NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

Final Year Engineering

(E&TC/E&C)

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 introduction of signal and system.

1.	**Discrete Time Signals and Systems**		**Lecture required**	**Reference No**
	a	Basic elements of Digital Signal Processing Systems. Advantage and limitation of DSP over ASP.	01	1
	b	Sampling of Analog signals, Aliasing, Sampling Theorem (Numerical only)	01	1, 2
	c	Classification of Discrete Time Signals , Classification of Discrete Time System .	03	1, 2
	d	Linear Convolution, Properties of Convolution, Causality and Stability condition in terms of the Impulse Responses .	02	1, 2
	e	Correlation (Autocorrelation & Crosscorelation of two sequences).	01	1, 2

Unit - II

Teacher should facilitate basic formulas of Z transform.

2.	**DT System Analysis Using Z- Transform**		**Lecture required**	**Reference No**
	a	Definition of Z transform, Meaning of ROC, Properties of ROC	01	1, 2
	b	Properties of Z transform and Numericals	02	1, 2
	c	Inverse Z transform, Power series method, partial fraction expansion method (Numerical only)	02	1, 2
	d	The one sided Z transform (Unilateral Z-Transform) Response of the system with nonzero initial conditions. (Numerical only)	02	1, 2
	e	Z-Transform solution of difference equations. (Numerical only)	01	1, 2

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Unit – III

Teacher should facilitate Fourier Transform of DT Signals and Systems

3.	Fourier Transform of DT Signals and Systems		Lecture required	Reference No
	a	Definition of Fourier Transform, DFT , Properties of DFT, IDFT.	02	1, 2
	b	Circular Convolution (Maximum N=8)	02	1, 2
	c	The DFT as Linear Transformation, Twiddle factor.	01	1, 2
	d	**FFT Algorithms:** Radix2 DIT and DIF algorithms to computer DFT. (Numerical Only)	03	1, 2

Unit – IV

Teacher should facilitate Design and Realization of Digital Filters.

4.	Design and Realization of Digital Filters		Lecture required	Reference No
	a	**IIR Filter structure :** Direct form, Cascade form, Parallel form and Transposed structures.	02	1, 2
	b	**IIR Filter Design:** Impulse invariance, Bilinear Transformation method of design.	02	1, 2
	c	**FIR Filter Structure:** Direct form, cascade form, and linear phase structure.	02	1, 2
	d	**FIR Filter Design:** Windowing method. (Numerical on Rectangular, Hamming, Hanning only) Gibbs phenomenon. .	02	1, 2

Unit - V

Teacher should facilitate Multirate DSP and Introduction to DSP processor.

5.	Multirate DSP and Introduction to DSP processor		Lecture required	Reference No
	a	Concept of Multirate DSP, Decimation, Interpolation (Theory only)	02	1, 2
	b	Sampling Rate Conversion by Rational Factor I/D. (Theory only)	01	1, 2
	c	**Application of DSP:** Voice processing, Image processing. (Short notes)	01	1, 2

	d	**DSP processor (TMS320C67XX) Architecture:** Architectural features of DSP processors: Multiplier and Multiplier Accumulator (MAC), Modified Bus Structures and Memory Access schemes in DSP, Multiple access memory, Multiport Memory, Pipelining, Special addressing modes, On chip Peripherals.	04	3

Reference Books:

1. John G. Proakis, Dimitris G. Manolakis, " Digital Signal Processing: Principles, algorithms and applications" Fourth edition, Pearson Prentice Hall.
2. P. Ramesh Babu "Digital Signal Processing" Fourth edition, Scitech Publications.
3. B.Venkataramani, M. Bhaskar - "Digital Signal Processor, Architecture, Programming and Applications" , TATA McGraw Hill, 2002.

Fiber Optic Communication

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

Unit – I

Teacher should facilitate learning of basic knowledge regarding FOC & transmission of rays.

1.	Introduction to Optical Fiber Communication System		Lecture Required	Reference No
	a.	Block diagram of OFCS, Advantage and Disadvantage of OFCS over other communication systems	**02**	**1,2**
	b.	Ray theory of transmission and concept of acceptance angle and Numerical Aperture (Numericals based on this)	**02**	**1,2,3**
	c.	Meridonial and skew propagation, wave theory of optical propagation: cut – off wavelength. Group velocity and Group delay,	**02**	**1,2**
	d.	Types of fibers (According to materials, Refractive index profile, Mode of propagation)	**02**	**1,2,3**

Unit – II

Teacher should facilitate learning of various sources & detectors used in optical transmission.

2.	Light Sources and Detectors		Lecture required	Reference No
	a.	**Sources** : Factors or Characteristics for their selection in OFCS	**01**	**1,2**
	b.	**Light Emitting diodes:** Surface emitter,LEDS, Edge emitter LEDS, LED operating Characteristics, Radiation patterns of surface and Edge emitters	**02**	**1,2,3**
	c.	**Laser diode:** Laser principles, semiconductor laser diode, Hetero junction Laser, strip- gromentry lasers, laser diode operating Characteristics, Radiation patterns	**02**	**1,2,3**
	d.	**Detectors:** Characteristics or factors for their Selection, P-N photo diode, P-I-N Photo diode, Avalanche photodiode,	**02**	**1,2,3**
	e.	**Detector parameters**: Quantum efficiency, Responsivity, speed of Response (Numericals based on this)	**01**	**1,2**

Unit – III

Teacher should facilitate learning of different losses taking place in fiber while transmitting the signal and their respective measurements.

3.	Losses & Measurements in Optical System		Lecture required	Reference No
	a.	**Losses in fibers**: Absorption, scattering and bending losses. Signal distortion in optical fiber: Material dispersion, waveguide dispersion, intermodal dispersion.	**04**	**1,2,3**
	b.	**Noise in optical fiber:** Thermal Noise, shot noise, S / N Ratio, Noise equivalent power (Numericals based on this)	**02**	**1,2**
	c.	**Optical Fiber Measurements:** Measurement of Attenuation, dispersion, refractive index. Field Measurements: Optical time domain reflectometry. (OTDR)	**02**	**1,2**

Unit – IV

Teacher should facilitate learning of Modulation & demodulation techniques used in OFC.

4.	Optical Transmission & Reception		Lecture required	Reference No
	a.	**Optical Transmitter & Receiver Circuit.**	**02**	**1,2**
	b.	**Modulation Bandwidth:** 3-dB electrical bandwidth, 3-dB optical Bandwidth(Numerical based on this)	**01**	**1,2**
	c.	**Intensity Modulation:**: LED Modulation and Circuits (Analog and digital) Analog modulation formats; AM / IM Sub carrier Modulation, FM / IM Sub carrier Modulation.	**03**	**1,2**
	d.	**Detection:** (Coherent detection, Heterodyne, Homodyne detection):- Optical heterodyne receivers,	**02**	**1,2**

Unit - V

Teacher should facilitate learning of optical amplifiers, optical networks and different types of sensors used in optics.

5.	Advanced Systems and Techniques		Lecture required	Reference No
	a.	**Fiber Optics System Design:** Optical power budgeting, Rise-time budgeting	**01**	**1,2**
	b.	**Advanced Systems**: Optical amplifiers(Semiconductor Amplifier, Raman Amplifier, EDFA),	**02**	**1,2**
	c.	**Optical Networks**: SONET / SDH.	**02**	**1,2**
	d.	**Advanced Techniques:** Optic Frequency Division Multiplexing, Wavelength Division Multiplexing, DWDM.	**01**	**1,2**
	e.	**Optical Sensors:** Intensity modulated, Phase modulated & Spectrally modulated sensors	**02**	**3**

Reference Books:

1. John M. Senior , "Optical Fiber Communication (principles & Practice)",PearsonEducation
2. Govind P. Agrawal, " Fiber Optic Communication System", Wiley
3. Dr. Subir Kumar Sarkar,"Optical Fibres and Fiber Optic Communication System", S.Chand

Interdisciplinary Elective

1. Automotive Electronics

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

Unit – I

1	**Use of Electronics In The Automobile**		**Lecture required**	**Reference No.**
	a	**Concept of A System:** Block Diagram, **Linear System Theory:** Continuous Time, Ist & IInd order system	2	1
	b	**Control Theory:** Open Loop Control & Close loop control	1	1, 3
	c	**Instrumentation:** Measurement, Basic Measurement Systems, issues	1	1, 3
	d	Signal Processing & Filtering	2	1
	e	**Electronics Fundamentals:** Electronics in Automobile Microcomputer application in Automotive Application System	1	1, 3
	f	Instrumentation application of Microcomputer	1	1

Unit – II

2	**Electronic Engine Control**		**Lecture required**	**Reference No.**
	a	**Motivation For Electronic Engine Control:** Exhaust Emission, Fuel Economy, Federal Government Test Procedures	1	1
	b	Concept of An Electronic Engine Control System	1	1
	c	Engine Performance Terms	1	1
	d	Electronic Fuel Control System	2	1
	e	Analysis of Intake Manifold Pressure	1	1
	f	Idle speed control	1	1
	g	Electronic Ignition	1	1

Unit – III

3	**Sensors and Actuators**		**Lecture required**	**Reference No.**
	a	**Automotive Control System Applications of Sensors And Actuators:** Representative Electronic Engine Control System	2	1
	b	Throttle Angle Sensor, Temperature Sensors	1	1
	c	Sensors For Feedback Control: Knock Sensor	1	1
	d	Automotive Engine Control Actuators: Fuel Injector, Exhaust Gas Recirculation Actuator	2	1
	e	Electric Motor Actuator: Brushless DC Motor, Stepper Motor	1	1
	f	Ignition System & Coil operation	1	1

Unit – IV

4	**Digital Powertrain Control Systems**		**Lecture required**	**Reference No.**
	a	Digital Engine Control & its features	1	1
	b	Control Modes for Fuel Control	1	1
	c	Discrete Time Idle speed control system (Block diagram & description only)	1	1
	d	EGR Control (Block diagram & description only)	1	1
	e	Variable Valve Timing Control (Block diagram & description only)	1	1
	f	Electronic Ignition Control : knock intensity & detection	1	1
	g	Integrated Engine Control System	1	1
	h	Hybrid Electric Vehicle	1	1

Unit – V

5	**Vehicle Motion Controls**		**Lecture required**	**Reference No.**
	a	Representative Cruise Control System: Configuration, Block diagram & description. Digital Speed Cruise control Block Diagram	1	1
	b	Cruise control Electronics (Block diagram & description only)	1	1
	c	Advanced Cruise Control (Block diagram & description only)		
	d	Antilock Braking System	1	1
	e	Electronic Suspension Control System	1	1
	f	Electronic Steering Control	1	1
		Automotive instrumentation System & Diagnostics		
	g	Modern Automotive & Computer Based Instrumentation System	1	1
	h	High Speed Digital Communications & CAN	1	1
	i	Electronic Control System Diagnostics	1	1, 2

Reference Books:

1.	William B. Ribbens – Understanding Automotive Electronics-An Engineering Perspective , Butterworth-Heinemann, An imprint Elsevier, First Indian reprint 2014, ISBN 978-93-5107-151-8
2.	Al Santini- Automotive Technology, Cengage Learning, India Edition, 2011, ISBN 978-81-315-1412-2
3.	K. K. Ramalingam- Automobile Engineering, Scitek Publication, Second Edition.

Interdisciplinary Elective

2. Image Processing

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

Unit – I

Teacher should facilitate learning of Basic Concepts of Digital Image and video fundamentals**.**

1.	**Digital Image and Video Fundamentals:**		**Lect required**	**Ref No**
	a	Introduction to Digital Image.	01	01
	b	Digital Image Processing System, Sampling and Quantization.	02	01
	c	Representation of Digital Image, Connectivity.	01	01
	d	Image File Formats: BMP, TIFF and JPEG.	01	01
	e	Color Models (RGB, HIS and CMY).	01	01
	f	Introduction to Digital Video, Chroma Sub-sampling, CCIR standards for Digital Video.	02	01

References:

1	Rafel C. Gonzalez and Richard E. Woods, 'Digital Image Processing', Pearson Education Asia, Third Edition, 2009.
2	S. Jayaraman, E.Esakkirajan and T.Veerkumar, "Digital Image Processing" Tata McGraw Hill Education Private Ltd, 2009.

