RESOLUTIONS MADE IN BOARD OF STUDIES MEETING

Resolved to adopt the following modified scheme for M.E (Electronic Instrumentation)

DEPARTMENT OF ELECTRONICS & COMMUNICATION ENGINEERING

Andhra University, Visakhapatnam

M.E (Electronic Instrumentation), Two year (Four Semester)

Scheme to be valid with effect from the admitted batch of 2007 - 2008

Semester – I

Subject Code	*Subject title*	*Credits*	*Pds/week*		*Sessionals*	*Unv. Exam Marks*	*Total*
			Theory	*Lab*			
MEI-1	Digital Signal Processing	4	4	-	30	70	100
MEI-2	Microprocessor Systems	4	4	-	30	70	100
MEI-3	Optical fibers and applications	4	4	-	30	70	100
MEI-4	Transducers and Signal Conditioners	4	4	-	30	70	100
MEI-5	VLSI	4	4	-	30	70	100
MEI-6	Elective - I	4	4	-	30	70	100
MEI-7	Microprocessor Lab	2	-	4	100	-	100
MEI-8	Seminar – I	2	-	2	100	-	100
	Total	28	24	6			

Elective – I

a) EMI/EMC
b) Artificial Intelligence and Neural Networks
c) Application Specific Integrated Circuits (ASIC)

Semester II

Subject Code	*Subject title*	*Credits*	*Pds/week*		*Sessionals*	*Unv. Exam Marks*	*Total*
			Theory	*Lab*			
MEI-9	Electronic Instrumentation Techniques	4	4	-	30	70	100
MEI-10	Data Acquisition System	4	4	-	30	70	100
MEI-11	Linear and Digital Systems Design	4	4	-	30	70	100
MEI-12	Bio-Medical Instrumentation	4	4	-	30	70	100
MEI-13	Elective - II	4	4	-	30	70	100
MEI-14	Elective - III	4	4	-	30	70	100
MEI-15	Instrumentation Lab	2	-	4	100	-	100
MEI-16	Seminar – II	2	-	2	100	-	100
	Total	28	24	6			

Elective – II

a) Process Control Instrumentation
b) Remote Sensing and Image Sensors
c) GPS & Applications

Elective III

1. Nanotechnology and Applications
2. Microcontrollers and Embedded Systems
3. Digital Image Processing

Semester III

Subject Code	*Subject title*	*Credits*	*Sessionals*	*Unv. Exam Marks*	*Total*
MEI-17	Thesis (Part I)	15	50	50	100

Project work to be submitted before the end of 3rd Semester and it will be evaluated by a committee consisting of Chairman, Board of Studies, Head of the Department and thesis guide in the AUCE(A) and in the Affiliated Colleges Thesis (Part I) will be evaluated by concerned Head of the Department and thesis guide of their respective colleges.

Semester IV

Subject code	*Subject title*	*Credits*	*Sessionals*	*Uni. Exam marks*	*Total*
MEI – 18	Thesis (Part II)	20	30	70	100

Thesis work is for a period of SIX months in Industry/Department. The students are required to submit their thesis two/three phases. Thesis is evaluated by a committee consisting of an external member from reputed institution, HOD/ Chairman BOS and thesis Guide.

M.E. (Electronic Instrumentation)

Syllabus for

DIGITAL SIGNAL PROCESSING

Credits : 4

Subject Code : MEI – 1 **Exam Marks :** 70

I – Semester **Sessionals :** 30

Common with M.Tech (Radar and Microwave Engineering), Digital Signal Processing (MTRM – 1), M.Tech (Communication Systems), Digital Signal Processing (MTCS-4)

Chapter – I : Advanced digital filter design techniques : Multiple band optimal FIR filters – design of filters with simultaneous constraints in time and frequency response, optimization methods for designing IIR filters, comparison of optimum FIR filters and delay equalized elliptic filters.

Chapter – II : Multirate DSP : The basic sample rate alteration – time – domain characterization, frequency – domain characterization : Cascade equivalences, filters in sampling rate alteration systems, digital filter banks and their analysis and applications, multi level filter banks, estimations of spectra from finite – duration observation of signals.

Chapter – III : linear prediction and optimum liner filters : forward and backward linear prediction, AR Lattice and ARMA lattice – ladder filters, Wieners filters for filtering on prediction.

Chapter – IV : DSP Algorithms : The Goertzel algorithm, the chirp – z transform algorithm the Levinson – Durbin algorithms, the Schur algorithm, and other algorithms, computations of the DFT, concept of tunable digital filters.

