General Note :

1. There should not be more than 2 students per batch while performi any of the lab experiment.
2. Mini Project cum design exercise :
   a) The students must design, rig-up, and test the circuits where possible and should carry out the experiments individually.
   b) This exercise carries sessional marks of 10 out of 25, while remaining 15 marks are for the remaining lab exercises.

SCHEME OF INSTRUCTION & EXAMINATION

B.E. IIIrd YEAR

(ELECTRONICS & COMMUNICATION ENGINEERING)

SEMESTER - I

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration In Hours	Maximum Marks	
			L	D/P		Univ. Exam	Sessionals
		THEORY					
1.	EC 301	Linear Integrated Circuiuits and Applications	4	-	3	75	25
2.	EC 302	Digital Integrated Circuits and Applications	4	-	3	75	25
3.	EC 303	Analog Communication	4	-	3	75	25
4.	EC 304	Automatic Control Systems	4	-	3	75	25
5.	EC 305	Microprocessors and Microcontrollers	4	-	3	75	25
		PRACTICALS					
1.	EC 331	Integrated Circuits Lab	-	3	3	50	25
2.	EC 332	Analog Communication Lab	-	3	3	50	25
3.	EC 333	Microprocessor and Microcontroller Lab	-	3	3	50	25
		Total	20	9	--	525	200

EC 301

LINEAR INTEGRATED CIRCUITS AND APPLICATIONS

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

Unit-I

Differential Amplifiers: Classification, DC and AC analysis of single/dual input Balanced and unbalanced output Configurations using BJTs. Level Translator.

Operational Amplifier: Op-amp Block Diagram, ideal Op-amp Characteristics, op-amp and its features, Op-Amp parameters & Measurements, Input and Output Offset voltages and currents, Slew Rate, CMRR, PSRR. Frequency Response and Compensation techniques.

Unit-II

Op-amp Applications I: Inverting and Non-inverting Amplifiers with ideal and non-ideal Op-amps, Voltage Follower, Difference Amplifier, Summing Amplifier, Ideal and Practical Integrator, Differentiator, V to I and I to V converters, Instrumentation Amplifier, Sample and Hold Circuit, Log and Antilog amplifiers, Precision Rectifiers.

Unit-III

Op-amp Applications II: Schmitt Trigger with and without reference voltage Astable Multivibrator, Monostable multivibrator, Triangular waveform generator.

Active Filters: Introduction, Butterworth 1st order, 2nd order low pass and high pass filters Wide and Narrow Band-pass, Band-reject and All-pass filters.

Unit-IV

Timer: Introduction to 555 timer and its functional diagram, Monostable Astable and Schmitt Trigger applications.

IC Function Generator: Analysis and Design of Function Generators using IC 8038 Voltage Controlled Oscillator: Operation and Applications using IC 566.

Phase Locked Loops: Introduction, Principles, Block Schematic and Description of IC 565, Applications of PLL: Frequency multiplication and frequency synthesis.

Unit-V

IC Regulators: Introduction, Analysis and design of regulators using 78XX and 723 monolithic ICs, Current limiting and Current foldback techniques using IC 723.

Data Converters: Introduction, basic Digital to Analog Converter techniques, Weighted Resistor DAC, Inverted R-2R Ladder DAC. Analog to Digital Converter: Types; Parallel Comparator ADC, Successive Approximation ADC and Dual Slope ADC. DAC and ADC specifications.

Suggested Reading:

1. David A. Bell, "*Operational Amplifiers and Linear ICs*," 3/e, Oxford Publications, 2011.
2. Roy, Chowdhury D., & Jain, Shail B., "*Linear Integrated Circuits*," 4/e, New Age International Publishers, 2010.
3. Sergio Franco, "*Design with Operational Amplifiers and Analog Integrated Circuits*," 3/e, TMH, 2008.
4. Ramakant A. Gayakwad, "*Op-Amps and Linear Integrated Circuits*," 4/e, PHI, 2010.
5. K.R.Botkar, "*Integrated Circuits*," 10/e, Khanna Publishers, 2010.

EC 302

DIGITAL INTEGRATED CIRCUITS AND APPLICATIONS

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

Unit-I

Manufacturer's designations for integrated circuits, Development integrated circuits, Integrated circuit package types, Pin identificatio and temperature ranges, IC characteristics, Introduction to diode a transistor logic families. TTL logic family, TTL series, Output configuratio Open Collector, Totem pole, Tri State logic.

Unit-II

Concept of negative logic, ECL logic family, MOS logic family (pM and nMOS) CMOS logic family and its characteristics, CM transmission gate (bilateral switch), and its applications, CMOS op drain and high impedance outputs. Dynamic MOS logic family, dynam MOS inverter, dynamic NAND and NOR gates, Comparison of vario logic families. Interfacing of CMOS and TTL driving CMOS ECL drivi TTL and TTL driving ECL.

Unit-III

Design using TTL-74XX and CMOS 40XX series: Demultiplexers, driv for LED and LCD displays, Multiplexers and their applications, Par generators and Checker circuits, Digital Comparator and Digital. Paral and serial binary adder/subtractor circuits using 2's compliment, Multipl Decimal adder, look- ahead adder.

Unit-IV

Flip-flops and their conversions, Design of Synchronous and Asynchron counters, Decade Counters, Cascading of BCD counters, application counters, Shift register and applications, Familiarity with 74 XX and CM 40XX series of IC Counters. Sequence detector.

Unit-V

ROM, MROM,EPROM, EEPROM,RAM, Types, Architecture's, operation and applications, NVRAM, Flash memory, CCD. Expanding word size and capacity. ASICs, Introduction to PLD's, Architectures of PAL, PLA with operation.