Unit - II

Teacher should facilitate learning of Image Enhancement techniques.

2.	**Image Enhancement:**		**Lect required**	**Ref No**
	a	Gray Level Transformations.	01	01,02
	b	Zero Memory Point Operations.	01	01,02
	c	Histogram Processing, Neighborhood Processing.	02	01,02
	d	Spatial Filtering, Smoothing and Sharpening Filters.	03	01,02
	e	Homomorphic Filtering.	01	01,02

References:

1	Rafel C. Gonzalez and Richard E. Woods, 'Digital Image Processing', Pearson Education Asia, Third Edition, 2009.
2	S. Jayaraman, E.Esakkirajan and T.Veerkumar, "Digital Image Processing" Tata McGraw Hill Education Private Ltd, 2009.

Unit – III

Teacher should facilitate learning of Image Segmentation and Representation.

3.	**Image Segmentation and Representation:**		**Lect required**	**Ref No**
	a	Detection of Discontinuities.	02	01,02
	b	Edge Linking using Hough Transform, Thresholding.	02	01,02
	c	Region based Segmentation, Split and Merge Technique.	02	01,02
	d	Image Representation and Description, Chain Code.	02	01,02

References:

1	Rafel C. Gonzalez and Richard E. Woods, 'Digital Image Processing', Pearson Education Asia, Third Edition, 2009.
2	S. Jayaraman, E.Esakkirajan and T.Veerkumar, "Digital Image Processing" Tata McGraw Hill Education Private Ltd, 2009.

Unit – IV

Teacher should facilitate learning of Image Transform.

4.	**Image Transform:**		**Lect required**	**Ref No**
	a	Introduction to Unitary Transform.	01	01,02
	b	Discrete Fourier Transform(DFT), Properties of DFT.	02	01,02
	c	Fast Fourier Transform (FFT).	01	01,02
	d	Discrete Hadamard Transform (DHT).	01	01,02
	e	Fast Hadamard Transform (FHT).	01	01,02
	f	Discrete Cosine Transform (DCT).	01	01,02
	g	Discrete Wavelet Transform (DWT).	01	01,02

References:

1	Rafel C. Gonzalez and Richard E. Woods, 'Digital Image Processing', Pearson Education Asia, Third Edition, 2009.
2	S. Jayaraman, E.Esakkirajan and T.Veerkumar, "Digital Image Processing" Tata McGraw Hill Education Private Ltd, 2009.

Unit – V

Teacher should facilitate learning of Image Compression.

5.	**Quality Assurance Techniques:**		**Lect required**	**Ref No**
	a	Introduction, Redundancy, Fidelity Criteria.	03	01,02
	b	Lossless Compression Techniques : Run Length Coding, Arithmetic Coding, Huffman Coding.	02	01,02
	c	Differential PCM.	01	01,02
	d	Lossy Compression Techniques: Improved Gray Scale Quantization, Vector Quantization, JPEG, MPEG-1.	02	01,02

References:

1	Rafel C. Gonzalez and Richard E. Woods, 'Digital Image Processing', Pearson Education Asia, Third Edition, 2009.
2	S. Jayaraman, E.Esakkirajan and T.Veerkumar, "Digital Image Processing" Tata McGraw Hill Education Private Ltd, 2009.

Elective-I

1. VLSI Design

Teacher, Paper setter and Examiner should follow the guidelines as given below. The programming part is restricted to VHDL only.

Unit - I

Teacher should facilitate learning of digital hardware components, an overview of integrated circuit technology and a basic knowledge of VHDL .

1.	**Introduction to VLSI and Hardware Description Language**		**Lecture required**	**Reference No**
	a	Digital Hardware: Standard chips, Programmable Logic Devices, custom-Designed Chips, The Design Process	03	2
	b	Basic Design Loop, Introduction to CAD tools(Concept of Design Entry, Synthesis, Functional Simulation, Physical design, Timing Simulation, Chip Configuration),	04	2
	c	Structure of VHDL and Verilog module, Operators and Data types for VHDL. (No programs using Verilog)	03	1

Unit - II

Teacher should facilitate VHDL writing styles and provide concept, basic statements and components of dataflow descriptions.

2.	**Styles of Descriptions and Data-flow Description (VHDL programming only)**		**Lecture required**	**Reference No**
	a	Styles of Descriptions: Behavioral, Structural, Switch-level, Data-flow, Mixed type, Mixed Language.	02	1
	b	Structure of Data-flow Description: Signal declaration and Signal assignment statements.	02	1
	c	Concurrent signal assignment statements, , Constant declaration and assignment statements, Assigning a delay to the signal assignment statements	02	1,2
	d	Conditional signal assignment (when….else), selective signal assignment (with….select), Assigning signal values using (...Others), Generate statement.	02	1,2

Unit – III

Teacher should facilitate the concept, basic statements and components of Behavioral and Structural descriptions.

3.	**Behavioral and Structural Description (VHDL programming only)**		**Lecture required**	**Reference No**
	a	Structure of Behavioral Description, variable assignment statement.	01	1
	b	Sequential statements for VHDL: IF statement, Signal and variable assignment, Case statement, Loop statement, Wait statement	03	1,2
	c	Organization of structural description, component declaration and instantiation, binding methods.	02	1
	d	State Machine: Structural Description of a 3 bit synchronous counter with active low clear.	01	1
	e	Procedures and Functions: Concept and Syntax with simple examples.	01	1

Unit – IV

Teacher should facilitate the learning of Switch level and mixed type description.

4.	**Switch level and Mixed type Description (VHDL Programming only)**		**Lecture required**	**Reference No**
	a	Single NMOS and PMOS switches: NMOS and PMOS switch description for VHDL	01	1
	b	Serial and parallel combinations of switches (Two NMOS switches in series and parallel, Two PMOS switches in series and parallel). Switch level description of: Primitive gates(Inverter, Two input AND,OR,NAND,NOR)	02	1
	c	Switch level description of: Combinational logics(Two input AND, OR, Three input NAND, NOR strong output)	01	1
	d	Switch level description of : Sequential circuits(S-R Latch, CMOS switch)	01	1
	e	Mixed Type Description: VHDL user defined types,	01	1
	f	Mixed Type Description: VHDL Packages, Implementation of Arrays, single and multi-dimensional Array. Mixed type description examples: Arithmetic-Logic Unit	02	1

Unit - V

Teacher should facilitate concept of VHDL file processing, fundamentals of CPLDs, FPGAs and various techniques for testing of digital circuits.

5.	Implementation and Testing of Logic circuits		Lecture required	Reference No
	a	VHDL file processing: Concept and built-in procedures for file handling.(No programs on file handling or record type)	01	1
	b	Programmable Logic Devices: Complex Programmable Logic Devices (CPLDs) and Field Programmable Gate Arrays(Examiner questions restricted to general structure of CPLD and FPGA) , Applications of CPLD's and FPGAs.	03	2
	c	Testing of Logic Circuits: Fault Model (Stuck-at Model, single and Multiple Faults, CMOS circuits), Complexity of a Test set, Path Sensitizing.	01	2
	d	Design of sequential circuits: Design for Testability, Built in self test, Boundary scan.	03	2

Reference Books:

1	Nazeih M. Botros - HDL programming Fundamentals VHDL and Verilog , Thomson Learning Inc.
2	Stephen Brown, Zvonko Vranesic- Fundamentals of Digital Logic with VHDL, Tata McGraw Hill Publishing Company Limited, 2nd Edition.
3	Michael John Sebastian Smith- Application Specific Integrated Circuit, Pearson Education.
4	Douglas Perry - VHDL programming, Tata MC-Graw Hill
5	Sudhakar Yalamanchil - An Introduction to VHDL from Synthesis to Simulation
6	Charles H.Roth, Lizy Kurian John – Principal of Digital System Design using VHDL, Bostan, Thomson Book.
7	Jayaram Bhasker- A VHDL Primer, P T R Prentice Hall

Elective-I

2. Broadband Communication

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

Unit - I

1.	**Packet switched WAN Protocols**		**Lecture required**	**Reference No**
	a	Basic switching concepts (circuit switching and packet switching) , X.25 protocol, packet Formats, sequence of events	02	1,2
	b	Frame Relay: Introduction, Frame relay protocols, architecture, comparison with X.25 protocol, frame mode call control, call control protocol	03	1,
	c	Frame relay congestion control, Congestion, Approaches, traffic rate management, explicit congestion avoidance, implicit congestion control	03	1

Unit – II

2.	**ISDN: Integrated Services Digital Network**		**Lecture required**	**Reference No**
	a	Introduction to ISDN, IDN, Principles of ISDN, Evolution of ISDN, ISDN Standards	02	1, 2
	b	Architecture, Transmission structure, User network interface configuration, ISDN protocol architecture,	03	1
	c	ISDN Connection, Addressing. Inter working ISDN – ISDN, ISDN – PSTN, ISDN – CSPDN.	03	1

Unit – III

3.	B-ISDN		Lecture required	Reference No
	a	Architecture and standards, B-ISDN Services Conversational, Messaging, Retrieval, Distribution, Business and Residential requirements	02	1
	b	B-ISDN protocol: User plane, Control plane, Physical layer, Line coding, Transmission structure,	03	1
	c	SONET Requirement, Signal Hierarchy, System Hierarchy, Frame format, pointer adjustment	03	1

Unit – IV

4.	ATM(Asynchronous Transfer Mode)		Lecture required	Reference No
	a	Overview, Virtual channels, Virtual paths, VP and VC switching, ATM cells, Header format, Generic flow control	02	1, 2
	b	Header error control, Transmission of ATM cells, Adaptation layer, AAL services and protocols. ATM switching building blocks**,**	04	1,2
	c	ATM cell processing in a switch, Matrix type switch, Input, Output buffering, central buffering, Performance aspects of buffering switching networks.	02	1,2

Unit - V

5.	ATM Traffic and congestion Control		Lecture required	Reference No
	a	Requirements for ATM Traffic and Congestion Control, Cell-Delay Variation.	02	1
	b	ATM Service Categories, Traffic and Congestion Control Framework	03	1
	d	Traffic Control, Congestion Control,(Traffic Management,ABR Traffic Management)	02	1,2

Reference Books:

1) Williams Stallings - ISDN and Broadband ISDN with frame Relay and ATM , PHI , 4TH Ed

2) Behrouz Forouzan. - Data Communication. and Networking, TMH

3) Balaji kumar - Broadband Communication, MGH

4) Mischa Schwartz - Broadband Internet Network, PHI

Elective-I

3. Biomedical Engineering

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

Unit – I

Teacher should facilitate learning of medical basics along with the applied engineering.

1		Introduction to Human Body and Measurement on it:	Lecture required	Reference No
	a	Basics of biomedical Instrumentation system.	1	1
	b	Anatomy and Physiology of the Human Body.	1	1
	c	Cells & Generation of potential in Body, Body potential.	1	1
	d	Transducers And Sensors: Transducers: Pressure transducers.	1	1,4
	e	transducer for temperature measurement Ultrasonic Transducers.	1	1,4
	f	Sensors: Pulse sensors Respiration sensors, Optical sensors.	1	1
	g	Recorder and displays: Permanent magnet moving coil instruments,PMMC writing system , X-Y Recorders.	1	1
	h	Medical oscilloscopes: Multibeam oscilloscope.	1	1
	i	Digital storage oscilloscopes. Bedside monitor.	1	1

Unit – II

Teacher should facilitate learning of Anatomy of heart & function of heart.