Chapter – V : Signal Processing Hardware : Multipliers, dividers, different forms of FIR Hardware, multiplexing, DTTR, TDM to FDM translator, realization of frequency synthesizer, FET hardware realization, different FFT architectures, special FFT processors, convolvers, Lincoln laboratory FDP and the compatible computer configurations.

Chapter – VI : Applications of DSP :

a) Speech : Model of speech production, speech analysis – synthesis system vocoder analyzers and synthesizers, linear prediction of speech.

b) DTMF System

Suggested Books :

1. Theory and applications of digital signal processing by Lawrence R. Rabiner and Bernard Gold, PHI
2. Digital Signal Processing. Principles, algorithms, and applications by John G. Proakis and Dimitris G. Manolakis, PHI, 1997.
3. Digital Signal Processing, A Computer – Based approach, by Sanjit K. Mitra, Tata Mc Graw-Hill, 1998

M.E. (Electronic Instrumentation)

Syllabus for

MICROPROCESSOR SYSTEMS

Credits: 4

Subject Code : MEI – 2 **Exam Marks :** 70

I – Semester **Sessionals :** 30

Common with M.Tech (Radar and Microwave Engineering), Microprocessor Systems (MTRM-2)

Introduction : Historical background, Microprocessor based personal computer systems, RISC processor, Micro controllers, comparison of 8048, 8049, 8051 and 8052, Architecture of 8051.

Introduction and comparison of 8086, 8088, 80186 / 80188, 80286, 80386, 80486, Pentium and Pentium – Pro Processors, Addressing modes, Memory and Architecture. 8086 / 8088 Hardware specifications – Memory interface – I/O Interface – Interrupts – DMA – The Arithmetic Coprocessor Bus Interface - 8086 / 8088 Addressing Modes – Instructions – Programming.

References :

1. The Intel Microprocessors 8086 / 8088, 80186, 80188, 80286, 80386, 80486, Pentium and Pentium – Pro Processor Architecture, Programming and Interface by Barray B. Berry, 4th Edition, PHI.

2. Microprocessors Principles and Applications by Gilmore, 2nd Edition, TMH.

3. Microprocessors and Interfacing Programming and Applications by Douglas V. Hall, Mc Graw Hill.

4. Microprocessors / Microcomputers Architecture, Software and Systems by A.J. Khambata, John Wiely & Sons.

Advanced Microprocessors by Daniel Tabak, Mc Graw Hill, 1995.

M.E. (Electronic Instrumentation)

Syllabus for

OPTICAL FIBERS AND THEIR APPLICATIONS

Credits : 4

Subject Code : MEI-3 **Exam Marks : 70**

Semester – I **Sessionals : 30**

Common with M.Tech (Radar and Microwave Engineering), Optical Fibers And Their Applications (MTRM-3), M.Tech (Communication Systems) Optical Fibers and Applications (MTCS-5)

1. Optic Fiber Waveguides

   Step – Index Fiber, Graded – Index Fiber, Attenuation, Modes in Step-Index Fibers, Modes in Graded – Index Fibers, Pulse Distortion and Information Rate in Optic Fibers, Construction of Optic Fibers, Optic Fibers, Optic Fiber Cables,

2. Light Sources and Detectors

   Light-Emitting Diodes, Light-Emitting – Diodes Operating Characteristics, Laser Principles, Laser Diodes, Laser-Diode Operating Characteristics, Distributed – Feedback Laser Diode, Optical Amplifiers, Fiber Laser, Vertical-Cavity Surface-Emitting Laser Diodes

   Principles of Photodetection, Photomultiplier, Semiconductor Photodiode, PIN Photodiode, Avalanche Photodiode,

3. Couplers and Connectors

   Principles, Fiber end Preparation, Splices, Connectors, Source Coupling, Distribution Networks and Fiber Components, Distribution Networks, Directional Couplers, Star Couplers, Switches, Fiber Optical Isolator, Wavelength-Division Multiplexing, Fiber Bragg Gratings, Other Components : Attenuator, Circulator and Polarization Controller

4. Modulation, Noise and Detection

   Light-Emitting-Diode Modulation and Circuits, Laser-Diode Modulation and Circuits, Analog-Modulation Formats, Digital-Modulation Formats, Optic Heterodyne Receivers, Thermal and Shot Noise, Signal-to-Noise Ratio, Error Rates, Modal Noise, Amplifier Noise, Laser Noise, and Jitter, Additional Noise Contributors, receiver Circuit Design

5. System Design and Fiber Optical Applications

Analog System Design, Digital System Design, Applications of Fiber Optics

Text Book : Fiber Optic Communications, Joseph. C. Palais, Pearson Education, Asia, 2002

Reference :

1. Fiber Optic Systems, John Powers, Irwin Publications, 1997

2. Optical Fiber Communication, Howes M.J., Morgen, D.V John Wiely

M.E. (Electronic Instrumentation)

Syllabus for

TRANSDUCERS AND SIGNAL CONDITIONERS

Credits : 4

Subject Code : MEI – 4 **Max. Marks :** 70

I – Semester **Sessionals :** 30

Unfraned theory of bilateral electromachenical transducers, sensitivity and linearlity analysis, static and dynamic responses, transfer function analysis of various transducers and their associated circuits, electrodynamic variable, variable inductance, variable capacitance, piezoelectric and force – balance transducers.

