WITH EFFECT FROM THE ACADEMIC YEAR 2008-2009

EC 384

INDUSTRIAL VISIT/STUDY

Atleast 3 days in semester — 3 x 8 =24 hours

Sessional / Examination — Grade*

Students are expected to visit at least two industries during the semester and submit a detailed technical report on the study – visits to the Department. The Department should evaluate the reports through a Committee consisting of Head of the Department and two more faculty members to award the Grades.

*Excellent /Good /Satisfactory /Unsatisfactory

* * *

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

SCHEME OF INSTRUCTION AND EXAMINATION

B.E. IV/IV (REGULAR)

ELECTRONICS & COMMUNICATION ENGINEERING

SEMESTER - I

Sl. No.	Syllabus Ref. No.	Subject	Scheme of Instruction: Periods per Week L/T	Scheme of Instruction: Periods per Week D/P	Scheme of Examination: Duration in Hrs	Scheme of Examination: Maximum Marks Univ. Exam	Scheme of Examination: Maximum Marks Sessionals
		THEORY					
1.	EC 401	Microwave Engineering	4	-	3	75	25
2.	EC 402	Verilog HDL	4	-	3	75	25
3.	EC 403	Electronic Instrumentation	4	-	3	75	25
4.	EC 404	Mobile Cellular Communication	4	-	3	75	25
5.		ELECTIVE-I	4	-	3	75	25
6.	ME 472	Industrial Administration & Financial Management	4	-	3	75	25
		PRACTICALS					
7.	EC 431	Microwave Lab	-	3	3	50	25
8.	EC 432	Verilog HDL Lab	-	3	3	50	25
9.	EC 433	Project Seminar	-	3	-	-	25
		Total	24	9	-	550	225

ELECTIVE - I

EC 405	Data Communication & Computer Networks	EC 408	VLSI Design
EC 406	Embedded Systems	EC 409	Optical Fiber Communication
EC 407	Digital Image Processing	EC 410	Multi Rate Signal Processing

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 401

MICROWAVE ENGINEERING

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT - I

GUIDED WAVES: Propagation of TE, TM and TEM waves between parallel planes. Velocity of propagation, wave impedance, attenuation in parallel plane guides. Elements of strip lines, micro strip lines, slot lines and finlines.

UNIT - II

Wave Guides: TE and TM waves in rectangular and circular wave-guides, Wave Impedance, Characteristic Impedance, Attenuation and Q of wave-guides. Cavity resonators, resonant frequency and Q, Applications of cavity resonator.

UNIT - III

Microwave Circuits and Components: Concept of Microwave circuit, Normalized voltage and current, Introduction to scattering parameters and their properties, Derivation of S Matrix for reciprocal and Non-reciprocal components- magic Tee, Directional coupler, E and H Plane Tees and their properties, Attenuators, Phase Shifters, Isolators and circulators.

UNIT - IV

Microwave Tubes: High frequency limitations of conventional tubes, Bunching and velocity modulation, mathematical theory of bunching, principles and operation of two cavity, multi cavity, Reflex Klystron, TWT and BWO.

Theory of crossed field interaction; principles and operation of magnetrons and crossed field amplifiers.

UNIT – V

Microwave Solid State Devices: Principles of operation, characteristics and applications of Varactor, PIN diode, Gunn diode and IMPATT diode.

Suggested Reading :

1. E. C. Jordan & Keith G. Balmain, "*Electromagnetic Waves and Radiating Systems*", 2/e, Pearson Education, 2006
2. Samuel Y. Liao, "*Microwave Devices and Circuits*", 3/e, Pearson Education, 2003.
3. R. E. Collins, "*Foundations for Microwave Engineering*", 2/e, John Wiley & Sons, 2003.
4. David M. Pozar, "*Microwave Engineering*", 2/e, John Wiley & Sons, 1999.
5. Peter A Rizzi, "*Microwave Engineering*", Prentice Hall India, 1998.

EC 402

VERILOG HDL

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT – I

Introduction to HDL's, Simulation, Capabilities of Verilog, Basic concepts, Data Types, System tasks and compiler directives, modules, ports, Gate level modeling, Gate types, Gate delays, Examples.

UNIT – II

Dataflow modeling, continuous assignments, Delays, Expressions, Operators, Operands, Operator types, Examples, Writing Test Bench. Behavioral modeling, Structured procedures, Procedural Assignments, Timing controls, Conditional Statements, Multiway Branching, Loops, Sequential and parallel blocks, Generate Blocks, Examples.

UNIT – III

Tasks, Functions, Procedural continuous assignments, Overriding parameters, Conditional compilation and execution, timing scales, System tasks, Timing and delays, Types of delay models, Path delay modeling, Timing checks, Switch level modeling, Switch modeling elements, Examples.

UNIT – IV

User defined primitives, Uses of programming language interface. Finite state machines: Mealy and Moore state Models, Design of FSM using Verilog HDL.

UNIT – V

Logic synthesis, Importance of logic synthesis, HDL Synthesis, Synthesis design flow, Verification of the Gate-Level Net list, Modeling tips for logic Synthesis, Examples of synthesis.

Suggested Reading :

1. Samir Palnitkar, *"Verilog HDL: A Guide to Digital Design and Synthesis"*, 2/e, Pearson Education,2005.
2. M.Morris Mano & Michael D.Ciletti, *"Digital Design"*, 4/e, Pearson Education.
3. Stephen Brown & Zvonko Vranesic, *"Fundamentals of Digital Logic with Verilog Design"*, Tata McGraw-Hill, 2002.
4. J. Bhasker, *"A Verilog HDL Primer"*, 2/e, BS Publications,2001.
5. Michael D. Ciletti, *"Advanced Digital Design with the Verilog HDL"*, PHI, 2005.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 403

ELECTRONIC INSTRUMENTATION

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Accuracy, Precision, Resolution and Sensitivity. Errors and their types. Standards of measurement, classification of standards, IEEE standards, Elements of ISO 9001, Quality management standards.

UNIT -II

Transducers: classification, factors for selection of a transducer, transducers for measurement of velocity, acceleration, force, radio activity, Hot wire anemometer. Passive electrical transducers- Strain gauges and strain measurement, LVDT and displacement measurement, capacitive transducer and thickness measurement. Active electrical transducers: Piezo electric, photo conductive, photo voltaic and photo emissive transducers.

UNIT-III

Characteristics of sound, pressure, power and loudness measurement. Microphones and their types. Temperature measurement, resistance wire thermometers, semiconductor thermometers and thermocouples. Humidity measurement, resistive, capacitive, aluminum oxide and crystal Hygrometer types. Magnetic tape recorders, direct recording, FM recording and digital recording.

UNIT-IV

Block diagram, specification and design considerations of different types of DVMs. Digital LCR meters, Spectrum analyzers. The IEEE488 or GPIB Interface and protocol.

Delayed time base oscilloscope, digital storage oscilloscope, and mixed signal oscilloscope.

