuit	1	1
	blanking times for bridge circuit, “smart” drive circuits for snuberless switching	1	1
	circuit layout consideration ,minimizing stray inductance in drive circuit - shielding and partitioning	1	1

	of drive circuit, reduction of stray inductance in bus bars,		
	Current measurement, capacitor selection aluminum electrolytic capacitors, metalized polypropylene capacitors and ceramic capacitors.	1	1

Unit – III

3	**Snubber circuit**	Lecture required	Reference No.
	function and types, diode snubber	1	1,2
	capacitive Snubber, effect of adding a snubber resistance	1	1,2
	implementation, snubber circuit for thyristors, need for snubber with transistors- turn-off snubber	1	1,2
	over voltage snubber, turn on snubber	1	1,2
	snubber for bridge circuit configurations, GTO snubber considerations	1	1,2
	component temp control and heat sinks: control of semiconductor device temperature, heat transfer by conduction,	1	1,2
	thermal resistance; heat sinks; heat transfer by radiation and convection; heat sink ambient calculation	2	1,2

Unit – IV

4	**Resonant Converters**	Lecture required	Reference No.
	Zero voltage and / or zero current switching	1	1,3
	switch mode inductive current switching, classification of resonant converters, Undamped series resonant circuit – capacitor parallel load circuit	1	1,3
	frequency characteristics, load resonant converters – SLR, PLR – Operation, steady state characteristics and control	2	1,3
	current source parallel resonant dc-ac inverter for induction heating	1	1,3

	class – E	1	1,3
	Resonant converter, ZCS and ZVS Resonant switch converters.	2	1,3

Unit V

5	**Power supply and other applicators / Residential and Industrial application**	Lecture required	Reference No.
	High frequency fluorescent lighting, Induction heating	1	1
	Electric welding, High voltage dc transmission, Twelve pulse line frequency converters	2	1
	Reactive power drawn by converters, rectifier mode of operation, Inverter mode of operation	1	1
	Control of HVDC converters, Harmonic filter and power factor correction, capacitors static VAR compensators	1	1
	Thyristor controlled inductor / Capacitor, converters with minimum energy storage elements, optimizing the utility interface with power electronic systems	1	1
	Generation of current harmonics, harmonics and power factor, harmonic standards and recommended practices	1	1
	Need for improved utility interface improved single phase utility interface, passive circuits, Active shaping of the input line current	1	1

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.

ANTENNA THEORY

Teacher, paper setter and examiner should follow the guidelines as given below.

UNIT – I

Teacher should facilitate learning basics of Maxwell equations. It explains basic terms of antenna.

1	Unit I		Lectures required	Reference no.
	a)	Radiation intensity, Directive gain, Directivity, Power gain beam width Band width Gain and radiation resistance of current element.	01	4
	b)	Half wave dipole and folded dipole Reciprocity principle.	02	4,1,3
	c)	Effective length and effective area Relation between gain, effective length and radiation resistance.	01	4
	d)	Loop Antennas - Normal mode and axial mode operation.	01	2
	e)	Antenna Arrays-Uniform linear array Method of pattern multiplication	02	5
	f)	Binomial array End-fire array.	02	4

UNIT – II

Teacher should facilitate learning basics of propogation, its structure. It also explain fundamentals equations of free space. Characteristics of Wireless Channel.

2	Unit II		Lectures required	Reference no.
	a)	Fundamental equations for free space propagation Friis transmission equation	02	1
	b)	Attenuation over reflecting surface, effect of earth's curvature. Ground, sky & space wave propagations.	02	1,2
	c)	Structure of atmosphere. Characteristics of ionized regions. Effects of earth's magnetic field.	01	2
	d)	Virtual height, MUF, Skip distance. Ionospheric abnormalities.	01	2
	f)	Multi-hop propagation. Space link geometry.	01	2
	g)	Characteristics of Wireless Channel: Fading, Multipath delay spread, Coherence Bandwidth, and Coherence Time.	02	4,3

UNIT – III

Teacher should facilitate learning various types of antennas, it's radiation patterns, basic designs.

3		Unit III	Lectures Required	Reference no.
	a)	Parabolic reflector, paraboloid reflector	02	5
	b)	aperture Pattern of large circular apertures with uniform illumination.	01	1,2,5
	c)	off axis operation of paraboloid reflectors, Cassegrain feed system.	02	5
	d)	Slot antenna, horn antenna.	03	4

UNIT – IV

Teacher should facilitate learning travelling wave wideband antennas and Huygen's source.

4		Unit IV	Lectures required	Reference no.
	a)	Helical antenna- Normal axial mode helix	02	4
	b)	Rhombic antenna- Design, Yagi-Uda antenna (numiricals)	02	4,5
	c)	Log periodic antenna. Spiral antennas.	02	1,2
	d)	Radiation mode and from an elemental area of a plane wave (Huygen's source).	02	1

UNIT – V

Teacher should facilitate learning of reflector and a aperture antenna.