Design and construction of the above types of transducers :

Uses of the above transducers in measurement of displacement, velocity and acceleration. Thermo couples, Quartz thermometers, transducers for pressure and flow measurements. Ionization ganges, load cell and force – balanced transducers. Doppler shift flow meter, thermal transport flow meter. Magnetic flow meter.

Text Books :

1. H.K.P. Neubert Instrument Transducers Oxford University Press : (Second edition)

2. E.O. Doebelin 'Measurement Systems' Mc Graw Hill.

M.E. (Electronic Instrumentation)

Syllabus for

VLSI

Credits : 4

Subject Code : MEI – 5 **Max. Marks :** 70

I – Semester **Sessionals :** 30

1. Digital Systems and VLSI : why design integrated circuits? – integrated circuits manufacturing – CMOS Technology – Integrated Circuit Design Techniques.

2. Transistors and Layout : Introduction – Fabrication processes – transistors – wires and vias – design rules – layout design and tools.

3. Logic Gates : Introduction – combinational logic functions – static complementary gates – switch logic – low power gates – delay through resistive interconnect-delay through inductive interconnect.

4. Combinatinal Logic Networks : Introduction – standard cell – based layout – simulation – combinational network delay – logic and interconnect design – power optimization – switch logic networks – combinational logic testing.

5. Sequential Machines : Introduction – latches and flip-flops – sequential systems and clocking disciplines – sequential system design – power optimization – design validation – sequential testing.

6. Subsystem Design : Introduction – subsystem design principles – combinational shifters – address – high density memory – field – programmable gate arrays – programmable logic arrays – floorplanning methods – off-chip connections.

Text books :

Modern VLSI Design, System – on – Chip by Wayne Wolf, Pearson Education, 3rd Edition.

References :

1. Introduction to VLSI Systems by C. Mead and L. Conway, Addison Wesley, 1980.

2. Introduction to VLSI Design by Eugene D. Fabrecius, McGraw Hill, 1990.

1. Basic VLSI Design by D.A. Pucknell & K. Eshragian, PHI, 3rd Edition.

M.E. (Electronic Instrumentation)

Syllabus for

Elective – I(a) : EMI / EMC

Credits : 4

Subject Code : MEI – 6(a) **Max. Marks :** 70

Semester – I **Sessionals:** 30

Common with M.Tech (Radar and Microwave Engineering), EMI/EMC (MTRM-5), M.Tech (Communication Systems) EMI / EMC (MTCS-6a)

I. Introduction, Natural and Nuclear sources of EMI / EMC :

Electromagnetic environment, History, Concepts, Practical experiences and concerns, frequency spectrum conservations. An overview of EMI / EMC, Natural and Nuclear sources of EMI.

II. EMI from apparatus, circuits and open area test sites :

Electromagnetic emissions, noise from relays and switches, non-linearities in circuits, passive intermodulation, cross talk in transmission lines, transients in power supply lines, electromagnetic interference (EMI). Open area test sites and measurements.

III. Radiated and conducted interference measurements and ESD :

Anechoic chamber, TEM cell, GH TEM Cell, characterization of conduction currents / voltages, conducted EM noise on power lines, conducted EMI from equipment, Immunity to conducted EMI detectors and measurements. ESD, Electrical fast transients / bursts, electrical surges.

IV. Grounding, shielding, bonding and EMI filters :

Principles and types of grounding, shielding and bonding, characterization of filters, power lines filter design.

V. Cables, connectors, components and EMC standards :

EMI suppression cables, EMC connectors, EMC gaskets, Isolation transformers, optoisolators, National / International EMC standards.

Text Books :

1. Engineering Electromagnetic Compatibility by Dr. V.P. Kodali, IEEE Publication, Printed in India by S. Chand & Co. Ltd., New Delhi, 2000.