2		The Anatomy of Heart; Function of Heart:	Lecture required	Reference No
	a	The circulatory system, Electro conduction system of the heart.	1	1
	b	Electrocardiographs, ECG waveforms, Standard lead system.	1	1
	c	ECG measurements: ECG preamplifier, Readout device.	1	1
	d	Heart problems: Heart blocks; Pacemakers: Pacemakers, Types of Pacemakers.	1	1

	e	Defibrillators:Ventricular Fibrillation.	1	1
	f	Heart rate measurement: Cardiotachometers, Average Heart rate meter.	1	1
	g	Electrode theory; Bio potential electrode : skin surface, Suction pasteless disspossible & air jet electrode. Unipolar & bipolar limb system eithoven triangle.	1	1
	h	Blood pressure measurement : introduction & techniques	1	1

Unit – III

Teacher should facilitate learning of Human Respiratory System and Its Measurements.

4		**Human Respiratory System and Its Measurements**	**Lecture required**	**Reference No**
	a	Respiratory Measurements; Spirometer; Respiratory gas analyzers infra-red gas analyzer.	1	1,3
	b	Oxygen analyzer, nitrogen analyzer; 8-channel EEG system.	1	1
	c	Blood: Measurement of blood flow, Radiographic technique, Indicator Dye dilution methods.	1	1,3
	d	Thermal convection, Magnetic blood flow rate, Ultrasonic blood flow meter.	1	1
	e	Blood gas Pressure: Blood gas analyzer, PH measurement of blood.	1	1,3
	f	Oximetry: Measurement of partial pressure of CO2 in blood, Measurement of blood PaO2, In vitro Oximetry.	1	1
	g	Patient Safety:Galvanic skin resistance; Patient safety: Macro shock, Macrocurrent shock.	1	1
	h	Block diagram of visual &auditory evoked potential system.	1	1

Unit - IV

Teacher should facilitate learning of human nervous and muscular system.

3		**The Human Nervous and Muscular System:**	**Lecture required**	**Reference No**
	a	The Nervous System: The peripheral nervous system, Central nervous system.	1	1,3
	b	Anatomical and physiological parameter of brain, Behavior and Nervous system.	1	1,3
	c	Study of Brain Signals: Different wave form of the Brain, Evoked potential.	1	1
	d	Type of electrodes; EEG Amplifier: Recording the EEG signals Electrode: micro & needle electrode.	1	1,3

	e	Artifacts:Processing Artifacts;Analysis of Disease using EEG&sleep patterns; Electromyography.	1	1
	f	(EMG): How muscles work, paralysis, myograph, Nerve conduction velocity.	1	1

Unit – V

Teacher should facilitate learning of Imaging Techniques & telemetry system.

5		**Imaging Techniques & telemetry system.**	**Lecture required**	**Reference No**
	a	Imaging Techniques: X ray imaging and CT Scan: Properties of X ray Production of X ray.	1	2
	b	Application of X ray in medicine, CAT Scan.	1	2
	c	X-ray therapy; Digital radiography.	1	2
	d	Ultrasound therapy units: physics, medical ultrasound, basic pulse echo system.	1	1
	e	Instruments of surgery: Principle, type of electro-surgery technique.	1	1
	f	Surgical diathermy machine, electrode used for surgical diathermy.	1	1
	g	Safety aspects in electro-surgical units, microwave diathermy.	1	1
	h	Telemetry: single channel telemetry ; ECG telemetry.	1	1
	i	Temperature telemetry; multichannel telemetry.	1	1

References:

1) R.S.Khandpur - Bio-medical Instrumentation , TMH 2nd ed
2) Nandini K. Jog - Electronics in Medicine and Biomedical Instrumentation, PHI.
3) Cromwell - Biomedical Instrumentation and Measurements, PHI. 2nd ed/Pearson 4th ed
4)H. S. Kalsi – Electronics Instrumentation

Elective-I

4. Industrial Automation

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

Unit - I

Teacher should facilitate design of unregulated and regulated power supply using discrete components and ICs.

1.		**Introduction to Industrial Automation**	**Lecture required**	**Reference No**
	a	Introduction to Industrial Automation, Role of automation in industries, Introduction to the types of manufacturing industries,	02	1,2
	b	Introduction to type of automation system, Benefits of automation. Introduction to Automation pyramid,	02	1, 2,
	c	Introduction to automation tools like PAC, PLC, SCADA, DCS, Hybrid DCS with reference to automation pyramid, Comparison of PLC, PAC, and SCADA on the basis of Performance criteria Control system audit, Performance criteria,	02	1, 2, 8
	d	Development of User Requirement Specifications (URS) for automation. Functional Design Specifications (FDS) for automation tools.	02	2,6,7

Unit - II

2.		**Basic concept of PLC, Pneumatic & Hydrolic**:	**Lecture required**	**Reference No**
	a	Programmable Logic Controller (PLC) Continuous versus Discrete Process Control, Relay based ladder diagram using standard symbols, Limitations of relay based system. Architecture of PLC, Types of Input & Output modules (AI, DI, DO, AO), Wiring diagram, Interfacing pneumatic & Hydraulic systems to PLC,	02	1, 8,
	b	Fixed & Modular PLC (Rack, slot, grouping), PLC specifications, PLC manufacturers, PLC Basic instructions, Timers (ON delay, OFF delay & Retentive) & Counters with timing diagrams, PLC ladder diagram, PLC programming for process applications	02	1,8
	c	<u>Pneumatic components</u> Pneumatic Power Supply and its components,Pneumatic relay (Bleed & Non bleed, Reverse & direct),Single acting & Double acting cylinder,Special cylinders: Cushion, Double rod, Tandem,	02	5

		Multiple position, Rotary,Filter Regulator Lubricator (FRL),Pneumatic valves (direction controlled valves, flow control etc),Special types of valves like relief valve, pressure reducing etc.,Time delay valve		
	d	Hydraulics Hydraulic components ,Hydraulic supply ,Hydraulic pumps,Actuator (cylinder & motor),Hydraulic valves	02	2

Unit – III

3.	**Instrumentation Standard Protocols**:		**Lecture required**	**Reference No**
	a	Definition of protocol, Introduction to Open System Interconnection (OSI) model, Communication standard (RS232, RS485), Modbus (ASCII/RTU),	02	2,3,7
	b	Introduction to third party interface, concept of OPC (Object linking and embedding for Process Control),	02	2,3,7
	c	HART Protocol: Introduction, frame structure, programming, implementation examples, benefits, advantages and limitation. Foundation Fieldbus.	02	2,3
	d	H1: Introduction, frame structure, programming, implementation examples, benefits, advantages and limitation. Comparison of HART, Foundation Fieldbus, Devicenet, Profibus, Controlnet, Industrial Ethernet.	02	2,3,7

Unit – IV

4.	**PLC Configuration, Applications and Machine automation**		**Lecture required**	**Reference No**
	a	PLC programming methods as per IEC 61131, Developing programs using Sequential Function Chart, Functional Block Diagram,	02	3,6,7
	b	Analog control using PLC (PID controller configuration), Interfacing PLC to SCADA/DCS using communication link (RS232,RS485) ,	02	3,6,7
	c	Protocols (Modbus ASCII/RTU) and OPC, Development stages involved for PLC based automation systems. Introduction Computer Numerically Controlled (CNC) Machines,	02	3,6,7
	d	Basic CNC Principle, servo control, types of servo control for motion axes, Control system of CNC, Introduction to G-code.	02	3,6,7

Unit - V

5.	Distributed Control System		Lecture required	Reference No
	a	DCS introduction, Various function Blocks, DCS components/block diagram, DCS Architecture of different makes, comparison of these architectures with automation pyramid,	02	3,4
	b	, DCS specification , DCS support to Enterprise Resources Planning (ERP) DCS detail Engineering,	02	3,4
	c	configuration and programming, functions including database management, reporting, alarm management,	02	3,4
	d	Historical database management, and user access management, communication, third party interfaces .	02	3,4

Text Books:

1. Introduction to Programmable Logic Controller, Gary Dunning, DELMAR Cengage Learning.
2. Process Control, Instrument Engineering Hand book, B.G. Liptak, Butterworth-Heinemann Ltd
3. Distributed computer control for industrial automation, Ppovik Bhatkar, Dekkar Pub.

Reference Books:

4. Industrial Electronics, Petruzella, McGraw-Hill
5. Pneumatic Instrumentation, Majumdhar, TMH
6. The management of control system: Justification and Technical Auditing, N.E. Bhttiha, ISA
7. Computer aided process control, S.K.Singh, PHI.
8. Programmable Logic Controllers: Principles and Applications, Webb &Reis, PHI.

Computer Communication Network

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

Unit - I

Teacher should explain about Computer Network, Network Topologies and Different Transmission Medias

1.	**Physical Layer**		**Lecture required**	**Reference No.**
	a	Introduction to Computer Network, Network Topologies ISO/OSI Reference Model TCP/IP Reference Model	03	1, 2
	b	LAN,MAN,WAN	01	1, 2
	c	Guided and unguided media: Transmission media: Twisted pair, Baseband coaxial cable, Broadband coaxial cable, Fiber optics. Wireless Transmission: Radio transmission, Microwave transmission, Infrared and light wave Transmission	02	1, 2
	d	1) ISDN: Narrowband ISDN: ISDN services, System architecture, Interface. Broadband ISDN 2) ATM reference model and ATM Switches.	02	1

Unit - II

Teacher should explain **Data Link Layer & Various protocols**

2.	**Data Link Layer**		**Lecture required**	**Reference No.**
	a	1) Design issues 2) Framing, Error Control & Flow control	02	1, 2
	b	1)Data Link Protocols: Unrestricted Simplex Protocol, stop and wait protocol, Simplex Protocol for a Noisy Channel. Sliding Window Protocols: One bit sliding window, Using Go-Back n, Protocol using Selective Repeat	03	1,2
	c	1) HDLC	01	2
	d	Multiple Access Protocols: ALOHA, Carrier Sense Multiple Access, CSMA,CSMA/CD,CSMA/CA	02	1,2

Unit – III

Teacher should explain functionalities of **Network Layer & Logical Addressing**.

3.	**Network Layer**		**Lecture required**	**Reference No.**
	a	1) Design Issue of Network Layer 2) Comparison of Virtual circuit and Datagram subnets	02	1
	b	Routing Algorithms, Shortest Path Routing, Flooding, Hierarchical Routing, Broad Cast Routing, Multicast routing	02	1, 4
	c	1)Congestion Control Algorithms 2)Congestion Prevention Policies 3)Choke Packets	02	1
	d	Internet Protocol: Internetworking, IPV4 Datagram, IPV6 Addresses	02	2

Unit – IV

Teacher should explain **Network Layer and Transport Layer functionalities.**

4.	**Network Layer and Transport Layer**		**Lecture required**	**Reference No.**
	a	1) ARP,RARP 2)ICMP,IGMP	03	1, 2
	b	1)Transmission Control Protocol(TCP) 2)User Datagram Protocol(UDP)	02	1,2
	c	1)Congestion Control of Transport Layer	01	2
	d	1)Quality of Service(QoS) 2)Techniques to improve QoS	02	1,2,4

Unit - V

Teacher should explain functionalities of **Application Layer & Significance of Network Security**

5.	**Application Layer**		**Lecture required**	**Reference No.**
	a	1)Domain Name System(DNS) 2)SNMP	02	1,2
	b	1)Network Security, Cryptography, Public key algorithms 2)Digital Signature	03	1,2,3,4
	c	1)Authentication Protocols 2)Firewalls	02	2,3,4
	d	1)Introduction to VOIP	01	1,3

Reference Books:

1. Andrew S Tanebaum - Computer Networks, 4th Ed. PHI/ Pearson education.
2. Behrouz A Forouzan - Data Communication and Networks, 3rd Ed. TMH.
3. Irvine Olifer - Computer Networks: Principles, Technology and Protocols, Wiley India.
4. William Stalling – Data and Computer communications, 7th Ed. PHI

Digital Signal Processing Lab

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

SN	Experiment Title	Lab hours required
1	Basic operations (Addition, Multiplication, Subtraction, Division and Scaling)on sequences of equal and unequal length.	02
2	Write a program for different waveform generation (Sin, Cos, Impulse, Unit step, delayed unit step, rising expontial, decaying expontial, Fliplr ie x(-n))	02
3	Sample an analog signal with different sampling frequencies and see the aliasing effect, thus verifying sampling theorem.	02
4	To study the circular convolution for calculation of linear convolution and aliasing effect. Take two sequences of length 4. Write a program to find 4 point circular convolution and compare the result with 8 point circular convolution to study aliasing in time domain.	02
5	Find DFT of a discrete sequence and also find its IDFT.	02
6	Solve Difference equation and find system response using Z transform.	02
7	To study the effect of different windows on FIR filter response.	02
8	Design Butterworth filter using Bilinear transformation method for LPF.	02
9	Design and implement two stage sampling rate converter	02
10	Implementation of digital filter using DSP Kit.	02
11	Sampling audio signal at different sampling rate using DSP kit.	02
12	Using ADC and DAC for signal acquisition and play back after processing	02

Note: Minimum **EIGHT** practical's are to be performed. At least **TWO** on DSP Hardware Platform.