5		Unit V	Lectures required	Reference no.
	a)	aperture – Beam width and effective area – Reflector type of antennas (dish antennas)	03	2,5
	b)	dielectric lens and metal plane lens antennas – Luxemberg lens – Spherical waves and biconical antenna. Micro strip antenna- it's application, design of antenna	03	3,4,5
	c)	Rectangular patch antenna- geometry, parameters.	02	5

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

Teacher, paper setter and examiner should follow the guidelines as given below.

UNIT – I

Teacher should facilitate learning basics of different types of communication systems. It explains types of wireless communication system along with advantages and disadvantages. It also give difference between wired and wireless communication.

1	Unit I		Lectures required	Reference no.
	a)	Different types of communication systems.	02	1
	b)	Wired Vs wireless communication systems.	02	1
	c)	Different types of wireless systems.	01	6
	d)	Requirements in wireless communication.	01	5
	e)	Wireless network architecture and classification. WBAN, WPAN, WLAN, WMAN, WWAN.	02	3
	f)	Wireless communication problems.	02	3

UNIT – II

Teacher should facilitate learning basics of wireless network topology. It also explain cell fundamentals. Includes Capacity expansion-cell splitting, cell sectoring, channel allocation methods. (Fixed channel, channel borrowing, dynamic channel)

2	Unit II		Lectures required	Reference no.
	a)	Wireless network topology.	01	2
	b)	Cellular topology: Concept, Hierarchy.	01	2,6
	c)	Cell fundamentals- Reuse of frequency, Handoff.	01	2,6
	d)	Signal to interference ratio calculation.	01	2
	f)	Capacity expansion- cell splitting, cell sectoring, channel allocation methods. (Fixed channel, channel borrowing, dynamic channel)	02	2
	g)	Trunking and Grade of service.	01	6

UNIT – III

Teacher should facilitate wideband modulation techniques, diversity technique and types. Also explains multiple access techniques.

3	Unit III		Lectures Required	Reference no.
	a)	Wideband modulation techniques- SSM, PN sequence.	02	1
	b)	DS-SS, FH-SS, OFDM, Time Hopping.	02	2,6
	c)	Diversity techniques and types- Space, frequency, Time.	02	2,6
	d)	Multiple access techniques- TDMA, FDMA, CDMA, SDMA.	03	6

UNIT – IV

Teacher should facilitate concepts of broadcast networks-DAB,DRM,DVB & DTH. Also explains GSM system.

4	Unit IV		Lectures required	Reference no.
	a)	Broadcast networks: Introduction, Digital audio broadcasting, Digital radio mondiale, HD radio technology, Digital video broadcasting, DTH.	04	1
	b)	GSM system, GPRS, EDGE, WLL, UMTS.	04	1

UNIT – V

Teacher should facilitate introduction to Bluetooth and 4G technologies.

5	Unit V		Lectures required	Reference no.
	a)	Introduction to Bluetooth, Wimax std, Wireless sensor nrtwork, ultra wideband technology, IEEE 802.15.4 and Zigbee.	03	1
	b)	4G Technologies: Multicarrier modulation, smart antenna technologies, OFDM-MIMO systems, software defined radio and cognitive radio, applications of 4G.	04	4

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

Teacher, Paper setter and Examiner should follow the guidelines as given below.

Unit - I

1	**Introduction And Direct Kinematics**	Lecture required	Reference No.
	Automation and Robots, Classification	1	1,2
	Application, Specification	1	1
	Notations. Dot and cross products	2	1,2
	Co-ordinate frames, Rotations, Homogeneous Coordinates	2	2,3
	Link co-ordinates, Arm equation ((Three axis, Four axis, and Five axis robots)	2	1,2,4

Unit – II

2	**Inverse Kinematics & Workspace Analysis**	Lecture required	Refer ence No.
	General properties of solutions	2	2,3
	Tool configuration, Inverse Kinematics of Three axis	2	2,3
	Four axis and Five axis robots Workspace analysis of Four axis and Five axis robots	2	2
	Work envelope, Workspace fixtures.	2	2,3

Unit – III

3	**Trajectory Planning and Task Planning**	Lecture required	Reference No.
	Trajectory planning, Pick and place operations, Continuous path motion	2	2
	Interpolated motion, Straight-line motion. Task level programming	2	2,,45
	Uncertainty, Configuration space, Gross motion planning, Grasp planning	2	2,4,5
	Fine-motion Planning, Simulation of Planar motion	1	2,3
	Source and goal scenes, Task planner simulation.	1	2,4

Unit – IV

4	**Robot Vision**	Lecture required	Reference No.
	Image representation, Template matching	2	2,6,9
	Polyhedral objects, Shape analysis	2	2
	Segmentation, Iterative processing	3	2,4,5
	Perspective transformation, Structured Illumination	2	2,4,5,7