2. Electromagnetic Interference and Compatibility IMPACT series, IIT – Delhi, Modules 1 – 9.

References :

1. Introduction to Electromagnetic Compatibility, Ny, John Wiley, 1992, by C.R. Pal.

M.E. (Electronic Instrumentation)

Syllabus for

Elective – I(b) : ARTIFICIAL INTELLIGENCE AND NEURAL NETWORKS

Credits : 4

Subject Code : MEI – 6(b) **Max. Marks :** 70

Semester – I **Sessionals:** 30

Common with M.Tech (Radar and Microwave Engineering), Artificial Intelligence and Neural Networks (MTRM-6(b))

Artificial Intelligence as Representation and Search

Introduction to AI, Roots and Scope of AI, Definition, Turing Test, Application Areas of AI, Predicate Calculus , Structures and Strategies for State Space Search , Heuristic Search , Control and Implementation of State Space Search

Representation and Inference

Knowledge Representation , Strong Methods for Problem Solving , Reasoning in Uncertain , Situations, Machine Learning : Symbol-Based: Framework for Symbol – Based Learning, Version Space Search, ID3 Algorithm, Un-supervised learning, Reinforcement Learning , Connectionist: Perceptron Learning, Backpropagation Learning, Competitive Learning, Hebbian Coincidence Learning, Attractor Networks

Neural Networks and Fuzzy Systems

Neural and Fuzzy machine intelligence, fuzziness as multivalence, the dynamical-systems approach to machine intelligence, intelligent behaviour as adaptive model-free estimation.

Neural Dynamics

I. Activations and signals : Neurous as functions, signal monotonicity, biological activations and signals, neuron fields, neuronal dynamical systems, common signal functions, pulse-coded signal functions, Neuronal dynamics II : Activation Models : neuronal dynamical systems, additive neuronal dynamics, additive neuronal feedback, additive bivalent models, BAM Connection matrices, additive dynamic and the noise-saturation dilemma, general neuronal activations : Cohen-grossberg and multiplicative models

Synaptic Dynamics

I. Unsupervised Learning : Learning as encoding, change, and quantization, four unsupervised learning laws, probability spaces and random processes, stochastic unsupervised learning and stochastic equilibrium, signal hebbian learning, competitive learning, differential hebbian learning, differential competitive learning. Synaptic Dynamics II : Supervised learning : Supervised function estimation, supervised learning as operant conditioning, supervised learning as stochastic pattern learning with known class

memberships, supervised learning as stochastic approximation, the back propagation algorithm.

Text Book:

1. "Artificial Intelligence – Structures and Strategies for Complex Problem Solving", George F. Luger, 4th Edition, Pearson Education , 2003.
2. Neural Networks & Fuzzy Systems, Bark Kosko, PHI Published in 1994.

Reference Books:

1. "Artificial Intelligence", Knight, Tata McGraw Hill
2. "Artificial Intelligence 'a Modern Approach" Russell & Norvig, second edition , Pearson Education , 2003.
3. Fundamentals of Artificial Neural Networks, Mohamad H Hassoum, PHI
4. Neural Network Design, Hagan, Demuth and Beale, Vikas Publishing House.

M.E. (Electronic Instrumentation)

Syllabus for

Elective – I(c) : APPLICATION SPECIFIC INTEGRATED CIRCUITS (ASIC)

Credits : 4

Subject Code : MEI – 6(c) **Max. Marks :** 70

Semester – I **Sessionals:** 30

Common with M.Tech (Radar and Microwave Engineering), Application Specific Integrated Circuits (MTRM-6(c))

1. Introduction to ASICs – Types of ASICs, Design flow, Economics of ASICs, ASIC cell libraries, CMOS Logic, CMOS design rules, Logic cells, I/O cells, cell compilers.
2. ASIC Library Design – Transistors as resistors, Transistor parasitic capacitance, Logical effort, Cell design, Programmable ASICs, Programmable ASIC logic cells, Programmable ASIC I/O cells, Programmable ASIC interconnect, Programmable ASIC design software.
3. Low-level design entry, Schematic entry, low-level design languages, PLA tools, EDIF, An overview of VHDL and verilog, Logic synthesis, Simulation.
4. ASIC construction, Floor planning and placement.
5. CMOS System Core Studies
   Dynamic Warp Processors : Introduction, The problem, the algorithm, a functional overview, detailed functional specification, structural floor plan, physical design, fabrication, Hierarchical layout and design of single chip 32 bit CPU : Introduction, Design methodology, Technology updatability and layout verification.
6. Practical Realities and Ground Rules
   Further thoughts on floor plans/layout, floor plan layout of the four bit processors, input/output (I/O) pads, "Real estate", further thoughts on system delays, ground rules for successful design, scaling of MOS circuits.