Introduction to virtual instrumentation , SCADA. Data acquisition system block diagram

UNIT-V

Biomedical Instrumentation: Human physiological systems and related concepts. Bio-potential electrodes, Bio-potential recorders - ECG, EEG, EMG, X- ray machines and CT scanners, magnetic resonance and imaging systems, Ultrasonic Imaging systems.

Suggested Reading:

1. Helfric A. D, and Cooper W. D, "*Modern Electronic Instrumentation and Measurement Techniques*", PHI, 1994.
2. Robert A Witte, "*Electronic Test Instruments: Analog and Digital Measurements*", 2/e, 2002.
3. Nakra B.C, and Chaudhry K.K., "*Instrumentation, Measurement and Analysis*", TMH, 2004.
4. Khandpur. R.S.,"*Handbook of Bio-Medical Instrumentation*", TMH, 2003.
5. Murthy D.V: S, "*Transducers and Instrumentation*", PHI, 2003.

EC 404

MOBILE CELLULAR COMMUNICATION

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction to wireless communication systems:-

Evolution of Mobile radio communication, paging systems, cordless telephone system, Cellular telephone systems, 1G, 2G, 3G, WLL, WLAN, Bluetooth and PAN, Trends in Radio & Personnel Communication.

UNIT-II

The cellular concept –system design fundamentals:-

Basic Cellular system its operation, frequency reuse, handoff strategies, interference & system capacity-co channel interference, adjacent channel interference, near-end far-end effect, crosstalk, trunking & grade of service, Improving coverage and capacity in cellular systems, frequency management, Setup channels, channel assignment : Fixed & Non- Fixed channel assignment.

UNIT-III

Mobile radio propagation:-

Free space propagation Model, three basic propagation mechanisms, practical link budget design using path loss models, outdoor propagation models-Okumura and Hata models, Indoor propagation models- partition loss, Ericson multiple break point model, small scale multipath propagation, parameters of mobile multipath channels, types of small scale fading.

UNIT-IV

Multiple access techniques for wireless communications:-

FDMA, TDMA, Spread spectrum multiple access (SSMA), space division multiple access (SDMA), packet radio protocols, carrier sense multiple access (CSMA), reservation protocols.

UNIT-V

Wireless systems and standards:-

Advanced Mobile Telephone systems (AMPS),ETACS,GSM,CDMA Digital cellular standard (IS-95), DECT, personal access communication systems(PACS),Future public land mobile telecommunication systems(FPLMTS),UMTS & IMT-2000: UMTS releases and standardization, UMTS system architecture, UMTS radio interface.

Suggested Reading :

1. Theodore.S.Rappaport, "*Wireless Communications: Principles and Practice*", 2/e, Pearson Education, 2003.
2. Simon Haykin & Michael Moher, "*Modern Wireless Communications*", 1/e, Pearson Education, 2005.
3. William.C.Y.Lee, "*Mobile Cellular Telecommunications: Analog and Digital Systems*", 2/e, Mc-Graw Hill, 1995.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

ME 472

INDUSTRIAL ADMINISTRATION & FINANCIAL MANAGEMENT

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT – I

Industrial Organisation : Types of various business organisations, Organisation structures and their relative merits and demerits. Functions of management.

Plant Location and Layouts: Factors affecting the location of plant and layout. Types of layouts and their merits and demerits.

UNIT – II

Work Study: Definitions, objectives of method study and time study. Steps in conducting method study. Symbols and charts used in method study. Principles of motion economy . Calculation of standard time by time study and work sampling. Performance rating factor. Types of ratings. Jobs evaluation and performance appraisal. Wages, incentives, bonus, wage payment plans.

UNIT – III

Inspection and Quality Control: Types and objectives of inspection S.Q.C., its principles. Quality control by chart and sampling plans. Quality circles, introduction to ISO.

UNIT – IV

Optimisation: Introduction ot linear programming and its graphical solutions. Assignment problems.

Project Management: Introduction to CPM and PERT .Determination of critical path.

Material Management : Classification of materials, Materials planning. Duties of purchase manager. Determination of economic ordering quantities. Types of materials purchase.

UNIT – V

Cost Accounting: Elements of cost. Various costs. Types of overheads. Breakeven analysis and its applications. Depreciation. Methods of calculating depreciation fund. Nature of financial management. Time value of money .Techniques of capital budgeting and methods. Cost of Capital. Financial leverage.

Suggested Reading:

1. Pandey I.M. *"Elements of Financial Management"*, Vikas Publ. House, New Delhi, 1994.
2. Khanna O.P., *"Industrial Engineering and Management"*, Dhanapat Rai & Sons.
3. Everrete E. Adama & Ronald J. Ebert, *"Production & Operations Management"*, Prentice Hall of India, 5th Edition, 2005.
4. S.N. Chary, *"Production and Operations Management"*, Tata McGraw Hill, 3rd Edition, 2006.
5. Paneer Selvam, *"Production and Operations Management"*, Pearson Eduction, 2007.

EC 431

MICROWAVE LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

List of Experiments

1. Characteristics of Reflex Klystron oscillator, finding the mode numbers and efficiencies of different modes.
2. Characteristics of Gunn diode oscillator, Power Output Vs Frequency, Power Output Vs Bias Voltage.
3. Measurement of frequency and Guide wavelength calculation:
   i. Verification of the relation between Guide wavelength, free space wavelength and cutoff wavelength of X- band rectangular waveguide.
   ii. Verification of the straight line relation between $(1/\lambda_g)^2$ and $(1/\lambda_0)^2$ and finding the dimension of the guide.
4. Measurement of low and high VSWRs: VSWR of different components like matched terminals, capacitive and inductive windows, slide screw tuner for different heights of the tuning posts etc.
5. Measurement of impedance.

   To find the parameters and scattering matrices of different microwave components like:
6. Directional coupler.
7. Tees: E plane, H plane and Magic Tee.
8. Circulator.

9. Measurement of radiation patterns for basic microwave antennas like horn and parabolic reflectors in E-plane and H-plane. Also to find the gain, bandwidth and beamwidth of these antennas.
10. Study of various antennas like dipoles, loops, Yagi antenna, log periodic antenna and their radiation pattern.
11. Mini Project:
    i. To design microwave components such as: Directional couplers, circulators and Hybrid junctions using MATLAB software.
    ii. To design antenna arrays such as: Binomial, Chebyshev, using MATLAB.
    iii. Design of a receiver at 2GHz with some bandwidth, porting it on to FPGA and to test using a microwave bench setup. Microwave link design.

Note: Simulation software like Ansys with electromag / Ansof may be procured for microwave and antenna system design.

EC 432

VERILOG HDL LAB

Instruction	3 Periods per week
Duration of University Examination	3 Hours
University Examination	50 Marks
Sessional	25 Marks

Write the Code (using VERILOG), Simulate and Synthesize

1. Basic Logic Gates.
2. Realization of a four variable function.
3. Arithmetic Units (Adders, Subtractors).
4. 8 - bit parallel adder using 4 - bit tasks and functions.
5. Multiplexers, Demultiplexers.
6. Encoders, Decoders, Priority encoder.
7. Four – bit Digital Comparator.
8. Arithmetic Logic Unit with 8 Instructions.
9. Waveform generators
10. Flip – Flops.
11. Registers/Counters.
12. Sequence detector using Mealy and Moore type state machines.