Guide lines for ESE:-

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

Reference Books:

1. John G. Proakis, Dimitris G. Manolakis, " Digital Signal Processing: Principles, algorithms and applications" Fourth edition, Pearson Prentice Hall.
2. P. Ramesh Babu "Digital Signal Processing" Fourth edition, Scitech Publications.
3. B.Venkataramani, M.Bhaskar - "Digital Signal Processor, Architecture, Programming and Applications" , TATA McGraw Hill, 2002.

Fiber Optic Communication Lab

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

SN	Experiment Title	Lab hours required
1	**Electrical Characteristics of (Different type LED).** a) To plot the VI characteristics of LED.	02
2	**Electrical Characteristics of Laser Diode.** a) LASER diode characteristics.	02
3	**Photometric characteristics of LED/LD(Polar plot/Intensity Measurement)** a) To plot the Photometric characteristics of LED/LD of different wavelengths.	02
4	**NA Measurement for Single/Multi mode, GI/SI,Fiber** a) To measure Numerical Aperture of SM-GI/SI fiber **b)** To mesure Numerical Aperture of MM-GI/SI fiber.	02
5	**Attenuation Measurement of optical fiber.** a) To measure attenuation due to angular misalignment. b) To measure attenuation due to longitudinal misalignment. c) To measure attenuation due to axial/lateral misalignment.	02
6	**Study of different fiber losses.** a) To measure propagation loss of given fiber. **b)** To measure bending loss of given fiber.	02
7	**Spectral characteristics of LED/LD.** a) To study spectral characteristics of LED/LD.	02
8	**Fiber optic Analog transmitter/Receiver parameter measurement**. a) To set up analog link and measure the various parameters.	04
9	**Fiber optic Digital transmitter/Receiver parameter measurement**. a) To set up digital link and measure the various parameters.	04
10	**Study of fiber optical connectors**	02
11	**Parameter measurement of opto isolator**	02
12	**Study of OTDR.**	02

Note: Lab file should consist of minimum eight experiments.

Guide lines for ESE:-

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

Reference Books:

1. John M. Senior , “Optical Fiber Communication (principles & Practice)”,PearsonEducation
2. Govind P. Agrawal, ” Fiber Optic Communication System”, Wiley
3. Dr. Subir Kumar Sarkar,”Optical Fibres and Fiber Optic Communication System”, S.Chand

Elective-I Lab

1. VLSI Design Lab

(Note: Group A is compulsory, minimum three experiments to be performed from h group B and C each.)

Teacher should facilitate performing the following VHDL programs. The VHDL code/ design entry, synthesis and simulation can be done on Xilinx ISE software. Downloading / Configuration / Implementation can be done on any available CPLD/FPGA board using Xilinx ISE.

	Group A	Lab hours required
	Realization of a full adder circuit using dataflow, behavioral, structural and mixed type of description.	
	(Introduction to the Xilinx ISE software. Implementation of a full adder using data flow and behavioral style of description.)	**02**
	Implementation of a full adder using structural and mixed style of description. Structural style should use of gates as component and mixed style can have any two or more styles of description.)	**02**
	Group B	
1	**Realization of all 2 input and 3 input Logic Gates.** (All two input gates can be accommodated in single program and all three input gates in another program using dataflow style of description.)	**02**
2	**Realization of 2 to 4 decoder/3 to 8 decoder.** (Dataflow/ behavioral/ structural/mixed type of description may be used).	**02**
3	**Realization of 4 to 1 multiplexer/ 8 to 1 multiplexer.** (Dataflow/ behavioral/ structural/mixed type of description may be used).	**02**
4	**Realization of 4 bit binary to Gray converter/ BCD to seven segment decoder.** (Dataflow/ behavioral/ structural/mixed type of description may be used).	**02**
	Group C	
5	**Realization of JK and T flip-flop .** (Dataflow/ behavioral/ structural/mixed type of description may be used).	**02**
6	**Realization of 4 bit binary up down counter with Asynchronous reset.**	**02**

	(Dataflow/ behavioral/ structural/mixed type of description may be used).	
7	**Realization of 4 bit BCD counter with Synchronous reset.** (Dataflow/ behavioral/ structural/mixed type of description may be used).	**02**
8	**Realization of 4 Bit Left / Right Shift Register.** (Dataflow/ behavioral/ structural/mixed type of description may be used).	**02**

Note: Lab file should consist ALL programs from group A, and minimum THREE programs from each group B and group C each . The lab file for each experiment should consist of the schematic block of the design, its truth table, algorithm, VHDL code, UCF file and simulation waveforms. Student should be able to verify the truth table with simulation waveform and show the implementation.

Guide lines for ESE:-

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

Elective-I Lab

2. Broadband Communication Lab

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

SN	Experiment Title	Lab hours required
1	Introduction to Electronic Private Automatic Branch Switching Exchanges Study of working of a Manual and Automatic matrix switching Network	02
2	Learning Broadband communication and its various protocol and connection using simtel Netsys software	01
3	Study of different types of ISDN interfaces	01
4	To set basic configuration of ISDN system using Emulator, ISDN Telephones, terminal Adapter and Analog Telephones.	01
5	To analyze simple Trace using Protocol Analyzer after establishing, voice communication between two ISDN telephones	01
6	Study of Different types of Numbering in ISDN System	01
7	Study of point to point/multipoint connections in ISDN System	01
8	Study of filtering in ISDN analyzer	01
9	Study of ISDN Telephone Features	01
10	Study of Euro-/SDN ETSI standards with Fault Finding	01

Note: Lab file should consist of minimum eight experiments.

Guide lines for ESE:-

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

Elective-I Lab

3. Biomedical Engineering Lab

(Note: Minimum FOUR Experiments from each group.)

	Group A	Lab hours required
1	Measurement of Blood Pressure Indirect method.	02
2	Study of ECG amplifier to measure amplitude and frequency components. Record of PQRST waveform using ECG mechine.	04
3	Measurement of pulse Rate.	02
4	Study of measurement of temperature of human body direct and indirect method.	02
5	Study different biomedical electrodes.	04
	Group B	Lab hours required
1	Study of pace maker unit to compare the operation of heart with the normal functioning of heart.	02
2	Study of blood cell counter to measure cell counts.	02
3	Study of spectrophotometer.	02
4	Use of ultrasound in medical electronics.	02
5	Study of temperature telemetry system to measure the received data	02

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 practice.

References:

1. R.S.Khandpur - Bio-medical Instrumentation , TMH 2nd ed
2. Nandini K. Jog - Electronics in Medicine and Biomedical Instrumentation, PHI.
3. Cromwell - Biomedical Instrumentation and Measurements, PHI. 2nd ed/Pearson 4th ed
4. H. S. Kalsi – Electronics Instrumentation

Elective-I Lab

4. Industrial Automation Lab

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

SN	Experiment Title	Lab hours required
1	Study of relay and contactor logic for load control	02
2	Study of fully automatic DOL & star-delta starters	02
3	Study and verification of counter functions	02
4	Study of AC drives and verification of start, stop, jog and direction control features	02
5	Study of types, functioning and symbols of various hydraulic components	02
6	Study of AC drives and verification of start, stop, jog and direction control features	02
7	Study of types, functioning and symbols of various hydraulic components	02
8	Study of types, functioning and symbols of various pneumatic components.	02
9	Development of timer and counter functions using PLC.	02
10	Development of interface of I/O devices using PLC.	02
11	Communication, downloading / uploading of PLC programs	02
12	Basic Analog Inputs (AI) and Analog Output (AO) programming techniques using scaling functions.	02
13	Understanding GUI features of HMI (WinCC flexible / other compatible)	02
14	System graphic designing using SCADA (WinCC / other compatible)	02
15	Mini-hardware project: Integration of 1DI, 1DO & 1AI with PLC	02

Note: Lab file should consist of minimum any <u>eight</u> experiments.

Guide lines for ESE:-

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

Reference Books:

1) Programmable Logic Controllers: Principles and Applications, Webb &Reis, PHI.

NORTH MAHARASHTRA UNIVERSITY,

JALGAON (M.S.)

Final Year Engineering

(E&TC/E&C)

Faculty of Engineering and Technology

TEACHER AND EXAMINER'S MANUAL

Semester – VIII

W.E.F 2015 – 2016

Satellite & Mobile Communication

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

Unit - I

Teacher should facilitate learning of Overview of Satellite Systems, Orbits and Launching Methods .

1.	**Overview of Satellite Systems, Orbits and Launching Methods**		**Lecture required**	**Reference No**
	a	Introduction – Frequency Allocations for Satellite Services Intelsat, Polar Orbiting Satellites Kepler's First , Second and Third Law **(no derivation).**	02	01
	b	Definitions of Terms for Earth orbiting Satellites – Orbital Elements – Apogee and Perigee Heights**(Numerical)**	01	01
	c	**Orbital Perturbations**-effects of a nonspherical earth, atmospheric drag, **inclined orbits (Numerical)-** Calendars, Universal time, Julian dates, Sidereal time, The orbital plane, The geocentric –equatorial coordinates system Earth station referred to the IJK frame, The subsatellite point,	03	01
	d	sun-synchronous orbit, standard time	01	01

Unit – II

Teacher should facilitate learning of geostationary orbit, Wave Propagation and Polarization.