Textbooks

1. Application Specific Integrated Circuits by J.S. Smith, Addison Wesley, 1997.

Reference Books

1. Basic VLSI Design : Systems and Circuits, Doublas A. Puckness & Kamran Eshraghian, Prentice Hall of India Private Ltd., New Delhi, 1989.
2. Principles of CMOS VLSI Design : A system perspective, N. Westle & K. Eshraghian, Addition – Wesley Pub. Co. 1985.
3. Introduction to VLSI System, C. Mead & L. Canway, Addison Wesley Pub Co. 1990.
4. The Design & Analysis of VLSI Circuits, L.A. Glassey & D.W. Dobbephl, Addison Wesley Pub Co. 1985.
5. Introduction to NMOS & VLSI System Design, A. Mukharjee, Prentice Hall, 1986.
6. VLSI Design Techniques for analog and digital circuits, R.L. Geiger, P.E. Allen & N.R. Streder, McGraw Hill Int. 1990.
7. Digital Integrated Circuits, A Design Perspective, Jan A. Rabey, Prentice Hall of India Pvt. Ltd., 1997.
8. Application specific integrated circuits, J.S. Smith, Addison Wesley, 1997.

M.E. (Electronic Instrumentation)

Syllabus for

ELECTRONIC INSTRUMENTATION TECHNIQUES

Credits: 4

Subject Code: MEI – 9 **Exam Marks:** 70

II – Semester **Sessionals:** 30

Principles and Design of Electronic Instruments : Digital voltmeters, Electronic counters, Frequency synthesizers, Wave analysers, Spectrum analysers, Sweep waveform generators and pulse generators, Lock-in amplifiers, Q-meters, High frequency impedance bridges, Ground loops, Electromagnetic and static pick-up, Interference, Shielding and grounding, Floating voltage measurements; Common signals and their effects.

Oscilloscopes: Sweep generators, Sweep modes, Storage oscilloscopes types, Erasing methods, Sampling oscilloscopes synchronous and random sampling, Time domain reflectomertry, Logic state analysers and their applications.

Display System : Liquid crystal, Solid state CRT, Displays,

Recorders : Servo magnetic, U-V recorders, X-Y plotters. Computer based automated test instruments.

Text Books :

B.M. Oliver and J.M. Cage, ELECTRONIC MEASUREMENTS AND INSTRUMENTATION Kogakusha-McGraw Hill.

Reference :

Manufacturer's Literature.

M.E. (Electronic Instrumentation)

Syllabus for

DATA ACQUISITION SYSTEM

Credits : 4

Subject Code : MEI – 10 **Exam Marks :** 70

II – Semester **Sessionals :** 30

Data Acquisition system : Introduction, Principles and design.

Digital to Analog converters (DACs) : Parallel R-2R, Weighted resistor, inverted ladder and serial (ADCs).

Analog to Digital Converters (ADCs) : Paralleled feedback, Successive approximation, Ramp comparison, Dual slope integration, Voltage to frequency, Voltage to time, Logarithmic types of ADCs, Accuracy analysis, Dynamic and static error analysis of the above, Typical study of monolithic DACs and ADCs.

Text Books

1. H. Schmid 'ELECTRONIC ANALOG-DIGITAL CONVERSION' McGraw Hill
2. D.G. Hoeschele 'A to D and D to A conversion techniques' Wiley
3. B.S. Sopnde Data Converters – Tata McGraw Hill

4. Analog Devices – Handbook.

Reference

1. E.R. Hanateck, User's Handbook of D/A and A/D converters – Wiley.
2. Datel / Intersil – Data acquisition systems.

M.E. (Electronic Instrumentation)

Syllabus for

LINEAR AND DIGITAL SYSTEMS DESIGN

Credits : 4

Subject Code : MEI – 11 **Exam Marks :** 70

II – Semester **Sessionals :** 30

Principles and applications of operational amplifiers as summers, Integrators controlled current voltage sources, Function generators, Logarithmic amplifiers, Anti logarithmic amplifiers, Instrumentation amplifiers, Sample and hold circuits, Comparators, Multivibrators, Window discriminators, Analog multipliers, Modulator circuits, Four quadrant multipliers, Squaring and square rooting, phase sensitive detector circuits, analog switches, multiplexers, Phase locked loops, broad band amplifiers, Precision rectifiers, IC voltage regulators, switched mode regulators and active filter circuits, 555, 566 * 8038 ICs and their applications, Line drivers, Receivers for MODEMS, Isolation amplifiers.