All the programs should be simulated using test benches.

Mini Project:

i) 8 bit CPU

ii) Generation of different waveforms using DAC.

iii) RTL code for Booths algorithm for signed binary number multiplication.

iv) Development of HDL code to control speed, direction of DC/Stepper motor.

v) Development of HDL code for MAC unit and realization of FIR Filter.

EC 433

PROJECT SEMINAR

Instruction	3 Periods per week
Sessional	25 Marks

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for a systematic and independent study of the state of the art topics in a broad area of his / her specialization.

Project seminar topics may be chosen by the student with advice and approval from the faculty members. Students are to be exposed to the following aspects of seminar presentation.

- Literature Survey
- Organization of the material
- Presentation of OHP slides / Power point presentation
- Technical writing

Each student is required to:

1. Submit a one-page synopsis before the seminar talk for display on the notice board.
2. Give a 20 minutes presentation through OHP, PC, Slide projector followed by a 10 minute discussion.
3. Submit a report on the seminar topic with list of references and slides used.

Seminars are to be scheduled from the 3rd week of the semester to the last week of the semester and any change in schedule should be discouraged.

For award of sessional marks students are to be judged by atleast two faculty members on the basis of an oral and written presentation as well as their involvement in the discussions.

EC 405

DATA COMMUNICATION AND COMPUTER NETWORKS
(Elective - I)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction to Data Communication, Data Communication Networking, Computer Communication architecture, The OSI reference model. A comparison of OSI, TCP/IP, and SNA architectures.

Data Link Control: Line Configurations, Flow control, sliding window, Error Control, ARQ protocols, High level Data Link Control Protocol.

UNIT-II

Circuit Switching: Digital Switching Concepts, Circuit Switching concepts, Digital Private Branch Exchange.

Packet Switching: Packet Switching Principles, Virtual Circuits and Data grams, Routing strategies, Traffic and congestion Control.

UNIT-III

Local and Metropolitan Area Networks: LAN/MAN technology, Bus/ Tree, Star and Ring topologies, The ring topology, Medium access control protocols, MAC performance, LAN/MAN standards, IEEE 802.2, 802.3, 802.4, IEEE 802.5, IEEE 802.6, IEEE 802.11, and IEEE 802.16

UNIT-IV

Protocols and Architecture: Protocol mechanisms, Network services, Transport services, The TCP/IP protocol suite, TCP, UDP.

Internetworking: Principles of internetworking, The Bridge, Routing with bridges, Connectionless and connection oriented internetworking.

UNIT-V

Presentation layer services, Encryption, and compression. Public key cryptography. Network Management, SNMP, SMTP and FTP; Principles of ISDN & BISDN, X.25 Packet Switching and ATM.

Suggested Reading :

1. William Stallings, "*Data and Computer Communications*", 7/e, PHI, 2004.
2. Behrouz A Forouzan, "*Data communications & Networking*", 3/e, TMH, 2005.
3. Fred Halsall, "*Data communications, Computer Networks and Open Systems*", 4/e, Pearson Education, 2003.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 406

EMBEDDED SYSTEMS
(Elective - I)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT – I

Introduction to Embedded Systems: Definition, classification and overview of processors and hardware units, software tools, IDE. Programming languages used: ALP, C/C++, mixing C with Assembly. Design goals of Embedded software, concepts of Real-Time, multitasking, size of Embedded programs. Features of tiny, Small, Large footprint, Operating Systems used in Embedded Systems.

UNIT - II

Overview of 8 – bit microcontrollers: PIC, Atmel, AVR, Philips, their H/W & S/W features, application areas. 16/32 – bit Microcontrollers: Broad features of architecture and instruction sets of power PC (MPC 604) and ARM (7TDMI/9TDMI). Programming using C language for medium and Hi-End applications is suggested.

UNIT - III

Devices and buses: I/O devices types and examples. UART and HDLC, parallel port devices, sophisticated interfacing features in devices/ ports, timing and counting devices. I^2C, USB, CAN and advanced I/O serial high speed buses, ISA, PCI, PCI-X and advanced buses. I/O programming : Synchronization , transfer rate and latency, polled waiting loops. Interrupt-driven I/O: Hardware driven interrupt, ISR, PICs. Programming using C language for medium and Hi-End applications is suggested.

UNIT - IV

Programming concepts and Embedded Programming: Concurrent Software, multithreaded Programming, shared resources and critical

sections, scheduling, deadlock, timers and Counters, watchdogs, memory management, recursive functions and memory allocation. Inter-process communication. Programming using C language for medium and Hi-End applications is suggested.

UNIT–V

Embedded System Design and Development Tools: Hardware and Software co-design and integration. Co-design issues during development process. Implementation tools, testing, design cycle in the development phase, target Systems, emulators, ICE, device programmer for downloading the codes into ROM. Integrated development environment (IDE) tools: Assembler, Compiler, Loader, Linker, Simulator. Prototype development – testing and debugger tools for Embedded Systems. Use of commercial and free tools for IDE: MP Lab free tool, Keil/Tornado (Commercial Tool).

Suggested Reading :

1. Raj Kamal, "*Embedded Systems, Architecture, Programming and Design*", TMH, 2003
2. Daniel W. Lewis, "*Fundamentals of Embedded Software, Where C and Assembly Meet*", Pearson Education, 2002.
3. Frank Vahid & Tony Givargis, "*Embedded System Design, A unified Hardware / Software Introduction*", John Wiley & Sons, 2002
4. Kirk Zurrel, "*C Programming for Embedded Systems*", CMP Books, 2002.
5. M. Ali Mazidi and J.G. Mazidi, "*The 8051 Microcontroller and Embedded Systems*", Pearson Education, 2000.

EC 407

DIGITAL IMAGE PROCESSING
(Elective - I)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT – I

Image Formation and Description: Digital image representation, elements of visual perception, sampling, Quantization and Elements of digital image processing system.

UNIT – II

Image Tranforms: Fourier transform, FFT, Discrete cosine transform, Hadamard transform, Haar transform, Slant transform and Hotelling transform and their properties.

UNIT – III

Image Enhancement: Spatial enhancement techniques – Histogram equalization, direct histogram specification, Local enhancement. Frequency domain techniques – Low pass, High pass and Homomorphic Filtering, Image Zooming Techniques.

UNIT – IV

Image Restoration: Degradation model, Algebraic approach to restoration, inverse filtering, Least mean square (wiener) filter, Constrained least square restoration and interactive restoration. Speckle noise and its removal techniques.

UNIT – V

Image compression : Redundancies for image compression: Huffman Coding, Arithmetic coding, Bit-plane coding, loss less and lossy predictive coding. Transform coding techniques, Zonal coding, Threshold coding.