1.	**Geostationary orbit, Wave Propagation and Polarization**		**Lecture required**	**Reference No**
	a	**Geostationary orbit (Numerical) -** Introduction, antenna look angles, The polar mount antenna, limit of visibility, near geostationary orbits.	02	01
	b	Earth Eclipse of satellite, sun transit outage, launching orbits, block diagram of earth station, transponder and Telemetric Tracking Command (TT&C).	02	01

	c	**Wave Propagation and Polarization(Numerical)-** Introduction, atmospheric losses, ionospheric effects, rain attenuation, **Polarization-** Introduction, Antenna polarization, polarization of satellite signals, cross polarization discrimination, Ionospheric depolarization rain depolarization, ice depolarization	04	01

Unit – III

Teacher should facilitate learning of fundamental of Satellite Antenna and Link Design

1.	**Satellite Antenna and Link Design(Numerical)**		**Lecture required**	**Reference No**
	a	**Satellite Antenna -**Aperture antennas, **Horn Antenna(Introductory Part)**- conical horn antenna, Pyramidal horn antennas, The parabolic reflector, The offset feed, double reflector antennas – cassergrain antenna, Gregorian antenna,	03	01
	b	**The Space Link-** Introduction, equivalent isotropic radiated power, **Transmission losses**- free-space transmission, feeder losses, antenna misalignment losses, fixed atmospheric and ionospheric losses.	04	01
	c	The link power budget equation, system noise, antenna noise, carrier to noise ratio, the **uplink-** saturation flux density, input backoff, the earth station HPA, **Downlink-** output back off, satellite TWTA output, Effect of rain-uplink /downlink rain Fade margin, combined Uplink and Downlink C/N ratio	05	01

Unit – IV

Teacher should facilitate learning of Information and Detection Theory

1.	**Introduction to Wireless Communications and Modern Wireless Communications system**		**Lecture required**	**Reference No**
	a	Evolution of Mobile radio communication, Mobile Radio systems around the world, wireless communication system, Trends in cellular radio and personal communications,	01	02

	b	Second generation(2G) cellular networks, Third generation(3G) wireless networks-3G W-CDMA(UMTS),3G CDMA2000,3G TD-SCDMA, wireless local loop(WLL) and wireless Local Area Networks(WLANs)	03	02

Unit - V

Teacher should facilitate learning of represent of Cellular Concept and System Design Fundamentals, Wireless systems and Standards

1.	**Cellular Concept and System Design Fundamentals, Wireless systems and Standards**		**Lecture required**	**Reference No**
	a	Introduction, Frequency reuse, channel assignment strategies, Handoff strategies-prioritizing handoffs, practical handoff considerations,	02	02
	b	**Interference and system capacity**- co-channel interference and system capacity, channel planning for wireless systems, adjacent channel interference, power control for reducing interference, Trucking and grade of service	03	02
	c	**Improving coverage and capacity in cellular systems**-cell splitting, sectoring, repeaters for range extension, a microcell zone concept	02	02
	d	**Global System for Mobile (GSM)-**GSM services and features, GSM system Architecture, GSM radio subsystem, GSM channel types, frame structure for GSM, IS-95(CDMA).	02	02&03

Reference Books:

1. D. Roddy, "Satellite Communications", Tata McGraw-Hill, 4th Edition, ISBN-0-07-007785-1.
2. T. Rappaport, "Wireless Communications-Principles and Practice, 2nd Edition, ISBN-978-81-317-3186-4.
3. Raj Pandya, " Wireless and personal communication system" ,PHI.

Radiation and Microwave Techniques

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

For teaching and paper setting use reference books prescribed.

Unit - I

Teacher should facilitate Transmission Line theory and analytical and graphical solution for various problems in transmission line.

1.	**Microwave Transmission Lines**		Lecture required	Reference No
	a	Equivalent circuit of Transmission Line, Transmission Line Equation and Solution- Equation for characteristic impedance, attenuation, phase constant, phase velocity, numerical based on topic.	01	1, 2
	b	Reflection coefficient, Transmission coefficient, Standing wave and standing wave ratio, numerical based on topic.	01	1, 2
	c	Line impedance & admittance (equation of line impedance in terms of Z_L, Z_0, reflection coefficient, standing wave ratio	02	1, 2
	d	Impedance matching – single stub – derivation for calculation of length & position of stub, numerical on it. Theory of double stub (no derivation, no numerical), comparison of single stub and double stub method, quarter wave transformer.	02	1 , 2
	e	Application of smith chart in solving transmission line problems -determination of voltage minima maxima location, its shifting, input/load impedance, SWR, calculation of line impedance, length of line, calculation of single stub.	02	1 , 2

In Question papers along with theory & derivations, numerical also expected for topic a to d.

For smith chart topic - Equation regarding smith chart not expected in university examination. Numericals (graphical solution of transmission line problems using smith chart) expected in question paper,

Unit - II

Teacher should facilitate waveguide theory & passive microwave components used for microwave communication.

1.	**Microwave waveguides and components**		Lecture required	Reference No
	a	Rectangular waveguide – wave equation, Introduction to circular waveguide.	01	1, 2
	b	TE modes in rectangular waveguide- group velocity, phase velocity, guided wavelength, cut off frequency, cut off wavelength, characteristic wave impedance.	02	1, 2

	c	TM mode, group velocity, guided wavelength, cut off frequency, cut off wavelength, Dominant, degenerate modes	01	1, 2
	d	Microwave components – Principle of S-parameters, properties of S-matrix, waveguide Tees (E, H) – S matrix for E, H plane tee	01	1, 2
	e	Magic Tee (E-H), applications of magic tee. Directional couplers (two hole, multi hole, bathe hole coupler), performance parameters of directional couplers (Definitions of coupling factor, directivity, isolation),	01	1, 2
	f	Ferrite Devices – Isolator, Circulator, (construction, working & applications)	01	1, 2
	g	Waveguide Terminations- matched termination, short circuit plunger, Waveguide corners, bends & twists, Attenuators (fixed & variable), For all above devices – construction, operation and applications expected.	01	1, 2

In University, question papers along with theory questions, numericals based on topic b and c are expected.

S matrix of only E and H plane tee expected. No numericals based on S matrix expected in University Examination.

Unit - III

Teacher should facilitate Microwave tube devices & solid state devices for generation of microwave.

1.	**Microwave Tubes and Solid State Devices**		Lecture required	Reference No
	a	Microwave tubes – Limitation of conventional tube devices, Classification of microwave tubes, linear beam tube – two cavity klystron, multi cavity klystron – construction, working, applegate diagram.	02	1, 2
	b	Reflex klystron - construction, working, applegate diagram, Mode curve- power output and frequency characteristics,	01	1, 2
	c	Travelling wave tube (TWT) – different slow wave structures, Helix travelling wave tube -construction and working.	01	2,1
	d	Microwave cross field tube – Magnetron – cylindrical magnetron construction, resonant modes in magnetron, mechanism of oscillation, phase focusing.	01	2, 1
	e	Microwave solid-state devices – PIN diode – construction, equivalent circuit. Transferred Electron Device (TED) – Gunn diode – Gunn effect,	01	1, 2
	f	Ridley Watkins Hilsum (RWH) theory: differential resistance, two-valley model, Modes of operation.	01	1, 2

	g	Avalanche Transit time devices- IMPATT diode- construction, operating principle, mechanism of oscillations,	01	1, 2
	h	Strip Lines – Microstrip line, parallel strip lines, coplanar strip lines, shielded strip lines. Monolithic Microwave Integrated circuits (MMIC) – Introduction, Materials (substrate, conductor, dielectric, and resistive).	01	1, 2

Numerical/derivation not expected from microwave tubes in university question paper.

For Strip lines & Monolithic Microwave Integrated circuits – only introduction part expected (diagram and explanation, applications, advantage, disadvantages- as applicable)

Unit - IV

Teacher should facilitate different microwave measurement techniques and antenna theory.

1.	**Microwave Measurement and antennas**		Lecture required	Reference No
	a	Microwave Measurement – Power Measurement- low, medium and high power measurement using thermistor, barretter, thermocouple, calorimetric methods,	01	2, 4, 5
	b	microwave bench components – frequency meter, slotted line, tunable probe/detector, Frequency measurement- measurement using frequency meter, using slotted line, using Electronic technique (down conversion). VSWR measurement – VSWR meter – basics. VSWR measurement of Low and high VSWR using slotted line.	02	2, 4, 5
	c	Attenuation measurement, Impedance measurement – using slotted line and reflectometer.	01	2, 4, 5
	d	Microwave Antennas – Terms (fundamental parameters) - Radiation pattern, beamwidth, directivity, Antenna gain, efficiency, effective aperture.	01	3, 4, 5
	e	Aperture antenna – Horn antenna- E, H plane horn, pyramidal horn, conical horn, Equation for antenna gain, Directivity and Beamwidth	01	3, 4, 5
	f	Reflector antenna- Parabolic reflector with all types of feeding methods, Modified parabolic reflectors. Equation for antenna gain, Directivity and Beamwidth	01	3, 4, 5
	g	Lense antenna – types, construction, advantages, Slot antenna, Microwave strip line antennas-Introduction	01	3, 4, 5

Along with theory, numericals based on calculation of beamwidth, gain, diameter / size, expected for horn and parabolic antennas expected in university question paper.

No derivation expected for efficiency, Gain, beamwidth of antennas, only numericals based on formulas are expected.

Unit - V

Teacher should facilitate application of microwaves as RADAR

1.	**Application of Microwaves**		Lecture required	Reference No
	a	**RADAR**- Basic principles and fundamentals, applications	01	2, 3, 5
	b	Radar range equation, factors influencing maximum range, detection of signals in noise.	02	2, 3, 5
	c	Pulsed Radar system	01	2, 3, 5
	d	Detection of moving target - MTI Radar, CW Doppler radar, FMCW Doppler radar,	02	2, 3, 5
	e	**Industrial Applications of Microwaves** – Microwave heating, microwave oven,	01	2
	f	Thickness measurement, and Medical applications of microwaves.	01	2

Along with theory, problems based on radar topic expected for university question paper.

Reference Books:

1.	Samuel Liao, Microwave Devices and Circuits, Pearson Education, 3/e,
2.	Annapurna Das, Sisir Das, Microwave Engineering, TMH, 2/e
3.	David M. Pozar, Microwave Engineering, Wiley India, 4/e
4.	Sisodia, Gupta, Microwaves : Introduction to Circuits, Devices and Antennas, New Age, 1/e
5.	Manojit Mitra, Microwave Engineering, Dhanpat Rai, 3/e
6.	Robert E Collin, Foundations for Microwave Engineering, Wiley India, 2/e
7.	Simon Ramo, Fields and Waves in Communication Electronics, Wiley India, 3/e
8.	K K Sharma, Fundamentals of Microwave and Radar Engineering, S Chand. 1/e

Elective-II

1. Embedded System

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

Unit - I

1.	Embedded System Introduction		Lecture required	Reference No
	a	**Introduction to Embedded System, History-** Defination of Embedded System (ES) and its classification. History of ES.	01	1,4
	b	**Design challenges, optimizing design metrics-** Size, performance, Power, NRE cost, unit cost, flexibility, time to prototype, maintenability, correctness etc	01	
	c	**Time to market, applications of Embedded Systems-** Derivation for time to market concept. List the application of ES.	01	
	d	**Recent trends in embedded systems-** Processor power, memory, OS, communication interface & networking capability, programming language, development tools, programmable hardware etc	01	
	e	**Embedded Design concepts and definitions, hardware and software design and testing-** Simplified hardware architecture of ES, Parameter that includes the software and hardware design. Test the ES with different testing method.	02	
	f	**Communication protocols like CAN, bluetooth and Zig-bee**	02	

Unit – II

2.	ARM Embedded System		Lecture required	Reference No
	a	**RISC Design Philosophy, comparison between CISC and RISC, ARM Design Philosophy-** Brief Introduction to instruction, pipeline, registers and load store architecture. Compare CISC and RISC, Brief introduction to ARM Design Philosophy	01	2

	b	**Embedded System hardware -**ARM bus technology, AMBA bus protocol, memory, peripherals. **Embedded System software-** BOOT code	02	2
	c	**ARM Processor fundamentals, ARM core architecture, data flow model**	01	
	d	**Current Program Status Register-** Processor mode, blanked registers, states and instruction sets, interrupt masks, conditions Flags, condition execution. **Pipeline-** Five stage pipeline, pipe line execution characteristics	02	
		Exceptions, Interrupts and Vector Table, Core Extensions, ARM Processor families	02	

Unit – III

3.	**ARM Processor**		**Lecture required**	**Reference No**
	a	**ARM-7 processor LPC 2148 Block diagram and pin diagram-**	03	3
	b	**Operating modes: ARM mode & Thumb mode**- brief introduction to ARM instruction set and Thumb instruction set.	02	2
	c	**Study of on-chip peripherals like I / O ports, timers, counters, interrupts, on-chip ADC, DAC, RTC modules, WDT, PLL, PWM and USB**	03	2, 3

Unit – IV

4.	**Programming & Interfacing for LPC2148**		**Lecture required**	**Reference No**
	a	**Hardware interfacing of LPC2148 using Embedded C language : LED, Switches, LCD Display & stepper motor-** (Interfacing diagram with embedded C program)	05	3
	b	**On chip programming: UART, Timer, Real Time Clock & ADC-** study of onchip pheripheral registers along with embedded C program**.**	03	3

Unit - V

5.	Real Time Operating System Concept		Lecture required	Reference No
	a	**Architecture of kernel**-kernel objects. **task and task scheduler-** task states, context switching, scheduling algorithms,	02	4
	b	**Interrupt service routine (ISR), Mutex, Semaphores, mailbox, message queues**	01	4
	c	**Pipes, events, timers, Priority inversion problem, priority Inheritance,RTOS services in contrast with traditional OS**	02	
	c	**Introduction to Ucos II RTOS and it's features, study of kernel structure of Ucos II.**	01	6
	d	**Case study of digital camera and automatic chocolate vending machine (without codes)**	02	4

Reference Books:

1. Rajkamal - Embedded Systems, TMH, Second edition
2. Andrew sloss " Arm System Developer guide"
3. Data sheet and User manual of LPC2148.
4. Dr.K.V.K.K. Prasad - Embedded / real time system, Dreamtech.
5. Steve Furber - ARM System-on-Chip Architecture, Pearson
6. Jean J Labrose - MicroC / OS-II, Indian Low Price Edition

Elective-II

2. Digital Image Processing

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

For digital image processing use methods / steps available only with reference books.