Text Books

1. A.B. Grebene 'Analog IC design' – Van Nostrand
2. G.B. Clayton 'Applications of Linear ICs' – Max Millan (India)
3. Toetze & Schenk 'Advanced electronic Circuits' John Wiley

Review of combinational logic design : Logic design with MSI and LSI; Multiplexers and Demultiplexers; Arithmetic units; Carry look-ahead adders; Decimal and BCD adders / subtractors; Tabular design; Read only memory methods; programmable logic array methods. Analysis and synthesis of sequential circuits : Algorithmic state machine (ASM) methods; Map entered variable and synthesis of random logic. Fault detection and error correction in combinational and sequential circuits ; two level multi level multi level fault detection methods. Test generation; redundance techniques. Introduction to computer aided design of digital circuits.

Text Book

S.C. Lee 'Digital system design' – Prentice Hall, May 2003 (Prescribed)

Reference

1. W.N. Carr ' MOS / LST Design and applications' McGraw Hill

2. M.A. Bruer and A.D. Fridman 'Diagnosis and reliable design of digital systems' Computer science press, 1976.

3. ZVI Kohavi 'Switching and Finite automata theory TMH 1976

4. Frederick J. Hill, Gerald R. Peterson 'Computer Aided Logical Design with emphasis on VLSI – 1933 (John Wiley)

M.E. (Electronic Instrumentation)

Syllabus for

BIO-MEDICAL INSTRUMENTATION

Credits : 4

Subject Code : MEI – 12 **Exam Marks :** 70

II – Semester **Sessionals :** 30

Chapter – I : Sources of Bioelectric potentials and Electrodes

Resisting and Action Potentials, Propagation of Action Potentials, The Bioelectric Potentials

Electrode theory, Bio Potential Electrodes, Biochemical Transducers

Chapter – II : The Cardiovascular System and Cardiovascular Measurements,

The Heart and Cardiovascular System, The Heart, Blood Pressure, Characteristics of Blood Flow, Heart Sounds

Electrocardiography, Measurement of Blood Pressure, Measurement of Blood Flow and Cardiac output, Plethysmography, Measurement of Heart Sounds,

Chapter – III : Patient Care & Monitory and Measurements in Respiratory System

The elements of Intensive Care Monitory, Diagnosis, Calibration and repairability of Patient Monitoring equipment, other instrumentation for monitoring patients, pace makers, defibrillators

The Physiology of respiratory system, tests and instrumentation for mechanics of breathing, respiratory theory equipment

Chapter – IV : Bio telemetry and Instrumentation for the clinical laboratory Introduction to biotelemetry, physiological parameters adaptable to biotelemetry, the components of biotelemetry system, implantable units, applications of telemetry in patient care

The blood, tests on blood cells, chemical test, automation of chemical tests

Chapter – V : X – ray and radioisotope instrumentation and electrical safety of medical equipment.

Generation of Ionizing radiation, instrumentation for diagnostic X – rays, special techniques, instrumentation for the medical use of radioisotopes, radiation therapy.

Physiological effects of electrical current, shock Hazards from electrical equipment, Methods of accident prevention

TEXT BOOK :

Biomedical Instrumentation and Measurements – C. Cromwell, F.J. Weibell, E.A. Pfeiffer – Pearson education.

M.E. (Electronic Instrumentation)

Syllabus for

Elective II(b) : REMOTE SENSING AND IMAGE SENSORS

Credits : 4

Subject Code : MEI – 13(b) **Exam Marks :** 70

II – Semester **Sessionals :** 30

Unit-I Basics of Remote Sensing

a) Principles of Remote sensing, History of Remote sensing, Remote sensing in India,

- Electromagnetic Radiation and Electromagnetic Spectrum, EMR quantities: Nomenclature and Units
- Thermal Emission of Radiation, Radiation Principles (Plank's Law, Stephen Boltezman law), Interaction of EMR with the Earth Surface (Wien's displacement law, Kirchoffs Law)
- Spectral signature, Reflectance characteristics of Earths cover types, Remote sensing systems.

Unit - II

Platforms and sensors

Platforms, Remote sensing sensors, resolutions Across track and along the track scanning, Optical sensors,

- Thermal scanners
- Microwave sensing radar
- satellite missions
- Landsat series, SPOT series, IRS satellite series, IKNOS,

Unit-III Microwave Remote Sensing

- Airborne and Space borne radar systems basic instrumentation.
- System parameters - Wave length, Polarization, Resolutions, Radar geometry.
- Target parameters - Back scattering, Point target, Volume scattering, Penetration, Reflection, Bragg resonance, Cross swath variation. Speckie radiometric calibration.
- Radar - Grametry - Introduction, Mosaicing Stereoscope.
- Application : Geology, Forestry, Land use, Soils etc. Future trends and Research

Unit-IV Thermal Imaging system

- Thermal Imaging System: Introduction - IR region of the Electromagnetic spectrum, Atmospheric transmission, Kinetic and radiant temperature, Thermal properties of materials, Emissivity, Radiant temperature. Thermal

conductivity. Thermal capacity, thermal inertia, Apparent thermal inertia, Thermal diffusivity.