Suggested Reading :

1. Gonzalez R.C. & Woods R.E. *"Digital Image Processing"*, 2/e, PHI, 2005.
2. Anil K Jain, *"Fundamentals of Digital Image Processing"*, PHI, 2001.
3. Madhuri A. Joshi, *"Digital Image Processing: An algorithmic approach"*, PHI,2006.
4. Rafael C. Gonzalez, Richard E. Woods & Steven L.Eddins, *"Digital Image Processing using MATLAB"*, Pearson Education, 2004.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 408

VLSI DESIGN
(Elective - I)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT – I

Review of semiconductor devices, Passive components for ICs, Device structures, BJTS, JFETS, MOSFETS – depletion type and enhancement type. Basic logic (Gates) circuits with BJTS, MOSFETS (N-MOS, P-MOS, BiCMOs. Sequential Circuits – Flip Flops & Latches.

Concept of Sheet resistance – Resister design, capacitor design – Considerations for the Design of BJT, MOSFET.

UNIT – II

Circuit or Cell Design, Importance of aspect ratio in FETS, emitter area in BJTS. Design of Inverters with different loads, design of AND, OR, NAND, NOR Gates, Influence of FAN – IN and FAN OUT on Gate design, Design of latches and Flip Flops.

UNIT – III

System level design considerations, Counters shift registers, Arithmetic logic Unit, Multiplexer, memories – ROM, Static RAM, Dynamic RAM. CAD tools – Simulation and Synthesis.

UNIT – IV

Different layers of ICs, (Unit Processes) wafer preparation – Epitaxy, Diffusion, Ion implantation, oxidation, Chemical vapor deposition, Optical lithography, Etching, Metalization, Bonding, Packaging and testing. Process flow for N–MOS, CMOS, BiCMOS.

UNIT - V

Basic current mirrors and single stage amplifiers, simple CMOS current mirror, common source, common drain and common gate amplifiers, bipolar current mirrors, basic operational amplifier.

Suggested Reading :

1. Douglas A. Pucknell & Kamran Eshraghian, *"Basic VLSI Design"*, 3/e, Prentice Hall India, 2001.
2. Wayne Wolf, *"Modern VLSI Design:System-on-chip design"*, Pearson Education, 3/e, 2002.
3. David A. Johns & Ken Martin, *"Analog Integrated Circuit Design"*, John Wiley & Sons, 2004.
4. Neil. H.E. Weste & Kamran Eshraghian, *" Principles of CMOS VLSI Design: A systems perspective"*, 2/e, Pearson Education, 2004.

EC 409

OPTICAL FIBER COMMUNICATION
(Elective - I)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I
Overview of optical fiber communication: Optical fibers, Structures, Wave guiding and fabrications, Nature of light, Basic optical laws and definitions, Modes and configurations, Mode theory of circular waveguides, single, Multimode step index and Graded index fibers, Fiber materials and fabrication.

UNIT-II
Signal degradation in optical fibers: Attenuation, Signal distortion in optical waveguides. Mode coupling, Design optimization of single mode couplers. Optical sources: Semiconductors as optical Sources and their fabrication. LED and Laser diodes, Linearity of sources, Modal, Partition and reflection noise, Power launching and coupling.

UNIT-III
Photo detectors: Physical principles of PIN and APD, Photo detector noise, detector response time, Avalanche multiplication noise, Temperature effect on avalanche gain, Photo diode materials.
Optical receiver operations; Fundamental receiver operation, Digital receiver performance calculation

UNIT-IV
Preamplifiers types, Analog receivers, Point to point links, Line coding, Eye pattern, Noise effects on digital transmission system performance. Over view of analog links, Carrier noise ratio in analog systems.

UNIT-V
Multi Channel transmission techniques, Classification of coherent optical fiber systems, Modulation techniques, polarization control requirements. WDM Application of optical fiber in Local Area Networks, Introduction of optical amplifiers.

Suggested Reading:

1. John M. Senior, "*Optical Fiber Communications:Principles and Practice*", 2/e, Pearson Education, 2006.
2. Gerd Keiser,"*Optical Fiber Communications*", 3/e, McGraw Hill, 2000.
3. Joseph C. Palais, "*Fiber Optic Communications*", 5/e, Pearson Education, 2008.
4. John Gowar, "*Optical Communication Systems*", 2/e, PHI 1993.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 410

MULTIRATE SIGNAL PROCESSING

(Elective - I)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT – I

Review of digital filters; Digital FIR filter design, Filter specifications, ideal filters; Equirippel filters; Windowing and the Gibbs phenomenon; The Remez Algorithm, Digital IIR filter design, Bilinear transformation.

UNIT – II

Fundamentals of Multi-rate Systems; Down sampling, Up sampling, commutativity of up sampling and down sampling, noble identities, inter-connection of building blocks, poly-phase representation of signals and filters, multi-stage implementation, applications of multi-rate systems.

UNIT – III

Useful classes of filters such as Nyquist Filter and square-root Nyquist filter; Systems using re-sampling filters, Re-sampling filters: Interpolators, Interpolator architecture, band-pass interpolator, rational ratio sampling, arbitrary re-sampling ratio, Farrow filter.

UNIT – IV

Half-band filters: Half-band low pass and high pass filters, window design of half-band filter, Remez Algorithm design of half-band filters, Hilbert transform band-pass filter, Interpolating with low pass half-band filters. Dyadic half-band filters. Recursive poly-phase filters: All pass recursive filters, two-path and M-path recursive all-pass filters.

UNIT – V

Cascade integrator comb filters; Cascade and multiple stage filter structures; Communication systems applications: timing recovery in a digital demodulator, digitally controlled sampled data delay, FM receiver and demodulator.

Suggested Reading :

1. Fredric J Harris, "*Multirate Signal Processing for Communication Systems*", Pearson Education, 2007.
2. P.P. Vaidyanathan, "*Multirate Systems and Filter Banks*", Pearson Education, 2004.
3. Mitra S K, "*Digital Signal Processing, A Computer Approach*", 3/e, TMH, 2006.
4. Emmanuel C. Ifeachor and Barrie W. Jervis, "*Digital Signal Processing: A practical Approach*", 2/e, Pearson Education, 2002.
5. N. J. Fliege, "*Multirate Digital Signal Processing*", John Wiley & Sons,1995.

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

SCHEME OF INSTRUCTION AND EXAMINATION

B.E. IV/IV (REGULAR)

ELECTRONICS & COMMUNICATION ENGINEERING

SEMESTER - II

Sl. No.	Syllabus Ref. No.	Subject	Scheme of Instruction		Scheme of Examination		
			Periods per Week		Duration in Hrs	Maximum Marks	
			L/T	D/P		Univ. Exam	Sessionals
		THEORY					
1.	EC 451	Radar & Satellite Communication Systems	4	--	3	75	25
2.		ELECTIVE - II	4	--	3	75	25
3.		ELECTIVE - III	4	--	3	75	25
		PRACTICALS					
4.	EC 481	Seminar	-	3	-	-	25
5.	EC 482	Project	-	6	viva	Gr*	50
		Total	**12**	**9**	**9**	**225**	**150**

ELECTIVE - II

EC 452 Global Positioning System

EC 453 Neural Networks and Fuzzy Logic

EC 454 Design of Fault Tolerant Systems

EC 455 Electro Magnetic Interference and Electro Magnetic Compatibility.