Unit - I

Teacher should facilitate Image Fundamentals, components involved, methods, resolution types and basic pixel relationships.

1.	**Image Fundamentals:**		**Lecture required**	**Reference No**
	a	Introduction and Examples of Fields that use Digital Image Processing,	01	1,2,3,4
	b	Fundamental Steps and components in Digital Image Processing,	01	1,2,3,4
	c	Image Sensing ,Acquisition, Sampling and Quantization,	02	1,3,4
	d	Spatial and Gray level Resolution, Basic pixel relationship,	02	1,2,3,
	e	Distance Measures, Statistical Properties	02	1,2,3,4

Unit - II

Teacher should facilitate Enhancement in spatial domain and in frequency domain.

2.	**Image Enhancement:**		**Lecture required**	**Reference No**
	a	**Enhancement in Spatial Domain:** a) Basic Gray Level Transformations	01	1,3,4
	b	Histogram Processing	01	1,2,3,4
	c	Enhancements using arithmetic and logical operations	02	1,2,3,4
	d	Smoothening and sharpening Spatial filters	02	1,3,4
	e	**Enhancement in FrequencyDomain:** a)Smoothening and Sharpening frequency Domain Filters.	02	1,2,3,4

Unit – III

Teacher should facilitate Image compression Model, Error Free Compression,Lossless and lossy predictive coding and standards.

3.	Image Coding and Compression:		Lecture required	Reference No
	a	Image Coding Fundamentals, Image Compression Model	02	1,3,4
	b	Error Free Compression	01	1,2,3,4
	c	LosslessPredictive Coding	01	1,2,3,4
	d	Lossy-Compression, Lossy Predictive Coding, Transform Coding,	02	1,3,4
	e	ImageCompression Standards, JPEG Baseline Coder Decoder	02	1,2,3,4

Unit – IV

Teacher should facilitate Image Restoration and Colour Image Processing.

4.	Image Restoration and Color Image Processing:		Lecture required	Reference No
	a	Image Degradation Model, Noise Models,	01	1,3,4
	b	Restoration in Presence of Noise in spatial Domain	01	1,2,3,4
	c	Linear Filtering	01	1,2,3,4
	d	Inverse Filter, Wiener Filter	01	1,3,4
	e	Constrained Least Square Restoration, Geometrical Transformation	01	1,2,3,4
	f	Spatial Transformation, and Grey Level Transformation.	01	1,3,4
	g	Color Image Processing	01	1,2,3,4
	h	Color models, RGB to HIS and vice versa	01	1,2,3,4
	i	Color Transforms, Smoothing and Sharpening	01	1,3,4

Unit - V

Teacher should facilitate Image Analysis and Image Processing Applications.

5.	**Image Analysis and Image Processing Applications:**		**Lecture required**	**Reference No**
	a	Edge detection	01	1,3,4
	b	Boundary representation by chain codes and B splines,	01	1,2,3,4
	c	Morphological Image Processing: Dilation, Erosion, Opening, Closing on Binary Images,	01	1,2,3,4
	d	Segmentation: Point, line. Edge detection, Boundary detection and Thersholding.	01	1,2,3,4
	e	Applications: Character Recognition, Fingerprint Recognition, Remote Sensing.	02	1,3,4
	f	Medical imaging, electron microscopy.	01	1,2,3,4

Reference Books:

1.Gonzalez and Woods, "Digital Image Processing", Pearson Education,

2.A. K. Jain, "Fundamentals of Digital Image Processing"; Pearson Education

3. Pratt William, "Digital Image Processing", John Wiley & Sons.

4. Arthur Weeks Jr., "Fundamentals of Digital Intake Processing", PHI.

Elective-II

3. Telematics

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

For study of different concepts of telephone switching and mobile communication refer only reference books.

Unit – I

Teacher should facilitate telephone switching and traffic engineering.

1.	**Telephone switching and Traffic Engineering**		**Lecture required**	**Reference No**
	a	Evolution of telecommunication, simple telephone communication, basics of switching systems	01	1
	b	Dialing mechanism, electronics switching, digital switching system,	02	1
	c	SPC configuration , Architecture features, centralized and distributed SPC, enhanced services.	03	1
	d	Traffic Engineering, Introduction, Traffic usages, traffic measurement unit, traffic distribution, Grade of service, Blocking probability	02	1

Unit - II

Teacher should facilitate introduction to Wireless Communication System

2.	**Introduction to Wireless Communication System**		**Lecture required**	**Reference No**
	a	History and evolution of mobile radio systems,	02	2
	b	Examples of wireless communication systems, Paging, Cordless Telephone systems,	02	2
	c	Cellular Telephone systems, Trends in cellular radio and Personal communications,	02	2
	d	Wireless local loop and LMDS, Wireless Local Area Networks, Bluetooth and Personal Area Networks, IEEE 802.15, IEEE-802.16	02	2

Unit – III

Teacher should facilitate introduction to Mobile cellular Telephony

3.	Mobile cellular Telephony		Lecture required	Reference No
	a	Limitations of conventional mobile Telephone system, Frequency band allocation, Basic cellular system components,	02	2
	b	Operations of a cellular system, Calculation of maximum number of calls per hour per cell, frequency channels per cell, concept of frequency reuse, cell splitting	02	2
	c	Hand off mechanism, Delayed hand off, Forced hand off. Mobile assisted hand off. Cell site hand off, Inter system hand off, co-channel Interference reduction factor, fading. Multi-user communication. TDMA, FDMA and CDMA	04	2

Unit – IV

Teacher should facilitate introduction to Digital cellular systems

4.	Digital cellular systems		Lecture required	Reference No
	a	GSM, radio aspects, features of GSM. Architecture details channel structure, security aspects, Authentication and ciphering key.	04	3,4
	b	Different call flow sequences in GSM, North American CDMA cellular standard,	02	3,4
	c	radio aspect, forward link and Reverse link structure, key features of standard	02	3,4

Unit - V

Teacher should facilitate introduction to IP telephony

5.	IP telephony		Lecture required	Reference No
	a	Introduction to VOIP, low level protocols, - RTP / RTCP / UDP,	02	5,6
	b	voice activity detection and discontinuous transmissions. IP telephony protocols: - H.323 standard, session Initiation protocol (SIP),	03	5,6

	c	Gateway location protocol, QOS requirements, RSVP Architecture, message format, reservation merging.	03	5,6

Reference Books:

1. Vishwanathan - Telecommunication switching systems, PHI
2. William C.Y. LEE - Wireless and cellular Telecommunications, MGH , 3rd Ed, 4th Ed
3. Raj Pandya - Mobile and personal communication systems , PHI
4. Rappaport - Wireless communication, PHI
5. Andrew S Tanenbaum- Computer Networks, 4th ED, PHI/ Pearson Education
6. Alberto Leon Garcia - Communication network, TMH
7. Andreas F. Molisch - Wireless communication, Wiley

Elective-II

4. Neural Network and Fuzzy Logic

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

For designing of circuits use methods / steps available only with reference books.

Unit - I

Teacher should facilitate the fundamentals of Neural Network, Types & Terminology.

1.	**Fundamentals of Neural Networks**		**Lecture required**	**Reference No**
	a	**Fundamental Concept**: Artificial Neural Network, Biological Neural Network, Evolution of Neural Networks.	01	1,3
	b	**Basic Models of ANN**: Types based on Connections, Learning & Activation functions. Terminologies of ANN.	02	1,3
	c	**McCulloch-Pitts Neuron:** Theory & Architecture. Linear & Non-Linear Separability.	01	1,3
	d	**Hebb Network**: Thery, Training Algorithm. (Numericals)	02	1,3
	e	**Perceptron:** Theory, Architecture. (Numericals)	02	1,3

Unit - II

Teacher should facilitate architectures & learning algorithms of various supervised learning networks

2.	**Supervised Learning Networks**		**Lecture required**	**Reference No**
	a	**Perceptron Networks:** Theory, Architecture, Perceptron learning rule, Flow Chart for Training Algorithm, Training algothms for single output classes & multiple output classes, Testing Algorithms. (Numericals)	02	1,3
	b	**Adaptive Linear Neuron (Adaline):** Theory, Architecture, Delta rule for learning, Flowchart for training, Training Algorithm, Testing Algorithm. **Multiple adaptive Linear Neurons (Medaline):** Theory, Architecture, Rule for learning, Flowchart for training, Training Algorithm, Testing Algorithm.	01	1,3

	c	**Back-Propagation Network:** Theory, Architecture, Flowchart for Training Process, Training Algorithm, Learning Factors of BPN, Testing Algorithm.	02	1,3
	d	**Associative Memory Networks:** Training algorithms for Pattern Association, Hebb Rule, Outer Product Rule.	01	1,3
	e	**Auto associative Memory Network:** Theory, Architecture, Flowchart for Training Process, Training Algorithm, Testing Algorithm. **Hetero Associative Memory Network:** Theory, Architecture, Flowchart for Training Process, Training Algorithm, Testing Algorithm.	01	1,3
		Bidirectional Associative Memory (BAM): Theory, Architectures.	01	1,3

Unit – III

Teacher should facilitate concept of fuzzy logic in various applications.

3.	**Fundamentals of Fuzzy Logic**		**Lecture required**	**Reference No**
	a	**Fundamental Concept:** Introduction to Fuzzy Logic. Applications.	01	1,2
	b	**Introduction to Classical Sets & Fuzzy Sets:** **Classical Stes**- Operations, Properties, Function Mapping, **Fuzzy Sets**- Operations, Properties.	01	1,2
	c	**Classical Relations & Fuzzy Relations:** **Classical Relations** – Cardinality, Operations, Properties, Composition of Classical Relations. **Fuzzy Relations -** Cardinality, Operations, Properties, Composition of Fuzzy Relations.	03	1,2
	D	Membership Functions: Features of membership function, Fuzzification, Various methods of membership value assignments	01	1,2
	e	Defuzzification: Lambda-Cuts on Fuzzy Sets, Lambda-Cuts on Fuzzy Relations, Various Defuzzification methods.	02	1,2

Unit – IV

Teacher should facilitate the Fuzzy Arithmetic, Measure & significance of Rule Base Approximate Reasoning

4.	Fuzzy Arithmetic, Measure & Rule Base Approximate Reasoning		Lecture required	Reference No
	a	**Fuzzy Arithmetic:** Interval Analysis, Fuzzy Numbers, Fuzzy Ordering, Fuzzy Vectors **Extension Principle**	01	1,2
	b	**Fuzzy Measures:** Belief & Plausibility Measures, Probability Measures, Possibility & Neccessity Measures.	01	1,2
	c	**Fuzzy Rule base & Approximate Reasoning:** Truth Values & Tables in Fuzzy Logic, Fuzzy Propositions, Formation of Rules, Decomposition of Rules, Aggregation of Fuzzy Rules.	04	1,2
	d	Fuzzy Inference System.	02	1,2

Unit - V

Teacher should facilitate the application of Neural Networks & Fuzzy Logic to the real world problems

5.	Applications & Advanced Systems		Lecture required	Reference No
	a	**Applications of Neural Networks:** Character Recognition Networks, Control System, Robot Kinematics, Expert Systems for Medical Diagnosis.	05	03
	b	**Applications of Fuzzy Logic:** Pattern Recognition, Control System.	03	02

Reference Books:

1) Principles of Soft Computing by S. N. Sivanandam & S. N. Deepa, Wiley India, Edition

2) Fuzzy Logic with Engineering Applications by Timuthi J. Ross, Wiely.