- IR - radiometers, Airborne and Satellite TTR scanner system
- Characteristics of IR images
  i) Scanner distortion, ii) image irregularities, iii) Film density and recorded iv)Temperature ranges
- Effects of weather on images
  i) Clouds, ii) Surface winds, iii) Penetration of smoke plumes
- Interpretation of thermal imagery
- Advantages of Thermal imagery

Unit-V

- Meteorological satellites
- Meteorological satellite characteristics and their orbits, TIROS, NIMBUS, NOAA, TIROS N, SEASAT, GOES, METEOSAT, INSAT
- Measurement of Earth and Atmospheric energy and Radiation budget parameters from satellites

Text books

1. Imaging Radar for Resource Survey: Remote Sensing Applications, 3, W Travelt, Chapman & Hall
2. Remote Sensing: The quantitative approach, P.H. Swain and S.M. Davis, McGraw Hill
3. Floyd, F. Sabins, Jr: Remote Sensing Principles and Interpretation, Freeman and Co. San Franscisco, 1978
4. Applied Remote Sensing C.P.L.O., Longman Scientific and Technical Publishers.
5. Introduction to Environmental Remote Sensing, E.C. Barrett & L.F Curtis, Chapman and Hall, London
6. Fundamentals of remote sensing, George Joseph, Universities Press

M.E. (Electronic Instrumentation)

Syllabus for

Elective II (c) : GLOBAL POSITIONING SYSTEM AND APPLICATIONS

Credits : 4

Subject Code : MEI – 13(c) **Exam Marks :** 70

I – Semester **Sessionals :** 30

Common with M.Tech (Communication Systems), Global Positioning System and Applications (MTCS-11), M.Tech (R&M) Global Positioning System and Applications (MTRM-14)

Unit I

Overview of GPS :

Basic concept, system architecture, space segment, user segment, GPS aided Geo-augmented navigation (GAGAN) architecture.

Unit II

GPS Signals

Signal structure, anti spoofing (AS), selective availability, Difference between GPS and GALILEO satellite construction.

Unit III

GPS coordinate frames, Geodetic and Geo centric coordinate systems, ECEF coordinate system, world geodetic 1984 (WGS 84) system, GPS time.

Unit IV

GPS orbits and satellite position determination : GPS orbital parameters, description of receiver independent exchange format (RINEX) – Observation data and navigation message data parameters, GPS position determination, least squares method

Unit V

GPS Errors :

GPS error sources – clock error, ionospheric error, tropospheric error, multipath, ionospheric error estimation using dual frequency GPS receiver.

Textbooks :

G S RAO, **Global Navigation Satellite Systems,** McGraw-Hill Publications, New Delhi, 2010

Reference Books :

1. B. Hoffman – Wellenhof, H. Liehtenegger and J. Collins, 'GPS – Theory and Practice', Springer – Wien, New York (2001).
2. James Ba – Yen Tsui, 'Fundamentals of GPS receivers – A software approach', John Wiley & Sons (2001).

M.E. (Electronic Instrumentation)

Syllabus for

Elective III(a) : NANOTECHNOLOGY AND APPLICATIONS

Credits : 4

Subject Code : MEI – 14(a) **Exam Marks :** 70

II – Semester **Sessionals :** 30

Unit 1 : Introduction to Nanotechnology

Essence of Nanotechnology, Nano in daily life, Brief account of nano applications, Properties of nano materials, Metal nano clusters, Semiconductor nano particles.

Unit 2 : Nano Materials

Nano composites, Nanofying electronics, Sensing the environment, Mechanising the micro world, Energy and cleaner environment with nano technology.

Unit 3 : Carbon Nano Structures

Introduction, Carbon molecules, Carbon clusters, Carbon nanotubes, Applications of carbon nanotubes.

Unit 4 : Diagnosing Personal Health and Medical Applications

Lab on a chip, Super X-ray vision, Mapping the genes, Understanding how pharmaceutical company develops drugs, Delivering a new drug the Nanotech way, Cooking cancer with nano cells, Biomimetics.

Unit 5 : Biological Materials

Introduction, Biological building blocks, Nucleic acids, Biological nanostructures.

Textbooks

1. Nanotechnology by Richard Booker, Earl Boysen, Wiley Publishing Inc., 2006.
2. Introduction to Nanotechnology by Charles P. Poole Jr., Frank J. Owens, John Wiley & Sons Publications, 2003.