EC 456 Micro Electro Mechanical Systems

ME 411 Entrepreneurship

ELECTIVE - III

EC 457 Speech Processing

EC 458 System Automation & Control

EC 459 Advance Topics in Microwave Engineering

EC 460 Television Engineering

ME 457 Robotics

LA 454 Intellectual Property Rights

***Excellent / Very Good / Good / Satisfactory / Un Satisfactory**

WITH EFFECT FROM THE ACADEMIC YEAR 2009-2010

EC 451

RADAR AND SATELLITE COMMUNICATION SYSTEMS

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Introduction to radar, radar block diagram and operation, radar frequencies, Applications of radar, Prediction of range performance, minimum detectable signal, receiver noise, probability density function, SNR, Integration of radar pulses, radar cross-section of targets, PRF and range ambiguities, transmitter power, system losses.

UNIT-II

Doppler effect, CW radar, FM CW radar, multiple frequency CW radar. MTI radar, delay line canceller, range gated MTI radar, blind speeds, staggered PRF, limitations to the performance of MTI radar, non-coherent MTI radar.

UNIT-III

Tracking radar: sequential lobing, conical scan, monopulse: amplitude comparison and phase comparison methods, Radar antennas. Rada displays. Duplexer.

Orbital aspects of Satellite Communication: Introduction to geo-synchronous and geo-stationary satellites, Kepler's laws, Locating the satellite with respect to the earth, sub-satellite point, look angles, mechanics of launching a synchronous satellite, Orbital effects, Indian scenario in communication satellites.

UNIT-IV

Satellite sub-systems: Attitude and Orbit control systems, Telemetry, Tracking and command control system, Power supply system, Space craft antennas, multiple access techniques, comparison of FDMA, TDMA, CDMA.

UNIT-V

Introduction to satellite link design, basic transmission theory, system noise temperature and G/T ratio, design of down link and uplink, design of satellite links for specified C/N, satellite data communication protocols.

Suggested Reading :

1. Merril. I. Skolnik, "*Introduction to Radar Systems*", 2/e, MGH, 1981.
2. Timothy Pratt and Charles Bostian, "*Satellite Communications*", John Wiley, 1986.
3. Toomay, "*Radar Principles of Radar*", PHI, 2/e, 2002.
4. Dennis Roddy, "*Satellite Communications*", 3/e, MGH, 2001.
5. M. Richharia, "*Satellite Communication Systems: Design Principles*", MacMillan, 2/e, 2003.

EC 481

SEMINAR

Instruction	3 Periods per week
Sessional	25 Marks

Oral presentation is an important aspect of engineering education. The objective of the seminar is to prepare the student for a systematic and independent study of the state of the art topics in a broad area of his / her specialisation.

Seminar topics may be chosen by the students with advice from the faculty members. Students are to be exposed to the following aspects of a seminar presentation.

- Literature survey
- Organization of the material
- Presentation of OHP slides / Power point presentation
- Technical writing

Each student is required to :

1. Submit a one page synopsis before the seminar talk for display on the notice board.
2. Give a 20 minutes presentation through OHP, PC, slide projector, followed by a 10 minutes discussion.
3. Submit a report on the seminar topic with list of references and slides used.

Seminars are to be scheduled the 3rd week to the last week of the semester and any change in schedule should be discouraged.

For award of sessional marks students are to be judged by at least two faculty members on the basis of an oral and a written presentation as well as their involvement in the discussions.

EC 482

PROJECT

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

Dealing with a real time problem should be the focus of under graduate project.

Faculty members should prepare project briefs (giving scope and references) well in advance, which should be made available to the students in the department.

The project may be classified as hardware / software modeling / simulation. It may comprise any or all elements such as analysis, design and synthesis.

The department should appoint a project coordinator who will coordinate the following.

- Grouping of students (a maximum of 3 in group)
- Allotment of projects and project guides
- Project monitoring at regular intervals.

All project allotment are to be completed by the 4th week of IV–Year, I-Semester, so that the students get sufficient time for completion of the project.

All projects will be monitored at least twice in a semester through individual presentations.

Every student should maintain a project dairy, wherein he/she needs to record the progress of his/her work and get it signed at least once in a week by the guide(s). If working outside and college campus, both the external and internal guides should sign the same.

Sessional marks should be based on the grades / marks, awarded by a monitoring project committee of faculty members as well as the marks given by the guide.

Efforts be made the some of the projects are carried out in reputed industries / research organizations with the help of industry coordinators. Problems can also be invited from the industries to be worked out through undergraduate projects.

Common norms should be established for final documentation of the project report by the respective department on the following lines:

1. The project little should be task oriented for example "Analysis and Modeling of ....."
2. Objectives of the project should be identified clearly and each student of the project batch should fulfill at least one of the objectives identified. The chapters of the project report should reflect the objectives achieved.
3. **Contents of the report should include the following**
   a. Title page
   b. Certificate
   c. Acknowledgements
   d. Abstract (limited to one/two paragraphs, page no.1 should start from this)
   e. Contents (Ch. No. Title of the chapter/section Page No.)
   f. List figures (Fig. No. caption of the figure Page No.)
   g. List of Tables (Table. No. Caption of the table Page No.)
   h. List of Symbols (ex. C: Velocity of light $3x10^8$ m/s)
   i. Chapter I should be introduction (limited 4-5 Pages) This should contain sections as objectives of the project, technical approach, literature survey, the importance of the project and organization of the report.
   j. Chapter II, Last two chapters should be on results with discussions and conclusions.
   k. References in IEEE format which should be duly referred in the report.
   l. Appendices. The algorithm related to the software developed should be thoroughly discussed.
   m. Index.
4. The project reports should be hard bound.

The project work if found inadequate and gets an Unsatisfactory grade, the candidate should repeat the project work with a new problem or improve the quality of work and report it again.

The project report should be evaluated and one of the following grades may be awarded at the external examination.

*** Excellent / Very Good / Good / Satisfactory / Unsatisfactory.**

EC 452

GLOBAL POSITIONING SYSTEM
(Elective - II)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT – I

GPS Fundamentals: GPS Constellation, Principle of operation, GPS Orbits, Orbital mechanics and satellite position determination, Time references, Geometric Dilution of Precision: GDOP, VDOP, PDOP.

UNIT – II

Coordinate Systems: Geometry of ellipsoid, geodetic reference system. Geoid, Ellipsoid, Global and Regional datum, WGS-84, IGS, ECI, ECEF. Various error sources in GPS: Satellite and receiver clock errors, Ephemeris error, Atmospheric errors, Receiver measurement noise and UERE.

UNIT – III

GPS measurements: GPS signal structure, C/A and P-codes, Code and carrier phase measurements, position estimation with pseudo range measurements, Spoofing and anti spoofing, GPS navigation and observation data formats. GPS Applications.