Unit V

5	**Programmable Logic Controller**	Lecture required	Reference No.
	Discrete-State Process Control, Relay Controllers background, hardwired control system definition, Ladder Diagram Elements and examples	2	4,2
	Relay Sequencers, advantages of Programmable Logic Controller (PLC),Evolutions of PLCs	1	4
	Block diagram of PLC system . symbols used. relays and PLC Software Functions, logic functions	1	3,4,11
	OR, AND, Comparator, Counters review, PLC Design, PLC Operation, Programming of PLCs . different methods	2	4,10
	ladder STL and CSF, ladder programming of simple system like traffic light controller	1	5,7,10
	conveyers, list of various PLCs available.	1	7,8,11

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

Teacher, Paper setter and Examiner should follow the guidelines as given below.

SN	Experiment Title	Lab hours required
1	Electrical (i-v) characteristics of different types of LED/LD.	02
2	Photometric characteristics of LED/LD. (Polar plot, Intensity measurement)	02
3	Numerical Aperture measurement for single or multimode, graded/step index fiber.	02
4	Attenuation measurement for optical fiber.	02
5	Fiber optic A/D transmitter/receiver parameter measurement.	02
6	Spectral characteristics of LED/LD.	02
7	Spectral response of optical fiber.	02
8	Multiplexing in fiber optic system.	02
9	Various faults measurement in fiber optic system.	02
10	Measurement of pulse spreading.	02
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.	02

Note: Lab file should consist of minimum eight experiments.

Reference Books:

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

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

Teacher should facilitate learning following lab experiments:

Sr. No.	Name of the Experiments	Lab Hours
1.	Study of Converters: V to F and F to V	2
2.	To plot characteristics of different control valves and calculation of Cv.	2
3.	To study Temperature control system using PID controller	2
4.	To study Pressure control system using PID controller	2
5.	To study Heat Exchanger	2
6.	To study the Pneumatic Actuator	2
7.	To study Hydraulic Actuator	2
8.	To study the calibration of RTD & Thermocouple	2
9.	To Study SCADA system.	2

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

Guide lines for ICA:

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

Guide lines for ESE:

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

Embedded Systems Lab

Teachers can modify the given list of practicals as per their convenience. Minimum 8 practicals are expected.

List of Practicals:

Exp. No.	Experiment Name	Lab Hours Required
1	Interfacing of LED with ARM7	2
2	Interfacing of LCD with ARM7	2
3	Interfacing of key with ARM7	2
4	Interfacing of seven segment display	2
5	Interfacing of matrix keyboard with ARM7	2
6	Interfacing of Stepper motor with ARM7	2
7	Interfacing of RF communication with ARM7	2
8	Program to implement AT commands and interface of GSM modem with ARM7	2
9	Implementation of uCOS II services	2
10	Implementation of semaphore	2

Note: Lab file should consist of minimum eight experiments.

Reference Books:

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

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

Teachers can modify the given list of practicals as per their convenience. Minimum 8 practicals are expected.

List of Practicals:

Exp. No.	Experiment Name	Lab Hours Required
1	Study of different file formats e.g. BMP, TIFF and extraction of attributes of BMP	2
2	Study of statistical properties- mean, standard deviation, profile, variance, threshold and Histogram plotting	2
3	Histogram equalization and modification of the image	2
4	Gray level transformations such as contrast stretching, negative, power law transformation etc	2
5	Spatial Domain filtering- Gaussian filtering, smoothing and sharpening filters.	2
6	DCT / IDCT of given image	2
7	Edge detection using Sobel, Canny, Prewitt and Roberts operators	2
8	Converting color image to grey & B / W image and vice versa.	2
9	Creating noisy image and filtering using MATLAB	2

Note: Lab file should consist of minimum eight experiments.

All experiments must be performed using simulator software only.

Reference Books:

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

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

Teacher, Paper setter and Examiner should follow the guidelines as given below.

SN	Experiment Title	Lab hours required
1	1. To simulate and analyze i-v characteristics of p-n junction diode.	04
2	To simulate and analyze voltage regulator using zener diode.	04
3	To simulate and analyze Half wave and full wave rectifiers.	04
4	To simulate and analyze wave shaping circuits.	02
5	To simulate and analyze i-v characteristics of Bipolar transistor.	02
6	To simulate and analyze biasing of Bipolar transistor.	02
7	To simulate and analyze i-v characteristics of Field Effect transistor.	02
8	To simulate and analyze biasing of Field Effect transistor.	02
9	To simulate and analyze CMOS digital circuits.	04
10	To simulate and analyze combinational and sequential logic gates.	04

Note: Lab file should consist of minimum eight experiments.

All experiments must be performed using simulator software only.

Reference Books:

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

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

Teacher should facilitate learning of following lab experiments:

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

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

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

Guidelines for ICA:

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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.