3) Introduction to Artificial Neural Systems by Jacek M. Zurada, West Publishing Company

Elective-III

1. Robotics

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

For designing of circuits use methods / steps available only with reference books.

Unit - I

Teacher should facilitate basic of Robots.

1.	**Introduction**		**Lecture required**	**Reference No**
	a	Automation and Robotics, Definition, Laws of robotics, Basic Structure of Robots.	02	2, 3,4
	b	Classification of Robots based on co-ordinate system, Present trends and future trends in robotics.	02	1, 2, 3,4
	c	Overview of robot subsystems, Components of Robot system-Manipulator, Controller, Power conversion unit etc,	03	2,3
	d	Specifications of robot, programming robots.	01	3

Unit - II

Teacher should facilitate Dynamic Modeling of Robotic and Kinematics - Link co-ordinate frames.

2.	**Dynamics & Kinematics**		**Lecture required**	**Reference No**
	a	Dynamic constraints, velocity & acceleration of moving frames, Robotic Mass Distribution & Inertia, Tension, Newton's equation.	02	1, 2, 3
	b	Euler equations, Dynamic Modeling of Robotic Manipulators. Homogeneous co-ordinate vector operations, matrix operations.	02	3.5
	c	Co-ordinate reference frames, Homogeneous transformation and manipulator orientation relative points reference frames, forward Kinematics - Link co-ordinate frames.	02	3,4.5
	d	D-H matrix, Inverse or back solutions- problem of obtaining inverse solution, techniques of using direct & geometric approach.	02	1,2,3

Unit – III

Teacher should facilitate actuators and sensors..

3.	**End Effectors and Actuators**		**Lecture required**	**Reference No**
	a	Different types of grippers, vacuum & other methods of gripping	02	1,2
	b	Overview of actuators, Internal & External sensors	01	1, 2
	c	Position, relocking and acceleration sensors, proximity sensors,	02	1,2
		Force sensors, touch slip sensor, laser range finder, camera	03	1,2

Unit – IV

Teacher should facilitate Jacobian in terms of D-H matrix and control loops of robotic system.

4.	**Motion Planning and Controllers**		**Lecture required**	**Reference No**
	a	On-off trajectory, relocking and acceleration profile.	02	1, 2
	b	Cartesian motion of manipulator, joint interpolated control.	02	1,2
	c	Jacobian in terms of D-H matrix, Obstacle avoidance.	02	1,2,3
	d	Basic control system, control loops of robotic system, Fuzzy controllers.	02	1,2

Unit - V

Teacher should facilitate Machine Vision system and Application of Machine Vision System.

5.	**Robot Vision**		**Lecture required**	**Reference No**
	a	Machine Vision system, description, sensing, Digitizing, Image Processing and Analysis.	03	1,2
	b	Architecture of robotic vision system.	01	3

	c	Application of Machine Vision System.	02	2,3
	d	Robotic assembly sensors & Intelligent Sensors.	02	2,3

Reference Books:

Text Books:

1. Fundamentals of Robotics: Analysis and Control – Robert J Schilling,PHI, NewDelhi
2. Robotic Engineering – Klafter, Thomas, Negin,PHI, New Delhi
3. Robotics and Control- R. K. Mittal, I. J. Nagrath, TMH, NewDelhi

Reference Books:

4.Robotics for Engineers – Yoram Koren,McGraw Hill, New York
5.Fundamentals of Robotics– T.C. Manjunath, Nandu Publishers, Mumbai
6.MEMS and Microsystems Design and Manufacture- HSU, TMH , NewDelhi

Elective-III

2. Nanotechnology

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

Unit – I

Teacher should facilitate learning of Nanotechnology.

1.	**Introduction to Nanotechnology**		**Lecture required**	**Reference No**
	a	Introduction: Evolution of science and technology, Introduction to Nanotechnology.	01	1,3
	b	Nanotechnology–Definition and Difference between Nanoscience and Nanotechnology.	02	1, 2
	c	Feynman predictions on Nanotechnology.	02	1, 3
	d	Role of Bottom up and top down approaches in nanotechnology, challenges in Nanotechnology.	03	1,3

Unit - II

Teacher should facilitate learning of Physical chemistry of solid surfaces.

2.	**Physical Chemistry of Solid Surfaces**		**Lecture required**	**Reference No**
	a	Introduction, Surface Energy.	02	1,3
	b	Chemical potential as function of surface curvature.	02	1,3
	c	Electrostatic Stabilization.	02	1,3
	d	Steric Stabilization.	02	1,3

Unit – III

Teacher should facilitate learning of nano particles and nano tubes.

3.	**Nano Particles and Nanotubes**		**Lecture required**	**Reference No**
	a	Properties of Nano particles: Metal nanostructures and semiconducting nanoparticles.	02	1,2
	b	Carbon nanostructure: carbon molecules, cluster, Nanotubes.	02	1, 2

	c	Properties of Nanotubes strength and elasticity.	02	1,2
	d	Applications of carbon Nanotubes.	02	1,2

Unit – IV

Teacher should facilitate learning of special nano material.

4.	**Special Nanomaterial**		**Lecture required**	**Reference No**
	a	Characterization and tool: carbon nano tubes, nano composites, carbon fullerenes.	02	1,3
	b	Micro and mesoporous material, core shell structure. Organic-Inorganic Hybrid.	02	1,3
	c	Intercalation Compounds, Nanocomposite & Nanograined material.	02	1,3
	d	Inverse opals,Bio induced nanomaterial.	02	1,3

Unit – V

Teacher should facilitate learning of Nano technology in electronics.

5.	**Nanotechnology in Electronics**		**Lecture required**	**Reference No**
	a	Nanomachines and nano devices NEMS and MEMS and their fabrication.	02	1,3
	b	Use of nanotechnology in electronics, Application of nano structure in electronics, sensor, optics, energy capture-transformation and storage.	03	1,3
	c	Applications of nanotechnology in biomedical electronics. Drug, Drug Delivery	01	1,3
	d	Photodynamic therapy, Molecular motors, Neuroelectronic interface.	02	1,3

Reference Books:

1. Mark Ratner and Daniel Ratner,"Nanotechnology:A Gentle introduction to next big Idea".Pearson Education.
2. Introduction to Nanotechnology-by Charles P.Poole Jr.Frank J.Owens-John Wiley & Sons.
3. Nano structure & Nano material by Guozhong cao,Imperial College Press.

Elective-III

3. Telecomm Network Management

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

Unit - I

Teacher should explain about **TMN architecture**

1.	**Foundations and TMN architecture**		**Lecture required**	**Reference No.**
	a	Network management standards, network management model, organization model, information model	03	1
	b	Abstract syntax notation 1 (ASN. 1), encoding structure, macros, functional model.	02	1
	c	Terminology, functional TMN architecture, Information architecture.	01	1
	d	physical architecture, TNN tube TMN and OSI.	02	1

Unit - II

Teacher should explain concepts of **Network managements**

2.	**Network managements**		**Lecture required**	**Reference No.**
	a	Configuration Management	02	1
	b	Fault Management, Performance Management	03	1
	c	Error Correlation Technology, Security Management, Accounting Management.	01	1
	d	Service Level Management, Management Service	02	1

Unit – III

Teacher should explain **TMN Modeling & Service**

3.	**TMN Modeling & Service**		**Lecture required**	**Reference No.**
	a	CMISE model, service definitions, errors, scooping and filtering features	02	1,2

	b	Synchronization, functional units, association services, common management information protocol specification	02	1,2
	c	Rationale for information modeling, management information model, object oriented modeling paradigm,	02	1,2
	d	Management Information Base (MIB)	02	1,2

Unit – IV

Teacher should explain **Simple Network Management Protocol.**

4.	**SNMP**		**Lecture required**	**Reference No.**
	a	**SNMPv1:** managed networks, SNMP models, organization model, information model	03	1, 3
	b	**SNMPv2:** communication model, functional model, major changes in SNMPv2, structure of management information (SMI), MIB	02	1,3
	c	SNMPv2 protocol compatibility with SNMPv1	01	1,3
	d	**SNMPv3:** architecture, applications, MIB security, Remote monitoring SM and MIB, RMON1 and RMON2	02	1,3

Unit - V

Teacher should explain functionalities of **Network management and tools**

5.	**Network Management And Tools**		**Lecture required**	**Reference No.**
	a	ATM integrated local management interface, ATM, MIB M1, M 2, M 3, M 4 interfaces	02	1,2,3
	b	ATM digital exchange interface management	03	1,2,3
	c	Digital subscriber loop (DSL) and asymmetric DSL technologies	02	1,2,3
	d	Network statistics management. Management platform case studies: OPENVIEW, ALMAP	01	1,2,3

Reference Books:

1. Mani Subramaniam, —Network Management Principles and Practise", Addison Wisely, New York, 2000.
2. Lakshmi G. Raman, — Fundamental of Telecommunications Network Management" Eastern Economy Edition, IEEE Press New Delhi.
3. Salh Aiidarons, Thomas Plevoyak —Telecommunications Network Technologies and implementations" Eastern Economy Edition, IEEE press New Delhi-1998.
4. Telecommunication Network Management - Haojin Wang Mc-Graw Hill Professional Publication.

Elective-III

4. Antenna and Wave Propagation

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

Unit - I

Teacher should facilitate introduction Antenna and it's Fundamental Concepts.

1.	**Antenna Fundamental Concepts**		**Lecture required**	**Reference No**
	a	Definitions – Radiation intensity – Directive gain – Directivity – Power gain – Beam width – Band width – Gain and radiation resistance of current element	02	1
	b	Half-wave dipole and folded dipole – Reciprocity principle Effective length and effective area, Relation between gain, effective length and radiation resistance.	02	1, 2
	c	Physical concept of radiation, Radiation pattern, near- and far-field regions, effective aperture, polarization, input impedance, efficiency	02	1, 2
	d	Friis transmission equation, radiation integrals and auxiliary potential functions	02	1, 2

Unit - II

Teacher should facilitate Antenna Arrays, Radiation from Wires and Loops.

2.	**Antenna Arrays, Radiation from Wires and Loops**		**Lecture required**	**Reference No**
	a	Antenna array concept	01	1, 2
	b	Analysis of uniformly spaced arrays with uniform and non-uniform excitation amplitudes,	03	1, 2
	c	Extension to planar arrays.	01	1, 2
	d	Infinitesimal dipole, finite-length dipole, linear elements near conductors,	02	1, 2
	e	dipoles for mobile communication, small circular loop.	01	1, 2

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Unit – III

Teacher should facilitate concept of Aperture Antennas

3.	**Aperture Antennas**		**Lecture required**	**Reference No**
	a	Huygens' principle, radiation from rectangular and circular apertures, design considerations,	02	1, 2
	b	Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts.	02	1, 2
	c	Broadband Antennas: Broadband concept,	02	1, 2
	d	Log-periodic antennas, frequency independent antennas.	02	1, 2

Unit – IV

Teacher should facilitate need of Microstrip Antennas.