UNIT – IV

GPS Augmentation systems: Code-based and carrier based DGPS Techniques, DGPS errors. Wide area augmentation system-architecture, GAGAN, Local area augmentation system concept.

UNIT – V

GPS Modernization and other satellite navigation systems: Future GPS satellites, New signals and their benefits, Hardware and Software

improvements, GPS integration – GPS/GIS, GPS/INS, GPS/pseudolite, GPS/cellular, GLONASS, Galileo System.

Suggested Reading :

1. Pratap Misra and Per Enge, "*Global Positioning System Signals, Measurements, and Performance*", Ganga-Jamuna Press, Massachusetts, 2001.
2. B. Hofmann-Wellenhof, H. Lichtenegger, and J. Collins, "*GPS Theory and Practice*", Springer Wien, 2000.
3. Satheesh Gopi, "*Global positioning System: Principles and applications*", TMH, 2005.
4. Bradford W. Parkinson and James J. Spilker, "*Global Positioning System: Theory and Applicatons*", Volume II, American Institute of Aeronautics and Astronautics, Inc., Washington, 1996.
5. Elliot D. Kaplan, "*Understanding GPS Principles and Applications*", Artech House, 1996.

EC 453

NEURAL NETWORKS AND FUZZY LOGIC
(Elective - II)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT – I

Basic model of a neuron. Neural network topologies: Feed forward topology and Recurrent topology; Neural network activation functions; Neural network learning algorithms: Supervised learning, Un-supervised learning, Reinforcement learning; Fundamentals of connectionist modeling: McCulloach – Pits model, Perceptron, Adaline, Madaline.

UNIT – II

Topology of multi-layer perceptron, Backpropagation learning algorithm, Applications and limitations of Multi layer perceptron. Classification of Neural networks; Radial Basis Function networks: Topology, learning algorithm for RBF. Applications; Kohenen's self-organising network: Topology, learning algorithm, Applications; Hopfield network: Topology, learning algorithm, Applications of Hopfield networks.

UNIT – III

Basic concepts of Recurrent neural networks; Dynamics of recurrent neural networks; Architecture and Training algorithms and applications of Recurrent neural networks; Industrial commercial applications of Neural networks: Semiconductor manufacturing processes, Communication, Process monitoring and optimal control, Robotics, Decision fusion and pattern recognition.

UNIT – IV

Introduction to Fuzzy systems; Fuzzy sets and operations on Fuzzy sets; basics of Fuzzy relations; Fuzzy measures, Fuzzy integrals, Fuzziness and fuzzy resolution; possibility theory and Fuzzy arithmetic; composition and inference; Considerations of fuzzy decision-making.

UNIT – V

Basic structure and operation of Fuzzy logic control systems; Design methodology and stability analysis of fuzzy control systems; Applications of Fuzzy controllers. Applications of fuzzy theory.

Suggested Reading :

1. Fakhreddine O. Karray and Clarence De Silva., "*Soft Computing and Intelligent Systems Design, Theory, Tools and Applications*", Pearson Education, India, 2009.
2. Satish Kumar, "*Neural Networks: A Classroom approach*", McGraw Hill, 2004.
3. Timothy J. Ross, "*Fuzzy Logic with Engineering Applications*", McGraw Hill,1995.
4. Chin-Teng Lin and C.S.George Lee, "*Neural Fuzzy Systems*", PH, 1996.

EC 454

DESIGN OF FAULT TOLERANT SYSTEM

(Elective - II)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT - I

Basic concepts of Reliability. Failures and faults, Reliability and failure rate, Relation between reliability & mean time between failure, Maintainability & Availability, reliability of series and parallel systems. Modelling of faults. Test generation for combinational logic circuits – conventional methods, Random testing, transition count testing and signature analysis.

UNIT – II

Fault Tolerant Design-I: Basic concepts – static, dynamic hybrid, and self purging redundancy, Sift-out Modular Redundancy (SMR), triple modular redundancy, 5MR reconfiguration, use of error correcting codes.

UNIT – III

Fault Tolerant Design-II: Time redundancy, software redundancy, fail-soft operation, examples of practical fault tolerant systems, introduction to fault tolerant design of VLSI chips.

UNIT - IV

Self checking circuits: Design of totally self checking checkers, checkers using m-out of 'n' codes, Berger codes and low cost residue code, self-checking sequential machines, partially self-checking circuits.

Fail safe Design: Strongly fault secure circuits, fail-safe design of sequential circuits using partition theory and Berger codes, totally self checking PLA design.

UNIT - V

Design for testable combination logic circuits: Basic concepts of testability, controllability and observability. The Read-Muller expansion technique, level OR-AND-OR design, use of control and syndrome-testable design.

Testable Design of Sequential Circuits: The scan-path technique, level-sensitive scan design (LSSD) and random access scan technique, built-in-test, built-in-test of VLSI chips, design for autonomous self-test, design in testability into logic boards.

Suggested Reading :

1. Parag K. Lala, "*Fault Tolerant & Fault Testable Hardware Design*", PHI,1985
2. Parag K. Lala, "*Digital systems Design using PLD's*", PHI 1990.
3. N.N. Biswas, "*Logic Design Theory*", PHI 1990.
4. Konad Chakraborthy & Pinaki Mazumdar, "*Fault tolerance and Reliability Techniques for high – density random – access memories Reason*", PHI,2002.

EC 455

EMI AND EMC
(Elective - II)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Sources of EMI – Intersystems and Intrasystem, EMI predictions and modeling, Cross talk, Cable wiring and coupling, Shielding and Shielding materials, Grounding and bouding.

UNIT-II

Transmitter models for EMI prediction:Types of emissions: amplitude culling, Frequency culling, Detail prediction and Performance prediction of various emissions. Receiver models for EMI prediction: Receiver EMI function. Receiver models for amplitude culling, Frequency culling, Detail predictions and performance prediction.

UNIT-III

Antenna models for EMI prediction:

Antenna EMI prediction considerations, Antenna models for amplitude culling, Frequency culling and detail prediction. Propagation models for EMI prediction:

Propagation considerations, Propagation models for amplitude culling, Propagation models and details predictions.

UNIT-IV

EMI measurements – Open area test site measurements, Measurement precautions, Radiated and conducted interference measurements, Control requirements and test methods.

UNIT-V

EMI filters characteristics of LPF, HPF, BPF, BEF, EMI standards – Military and Industrial standards, FCC regulations.

Suggested Reading :

1. William Duff G., & Donald White R. J, "*Series on Electromagnetic Interference and Compatibility*", Vol. 5, EMI Prediction and Analysis Technique – 1972.
2. V.P. Kodali, "*Engineering Electromagnetic Compatibility*", S. Chand, 1996.
3. Weston David A., "*Electromagnetic Compatibility, Principles and Applications*", 1991.
4. Kaiser B. E., "*Principles of Electromagnetic Compatibility*", Artech House, 1987.