M.E. (Electronic Instrumentation)

Syllabus for

Elective III(b) : MICROCONTROLLERS AND EMBEDDED SYSTEMS

Credits : 4

Subject Code : MEI – 14(b) **Exam Marks :** 70

II – Semester **Sessionals :** 30

1. Introduction

Embedded systems overview, Design challenge, Processor Technology, IC Technology, Design Technology, Trade-offs.

2. Custom single-purpose processors: Hardware

Introduction, Combinational logic, Sequential logic, Custom single-purpose processor Design , RT-level custom single-purpose processor design, Optimizing custom single-purpose processors.

3. General purpose processors : Software

Introduction, Basic Architecture, Operation, Programmer's view, Development environment, Application-Specific Instruction-set Processors, Selecting a Microprocessor.

4. Memory:

Introduction, Memory types, Memory Hierarchy and cache, Advanced Memory Interfacing : Communication Basics, Memory Access, I/O addressing, Interrupts, DMA, Arbitration, Multilevel Architecture, Protocols.

5. Microcontrollers:

Review 8051 Microcontroller Architecture & Programming.

Peripherals:

Timers, Counters and Watchdog Timers, UART, Pulse width Modulators, LCD controllers, Stepper Motor Controllers, Analog to Digital converters, Real-Time clocks.

6. An Exemplary Embedded Systems using Microcontrollers: Digital Camera Introduction, Specifications, Design.

7. State Machine and Concurrent process models:
Introduction, Models Vs. Languages, Text Vs. Graphics:
Textual Languages Vs. Graphical Languages, an Example, A Basic State Machine Model, FSM, FSM with Datapath Model: FSMD, Using State Machines, Concurrent Process Model, Communication among Processes.

Text Books:

1. Embedded System Design: A Unified Hardware/Software Introduction By Frank vahid / Tony Givargis
   John wiley & sons
2. The 8051 Microcontroller & Embedded Systems By
   Muhammad Ali Mazidi & Janice Gillispie Mazidi PHI

References:

1. Embedded Systems Architecture, Programming and Design By Raj Kamal TMH
2. Embedded Software Priner By Simon.
3. The 8051 Microcontroller: Architecture, Programming & Applications. By Kenneth J.Ayala Penram International. 2nd edn.

M.E. (Electronic Instrumentation)

Syllabus for

Elective III(c) : DIGITAL IMAGE PROCESSING

Credits : 4

Subject Code : MEI – 14(c) **Exam Marks :** 70

II – Semester **Sessionals :** 30

Common with M.Tech (R&M), Digital Image Processing (MTRM-13(c)), M.Tech (Communication Systems), Digital Image Processing (MTCS-13(c))

1. Digital Image Fundamentals
   An image model – sampling & quantization – basic relation between pixels : imaging geomentry.

2. Image Transforms
   Properties of 2-D fourier transforms, FFT algorithm and other separable image transforms, Walsh transforms, Hadamard, Cosine, Haar, Slant Transforms, RL Transforms and their properties.

3. Image Enhancement & Restoration
   Spatial domain methods, Frequency domain methods, Histogram Modification technique, Neighbourhood averaging, Median filtering, Low pass filtering, Averaging of Multiple Images, Image sharpening by differenctiation, High pass Filtering, Degradation model for Continuous functions, Discrete Formulation, Diagonalization of Circulant and Block – Circulant Matrices, Effects of Diagonalization, Constrained and unconstrained Restorations Inverse filtering, Wiener Filter, Constrained least Square Restoration.

4. Image Encoding

Objective an subjective Fidelity Criteria, the encoding process, the Mapping, the Quantizer and the Coder, Contour Encoding, Run length Encoding, Image Encoding relative to a Fidelity Criterion, Differential Pulse Code Modulation, Transform Encoding.

5. Image Compression
   Fundamentals, Image compression models, error free compression, lossy compression, image compression standards.

6. Image Segmentation
   The detection of Discontinuities, Point Line and Edge Detections, Gradient Operators, Combined Detection, Thresholding.

7. Image Representation
   Representation Schemes, Chain Codes, Polygon Approximation, Boundary Descriptors, Simple Descriptors, Shape Numbers, Fourier Descriptors.

8. Image Construction from Projections
   Radon Transforms, Convolution/filterback Projection.

Textbooks

1. Gonzalez RC & Woods RE, Digital Image Processing, Addison Wesley Publishing Company.
2. Jain AK, Fundamentals of Digital Image Processing, PHI
3. Rosefeld & Kak AC, Digital Picture Processing Academic Press Inc.