4.	**Microstrip Antennas**		**Lecture required**	**Reference No**
	a	Concept, Advantages and disadvantages,	01	1, 2
	b	Basic characteristics of microstrip antennas,	02	1, 2
	c	feeding methods, methods of analysis,	03	1, 2
	d	design of rectangular and circular patch antennas.	02	1, 2

Unit - V

Teacher should facilitate basics of Wave Propagation.

5.	**Wave Propagation**		**Lecture required**	**Reference No**
	a	**The three basic types of propagation:** Ground wave, space wave and sky wave propagation.	01	2,3
	b	**Sky Wave Propagation:** Structure of the ionosphere – Effective dielectric constant of ionized region – Mechanism of refraction – Refractive index – Critical frequency – Skip distance – Effect of earth's magnetic field	03	2,3

		– Energy loss in the ionosphere due to collisions – Maximum usable frequency – Fading and diversity reception.		
	c	**Space Wave Propagation:** Reflection from ground for vertically and horizontally polarized waves – Reflection characteristics of earth – Resultant of direct and reflectedray at the receiver – Duct propagation.	03	2,3
	d	**Ground Wave Propagation:** Attenuation characteristics for ground wave propagation –Calculation of field strength at a distance.	01	2,3

Reference Books:

1. C. A. Balanis, "Antenna Theory and Design", 3rd Ed., John Wiley & Sons., 2005.
2. Antennas And Wave Propagation by: K.D.PRASAD
3. Harish A. R., Antenna and wave propagation, Oxford University Press.

Satellite & Mobile Communication Lab

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

Group A

SN	Experiment Title	Lab hours required
1	To set up Direct link In this practical use direct connection between Transmitter and receiver	01
2	To set up Active Satellite link	01
3	To Study Satellite transponder	01
4	To set up Satellite communication link	01
5	To transmit and receive function generator waveforms through Satellite link.	01
6	To understand the shape of Earth. Measurement of latitude and longitude.	01
7	To understand the principle of PRN code in GPS.	01

Group B

SN	Experiment Title	Lab hours required
8	To establish PC-to-PC Communication using Satellite Communication link.	01
9	To establish the link between GPS Satellite and GPS Trainer.	01
10	Mobile Transmitter and Receiver (Trainer Kit)	01
11	To study GSM architecture	01
12	To Study cordless Telephone system	01
13	To study CDMA	01
14	To study VOIP	01
15	To study RSVP Architecture.	01

16	Study of GSM AT commands.	01

Note: (Note: Minimum FOUR Experiments from each group.)

Guide lines for ESE:-

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

Reference Books:

1. D. Roddy, "Satellite Communications", Tata McGraw-Hill, 4th Edition, ISBN-0-07-007785-1.
2. T. Rappaport, "Wireless Communications-Principles and Practice, 2nd Edition, ISBN-978-81-317-3186-4.

Radiation and Microwave Techniques Lab

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

SN	Experiment Title	Lab hours required
1	Plot and study V-I Characteristics of GUNN Diode	02
2	Plot and study Reflex Klystron Characteristics	02
3	Measurement of Attenuation (Fixed and Variable)	02
4	Microwave Junction: Power splitting Characteristics (E / H/ EH plane tee)	02
5	Measurement of coupling factor, insertion loss, directivity and isolation of Directional coupler	02
6	Study of Circulators (Y or T Type) and Isolators (measurement of isolation)	02
7	Measurement of VSWR (using V_{max} / V_{min} method)	02
8	Plot radiation pattern of horn antenna.	02
9	Plot radiation pattern of parabolic antenna.	02
10	Measurement of unknown impedance using smith chart	02
11	Study of MIC components.	02

Note: Lab file should consist of minimum Eight experiments.

Guide lines for ESE:-

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

Reference Books:

1.	Samuel Liao, Microwave Devices and Circuits, Pearson Education, 3/e,
2.	Annapurna Das, Sisir Das, Microwave Engineering, TMH, 2/e
3.	David M. Pozar, Microwave Engineering, Wiley India, 4/e
4.	Sisodia, Gupta, Microwaves : Introduction to Circuits, Devices and Antennas, New Age, 1/e
5.	Manojit Mitra, Microwave Engineering, Dhanpat Rai, 3/e
6.	Robert E Collin, Foundations for Microwave Engineering, Wiley India, 2/e

Elective-II lab

1. Embedded System lab

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

SN	Experiment Title	Lab hours required
1	**Study of IDE (Integrated Development Environment)-** Understand the characteristics, feature, uses, advantages and examples of IDE.	2
2	**C-Program to explore timers / counter -** To generate clock signal and to perform timer/counter operation	2
3	**C-programs for interrupts-** To generate an interrupt and perform particular action	2
4	**Program to interface LED and switch-** To interface LED and Switches such that after pressing switch respective LED should turn ON and Blinking of LEDs in different manner with different delay.	2
5	**Program to interface LCD** Write a C program for interfacing of LCD and display the message by using string concept.	2
6	**Program to interface Keyboard and display key pressed on LCD** Write a C program to interface keypad and LCD and display message as respective key press.	2
7	**Program to interface stepper motor-** Write a C program to rotate the stepper motor in clockwise and anticlockwise direction.	2
8	**Writing basic C-programs for I / O operations-** Write a C program to accept data from sensor and to display it on LCD / LED**.**	2
9	**Implementation of USB protocol and transferring data to PC-**	2

	To transfer string on PC using USB Protocol.	
10	Write a program / algorithm for the microcontroller to work in low power modes**.**	2
11	**Program to demonstrate RF communication-** Write a C program to interface RF Transmitter-Receiver to LPC 2148 and to transfer data using RF Communication.	2
12	**Writing a scheduler / working with using RTOS for 4 tasks with priority. The tasks may be keyboard, LCD, LED etc.and porting it on microcontroller/ microprocessor**	2

Note: Lab file should consist of minimum eight experiments.

Guide lines for ESE:-

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

Elective-II lab

2. Digital Image Processing Lab

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

SN	Experiment Title	Lab hours required
1	**Study of different file formats e.g. BMP, TIFF and extraction of attributes of BMP.** a) BMP. b) TIFF and extraction of attributes of BMP.	04
2	**Study of statistical properties- mean, standard deviation, profile, variance and Histogram plotting.** a) Study of statistical properties-mean, standard deviation and profile. b) Study of statistical properties- variance and Histogram plotting.	04
3	**Histogram equalization and modification of the image.** a) Histogram equalization of the image. b) modification of the image.	04
4	**Gray level transformations such as contrast stretching, negative, power law transformation** a) contrast stretching, negative. b) power law transformation	04
5	**Spatial Domain filtering- smoothing and sharpening filters.** a) Spatial Domain filtering- smoothing filters. b) Spatial Domain filtering- sharpening filters.	04
6	**DCT / IDCT of given image.** a) DCT of given image. b) IDCT of given image.	04
7	**Edge detection using Sobel, Prewitt and Roberts operators.** a) Edge detection using Sobel, Prewitt operators. b) Edge detection using Roberts operators.	04
8	Capturing image through grabber card from camera and Process it.	02
9	**Application Development** a. Biometric Authentication such as Face / Finger Print / Signature Recognition. b. Human Expression Detection.	04
10	**Creating noisy image and filtering using MATLAB**	02

11	**Study of morphological processing in digital image**	02
12	**Converting color image to B / W image and vice versa.**	02

Note: Lab file should consist of minimum Eight experiments.

All experiments must performed using MATLAB only.

Guide lines for ESE:-

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

Reference Books:

1) Gonzalez and Woods, "Digital Image Processing", Pearson Education,

2) A. K. Jain, "Fundamentals of Digital Image Processing"; Pearson Education

3) Pratt William, "Digital Image Processing", John Wiley & Sons

4) Arthur Weeks Jr., "Fundamentals of Digital Intake Processing", PHI.

Elective-II Lab

3. Telematics Lab

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

SN	Experiment Title	Lab hours required
1	**To Study Electronic Telephone exchange (C-Dot. OR E-10B)** a. CDOT MAX-XL switching network on PSTN platform b. Trunk group setup and call flow analysis on CDOT MAX-XL switching system c. Subscribers Management and features in CDOT MAX-XL switching system **d.** SS7 signaling setup in CDOT MAX-XL switching system	04
2	**Traffic Measurement calculations** **a.** Study of different traffic parameters and calculations	02
3	**To Study Digital cordless Telephone system** a. Study the functional block diagram and operation of all sections of Digital Cordless Telephone system - Base unit b. Study the Polarity protection block c. Study the functional block diagram and operation of all sections of Handset unit d. Study the charging circuit (with Base unit as well as with adaptor)	04
4	**To Study Telephone Trainer Kit** a. Understanding of Telephone b. Study of Telephone features c. Study of Speech Circuits, ringers, tone dialing, pulse dialing and switching mechanism between subscribers: incoming and outgoing calls.	04
5	**Study of Mobile Transmitter and receiver** a. Study and observe Transmitted/Received RF signals b. Study and observe Tx IQ/ Rx IQ signals c. Study and observe signal constellation of GMSK signal (Tx I/Q) & (Rx I/Q) d. Study and measure Battery voltages the Battery charging phenomena e. Study and analyze Different sections & fault finding	04

SN	Experiment Title	Lab hours required
6	**Study of DTMF signaling including DTMF decoder** a. Study of the Telephone by Line Connection b. Study of the Polarity Protection Block c. Study of the Working of Voltage Dropper Circuit in Telephone	2
7	**To study GSM architecture** **a.** GSM Theory & Standards b. Understanding of GSM technology, its network, GSM capability & data services	2
8	**Study of GSM AT commands** a. Understanding RF environment & study of GSM network by actually connecting to the GSM environment by any service provider. b. Command Level Study c. Real Time study of GSM 07.05 & 07.07 commands	2
9	**To study CDMA** a. To study theory of CDMA DSSS Modulation & 4 Demodulation b. To generate CDMA-DSSS signal c. To demodulate CDMA-DSSS signal using BPSK d. To study pseudo random bit sequence generation.	2
10	**To study of VOIP** a. To Study the Block Diagram and Working principle of VOIP	2
11	**To study of RSVP architecture** a. To study the RSVP as part of the integrated services approach that provide QOS to individual application	2

Note: Lab file should consist of minimum Eight experiments.

Guide lines for ESE:-

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

Reference Books:

1. Vishwanathan - Telecommunication switching systems, PHI
2. William C.Y. LEE - Wireless and cellular Telecommunications, MGH , 3rd Ed, 4th Ed
3. Raj Pandya - Mobile and personal communication systems , PHI
4. Rappaport - Wireless communication, PHI
5. Andrew S Tanenbaum- Computer Networks, 4th ED, PHI/ Pearson Education
6. Alberto Leon Garcia - Communication network, TMH
7. Andreas F. Molisch - Wireless communication, Wiley

Elective-II Lab

4. Neural Network and Fuzzy Logic Lab

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

SN	Experiment Title	Lab hours required
1	**To study implement AND, OR, NAND etc logic function using perceptron.**	2
2	**To study implement EX—OR logic function using perceptron.**	2
3	**To study implement MEDALINE network.**	2
4	**To study and implement back propagation network.**	2
5	**To study and implement BAM algorithm..**	2
6	**To study and implement fuzzy compositions of given examples.**	2
7	**To study and implement fuzzification methods.**	2
8	**To study and implement defuzzification methods.**	2
9	**To study and implement fuzzy rule base system.**	2
10	**To study fuzzy inference system.**	2
11	**To study and implement neural system for Character Recognition/ Control System/ Expert Systems for Medical Diagnosis.**	2
12	**To study and implement Fuzzy Logic system for Pattern Recognition/Control system**	2

Note: Lab file should consist of minimum eight experiments.

Guide lines for ESE:-

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

Reference Books:

1. Principles of Soft Computing by S. N. Sivanandam & S. N. Deepa, Wiley India, Edition
2. Fuzzy Logic with Engineering Applications by Timuthi J. Ross, Wiely.
3. Introduction to Artificial Neural Systems by Jacek M. Zurada, West Publishing Company