EC 456

MEMS
(Elective - II)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Introduction to Electromechanical switches and their applications in electronics – Pure mechanical switches, Magnetic switches and reed relays – Thermo mechanical switches and relays – Bimetallic switches. Shape memory alloy based switches, Electro static force based switches and MEMS.

UNIT-II

Engineering Mechanics & Electro Statics

Review of the mechanical concepts – stress, strain, Shear force, Bending moment, Deflection, Differential equation describing the deflection under concentrated force, distributed force, Deflection curves for cantilevers (single and fixed), fixed beams (both ends fixed). Brief description of bending of square and circular plates. Qualitative description of vibrational characteristics of the above structures, Mechanical behavior of thin films.

UNIT-III

Electro static excitation, Electric field, flux and flux density, coulombic force due to applied voltage between two plates, Capacitance between two plates, Fringe fields, Laplace's equation and fringe field estimations. Analysis of parallel plate system one fixed and the other held by a spring, under applied constant voltage – Variation of displacement with applied Voltage – Variation of capacitance with applied voltage – Critical or pull in Voltage – Analysis of Cantilevers. Fixed beams under constant voltage excitation, constant charge excitation, Qualitative analysis of transient behavior of MEM structures.

UNIT-IV

MEM switches, Cantilevers, Fixed beam, Plate and diaphragm switches. Plunger switches, sea–saw switches – Normally open switches (NOS) Normally closed switches, Triode switches – multi contact switches, conductive switches – Capacitive switches – Switch Gates RF MEMS, MEMORY Element. MEM Capacitor, Variable Capacitor – Coumb Capacitor.

MEM Gates – AND, OR, XOR. MEM Transducers, Pressure, Temperature, Vibration. MEM actuators, Thermal actuators, Piezo electric actuators, Electro static actuators.

UNIT-V

MEM Technology, Properties of MEM materials, Materials normally used – Silicon, Sio_2, Metals & Polymers. Processing technologies: Micro Machining and etching, Surface machining (deposition and etching techniques) Liga – Lithography (X – Ray) Electro forming (deposition) and moulding. Process flow, Packaging, Limitations of MEM Devices – Sticking, life, speed, contact life. Present status – integrability with ICs.

Suggested Reading :

1. Gabriel. M. Reviez, "*RF MEMS Theory, Design and technology*", John Wiley, 2003.
2. Tai – Ran HSU, "*MEMS & MICRO Systems, Design and Manufacture*", TMH, 2/e, 2003.
3. Thimo Shenko, "*Strength of Materials*", CBS Publishers, 2000.
4. Servey E. Lyshebski, "*MEMS & NEMS System*", CRC Press, 2002.

ME 411

ENTREPRENEURSHIP
(Elective - II)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Indian Industrial Environment – competence, Opportunities and Challenges. Entrepreneurship and Economic growth. Small Scale Industry in India – Objectives. Linkage among small, medium and heavy industries. Types and forms of enterprises.

UNIT-II

Identification and characteristics of entrepreneurs. Emergence of First generation entrepreneurs, environmental influence and women entrepreneurs. Conception and evaluation of ideas and their sources. Choice of Technology - Collaborative interaction for Technology development.

UNIT-III

Project formulation, Analysis of market demand, Financial and Profitability and analysis and Technical analysis. Project financing in India.

UNIT-IV

Project Management during construction phase, project organization, project planning and control using CPM, PERT techniques, Human aspects of project management. Assessment of tax burden.

UNIT-V

Behavioral aspects of entrepreneurs : Personality – determinants, attributes and models. Leadership concepts and models. Values and attitudes. Motivation aspects. Change behavior.

Time Management: Various approaches of time management, their strengths and weaknesses. The urgency addiction and time management matrix.

Suggested Reading :

1. Vasant Desai , "*Dynamics and Entrepreneurial Development and Management*", HPH, 1997.
2. Prasanna Chandra, "*Project- Planning, Analysis, Selection, Implementation and Review*", TMH, 1995.
3. Stephen R. Covey and A. Roger Merrill, "*First Things First*", Simon and Schuster publication, 1994.
4. G.S. Sudha, "*Organizational Behaviour*", NPH, 1996.
5. Robert D. Hisrich, Michael P. Peters, "*Entrepreneurship*", 5/e, TMH, 2005.

EC 457

SPEECH PROCESSING
(Elective - III)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Mechanism of speech production, source filter model of speech production, speech sounds . Differential PCM. Adaptive delta modulation, Adaptive differential PCM (ADPCM).

Short time spectral analysis, cepstral analysis, Auto correlation function, Linear predictive analysis, pitch synchronous analysis.

UNIT-II

Short –time Energy function, zero crossing rate, End point detection, vector quantization. Format Tracking; Pitch extraction.

UNIT-III

Format synthesizer; Linear predictive synthesizer, phone use synthesis, Introduction to Text-to-speech and Articulator speech synthesis.

UNIT-IV

Sub-band coding, Transforms coding, channel decoder, Formant decoder, cepstral decoder, linear predictive decoder, vector quantizer coder.

UNIT-V

Problems in Automatic speech recognition, Dynamic warping, Hidden Markow models, speaker Identification / verification.

Suggested Reading :

1. Daniel Jurefskey & James H. Martin, "*Speech and Language Processing*", Pearson Education, 2003.
2. Rabiner and Schafer, "*Digital Processing of Speech Signals*", PHI, 1978.
3. Owens F.J., "*Signal Processing of Speech*", Macmillan, 2000.
4. Papamchalis, "*Practical Approaches to speech coding*", PHI, 1987.

EC 458

SYSTEM AUTOMATION AND CONTROL
(Elective - III)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Introduction to sensors and transducers: displacement, position, and proximity, velocity and motion, force, fluid pressure, liquid flow, liquid level, temperature, light. Selection of sensor.

UNIT-II

Data acquisition and Signal conditioning: various signal conditioning modules. Use of data acquisition. Fundamentals of Analog to digital conversion, sampling, amplifying, filtering, noise reduction. Criteria to choose suitable data acquisition equipment.

UNIT-III

Introduction to systems: Measurement and control. Basic system models. Mathematical models. Mechanical system building blocks, Electrical system building blocks, Fluid system building blocks and Thermal system building blocks. Engineering systems: Rotational – translational, Electromechanical, hydraulic-mechanical.

UNIT-IV

Dynamic responses of systems, system transfer functions, frequency response, closed loop controllers. Microcontroller basics, architecture, hardware interfacing, programming a microcontroller. Programmable logic controllers: basic structure, input/output processing, programming, selection of a PLC.

UNIT – V

Motion control and robotics: concepts of motion control system and real world applications. Components of a motion control system. Motion controller. Motors and mechanical elements, move types, Motor amplifiers and drives. Feed back devices and motion input/output.

Suggested Reading:

1. W. Bolton, "*Mechatronics: Electronic control systems in mechanical and electrical Engineering*", 3/e, Pearson Education, 2008.
2. Robert A. Witte, "*Electronic Test Instruments: Analog and Digital Measurements*", 2/e, Pearson Education, 2002.
3. Dan Necsulescu, "*Mechatronics*", 1/e, Pearson Education, 2002.

EC 459
ADVANCED TOPICS IN MICROWAVE ENGINEERING
(Elective - III)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Impedance Matching with Reactive Elements: Single stub, double stub and triple stub, waveguide reactive elements, quarter wave transformers, theory of small reflections, approximate theory of multisection quarter, wave transformers, binomial and chebyshev transformers, tapered transmission lines.

UNIT-II

Introduction to strip line and micro strip lines, Field configuration, characteristic impedance, losses in lines, quality factor, coupled line directional couplers, even and odd mode analysis of four port networks, branch line couplers.

UNIT-III

Microwave integrated circuits, materials, fabrication, hybrid microwave integrated circuits, lumped inductor, capacitor and resistor, advantages and difficulties with MICs.

UNIT-IV

Avalanche transit time devices, Read diode, IMPATT diode, TRAPTT diode, BARITT diode, Parametric amplifiers, applications.

UNIT-V

Microwave measurements, detection of microwaves, Power measurement, bolometer methods, Impedance measurement using slotted line, network analyser, Measurement of scattering parameters, frequency and wavelength. Low, high VSWR measurement, Measurement of lumped elements.

Suggested Reading :

1. R. E. Collins, "*Foundations for Microwave Engineering*", 2/e, John Wiley & Sons, 2003.
2. Samuel Y. Liao, "*Microwave Devices and Circuits*", PHI, 2003.
3. Gupta K. C., & Sinha A., "*Microwave Integrated Circuits*", New Age, 1983.

EC 460
TELEVISION ENGINEERING
(Elective - III)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Television Picture: Elements of T.V. System, Picture elements. Horizontal and vertical scanning, frame and field frequencies, horizontal and vertical synchronization, and blanking. T.V. Channel standard of transmission.

UNIT-II

Composite video Signal and Scanning: Construction of composite Video signal, horizonatal blanking time and vertical blanking time. Linear scanning standard scanning pattern. Flicker sync. pulses blanking signals.

UNIT-III

TV Camera tubes: TV Camera tube requirement image orthicon, vidicon, plumbicon, characteristics of camera tubes.

TV Transmitters: Negative picture transmission, arrangements at TV Studios. Types of TV transmitters. Block diagram of TV transmitters and TV transmitting aerials.

UNIT-IV

TV Receiver (Black & White): Block diagram of TV receiver, receiving aerials, description of receiver circuits of different stages. Blocking oscillators, EHT and picture tube circuits. SMPS reception of TV signals from satellites.

UNIT-V

Colour TV transmission and reception: Fundamental concepts of 3 colours systems. Different colour systems like NTSC, PAL, SECAM, Colour TV transmitters block diagram. Colour TV receiver block diagram (PAL).

Audio / Video signal recording principles of VCR and VCP with block diagrams. Standard VHS recording, fault analysis of VCR. Principles of CATV and HDTV.

Suggested Reading :

1. A.M. Dhake, "*Television and Video Engineering*", 2/e, TMH, 1995.
2. R.R. Gulati, "*Modern Television Practice: Principles, Technology and Service*", Wiley Eastern, 2000.

ME 457

ROBOTICS
(Elective - III)

Instruction	4 Periods per week
Duration of University Examination	3 Hours
University Examination	75 Marks
Sessional	25 Marks

UNIT-I

Robots: History and evolution of robots, Laws of robotics, Basic configuration, degree of freedom, work envelope, motion control methods. Application in industry – material handling, loading & unloading processing, welding & painting applications, assembly and inspection, Robot specification requirements.

UNIT-II

Rotation matrix. Homogenous transformation matrix. Denavit – Hartenberg convention. Euler angles, RPY representation. Direct and inverse Kinematics for industrial robotics for position and orientation Redundancy.

UNIT-III

Manipulator Jacobian Joint – End effector velocity – direct and inverse velocity analysis, Trajectory planning, interpolation cubic polynomial linear segments with parabolic blending, static force and moment transformation, Solvability, Stiffness, Singularities.

UNIT-IV

Robot dynamics : Lagrangian formulation, link Inertia tensor and manipulator Inertia tensor, Newton – Euler formulation for RR & RP Manipulators. Control; Individual Joint, computed torque.

UNIT-V

End effectors. Position and velocity measurement. Sensor: Proximity and range, tactile, force and torque. Drives for robots: Electrical, hydraulic and pneumatic. Robot vision: Introduction to techniques, image acquisition

and processing. Introduction to robot programming languages like AL and AML.

Suggested Reading :

1. Spong and Vidyasagar, "*Robot Dynamics and Contros*", John Wiley and Sons, 1990.
2. R.K. Mittal and I.J. Nagrath, "*Robotics and Control*", TMH, 2003.
3. Groover, "*Industrial Robotics*", MGH.
4. Asada and Slotine, "*Robot Analysis and Intelligence*", Wiley Interscience, 1986.
5. Fu. K.S. Gon Zalez R.C., Lee C.S.G., "*Robotics, Control Sensing Vision and Intelligence*", MGH, Int. Ed., 1987.

WITH EFFECT FROM THE ACADEMIC YEAR 2009 -2010

LA 454

INTELLECTUAL PROPERTY RIGHTS
(Elective - III)

Instruction	4	Periods per week
Duration of University Examination	3	Hours
University Examination	75	Marks
Sessional	25	Marks

UNIT-I

Introduction: Meaning of Intellectual Property, Nature of I.P., Protection of I.P, Rightsd, Kinds of Intellectual Property Rights, International Conventions of Intellectual Property Rights, Patent Treaty 1970, GATT 1994, TRIPS & TRIMS. International Organization for Protection of IPR – WTO , WIPO, UNESCO.

UNIT-II

Patents: Meaning of Patent, Commercial significance, obtaining of patent, patentable subject, matter-rights and obligations of patentee, specification, Registration of patents, Compulsory licensing and licenses of rights, Revocation.

UNIT-III

Industrial Designs: Definition of Designs. Registration of Desi gns. Rights and Duties of Proprietor of Design. Piracy of Registered designs.

UNIT-IV

Trade marks: Meaning of trademark, purpose of protecting trademarks Registered trademark, procedure – passing off. Assignment and licensing of trademarks, Infringement of trademarks.

UNIT-V

Copy Right: Nature, scope of copyright, subject matter of copyright, right conferred by copyright, publication. Broadcasting, telecasting, computer programme, database right. Assignment, transmission of copyright, Infringement of copyright.

Suggested Reading :

1. Cornish W.R., "*Intellectual Property – Patents, Copyright, Trademarks and Allied Rights*", Sweet & Maxwell, 1993.
2. P. Narayanan, "*Intellectual Property Law*", Eastern Law House, 2/e, 1997.
3. Robin Jacob & Danial Alexander, "*A guide book to Intellectual Property Patents*", Sweet and Maxwell, 4/e, 1993.
4. Ganguly, "*Intellectual Property: Unleashing the knowledge Economy*", TMH, 2003.

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