Suggested Reading:

1. Ronald J. Tocci, Neal S. Widmer & Gregory L. Moss, "*Digital Systems: Principles and Applications,*" PHI, 10/e, 2009.
2. David A. Hodges, Horace G Jackson and Resve A Saleh "*Analysis and Design of Digital Integrated Circuits,*" 3/e, McGraw Hill, 2003.
3. Jain R.P., "*Modern Digital Electronics,*" 3/e, TMH, 2003.
4. Sonde, B. S., "*Introduction to system Design using IC's,*" Wiley, 2/e, 1994.
5. Morris R L and Miller J R, "*Designing with TTL Integrated Circuits,*" TMH, 1971.

EC 303

ANALOG COMMUNICATION

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

Unit-I

Linear Modulation schemes: Need for modulation, double side ban suppressed carrier (DSB-SC) modulation, conventional Amplitu Modulation (AM). Hilbert transform, properties of Hilbert transform. Pr envelop. Complex envelop representation of band pass signals, In-pha and Quadrature component representation of band pass signals. Low pa representation of band pass systems. Single side band (SSB) modulati and Vestigial-side band (VSB) modulation. Modulation and demodulati of modulation schemes

Unit-II

Angle modulation schemes: Frequency Modulation (FM) and Pha modulation (PM), Concept of instantaneous phase and frequency. Typ of FM modulation: Narrow band FM and wide band FM. FM spectru in terms of Bessel functions. Direct and indirect (Armstrong's) methods FM generation. Balanced discriminator, Foster–Seeley discriminator a Ratio detector for FM demodulation. Pre-Emphasis and De-Emphas Capture effect.

Unit-III

Transmitters and Receivers: Classification of transmitters. High le and low level AM transmitters. FM transmitters. Principle of operation Tuned radio frequency (TRF) and super heterodyne receivers. Selecti of RF amplifier. Choice of Intermediate frequency. Image frequency a its rejection ratio Receiver characteristics: Double spotting, Tracking a alignment, Automatic Gain Control.

Unit-IV

Noise Sources and types. Atmospheric noise, Shot noise and thermal noise. Noise temperature. Noise in two-port network: noise figure, equivalent noise temperature and noise bandwidth. Noise figure and equivalent noise temperature of cascade stages. Narrow band noise representation. S/N ratio and Figure of merit calculations in AM, DSB-SC, SSB and FM systems.

Unit-V

Analog pulse modulation schemes: Sampling of continuous time signals. Sampling of low pass and band pass signals. Types of sampling. Pulse Amplitude Modulation (PAM) generation and demodulation. Pulse time modulation schemes: PWM and PPM generation and detection.

Suggested Reading:

1. Simon Haykin, "*Communication Systems*," 4/e, Wiley India, 2011.
2. Herbert Taub, Donald L. Shilling & Goutam Saha, "*Principles of Communication Systems*," 3/e. TMH, 2008.
3. P. Ramakrishna Rao, "*Analog Communication*," 1/e, TMH, 2011.
4. A. Bruce Carlson and Paul B. Crilly, "*Communication Systems*," 5/e, 2011.
5. Singh, R.P. and Sapre, S.D., "*Communication Systems*," TMH, 2007.

EC 304

AUTOMATIC CONTROL SYSTEMS

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

Unit-I

Control System fundamentals and Components: Classification of control systems, Open and Closed loop systems, Error sensing devices – potentiometers and syncros. AC and DC servo motors. Mathematical modeling of mechanical systems and their conversion into electrical systems. Block diagram reduction and Signal flow graphs.

Unit-II

Time response: Transfer function and Impulse response, types of input. Transient response of second order system for step input. Time domain specifications. Types of systems, static error coefficients, error series, Routh - Hurwitz criterion for stability.

Root locus techniques: Analysis of typical systems using root locus techniques. Effect of location of roots on system response.

Unit-III

Frequency response plots: Bode plots, frequency domain specifications. Gain margin and Phase Margin. Principle of argument, Polar plot, Nyquist plot and Nyquist criterion for stability.

Compensation: Cascade and feedback compensation using Bode plots. Phase lag, lead, lag-lead compensators. PID controller.

Unit-IV

Discrete Control Analysis: Digital control, advantages and disadvantages, and digital control system architecture. The discrete transfer function. Sampled data system. Transfer function of sample data systems. Stability of Discrete data systems.

Unit-V

State Space Representation: Concept of state and state variables. State models of linear time invariant systems, State transition matrix, Solution of state equations. Design of digital control systems using state-space concepts. Controllability and observability.

Suggested Reading:

1. Nagrath, I.J., and Gopal, M., "*Control System Engineering*," New Age Publishers, 5/e, 2009.
2. Ogata, K., "*Modern Control Engineering*," 5/e, PHI, 2010.
3. Benjamin C. Kuo, "*Automatic Control Systems*," 7/e, PHI, 2010.
4. Richard C. Dorf & Robart H. Bishop, "*Modern Control Systems*," 11/e, Pearson, 2008.
5. Gopal, Madan, "*Digital Control Engineering*," 1/e, New Age Publishers, 2008.

EC 305

MICROPROCESSORS AND MICROCONTROLLERS

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

Unit-I

8086/8088 Architecture and Instruction set: Minimum and Maximu mode operations, 8086 control signal interfacing under minimum mo system, control signal interfacing under maximum mode usin multiprocessing systems. Addressing modes, Interrupt structure, Instructi formats, Instruction execution timings. Evaluation of x86 seri microprocessors.

Unit-II

8086 Assembly Language programming: Assembler directives a operators, programs using data transfer, arithmetic, logical, Branching a ASCII instructions. String processing, Procedures, Macros and sta Basic programs using DOS functions. Introduction to assemblers a debugging tools.

Unit-III

8086 Interfacing: Memory interfacing using standard RAM, EPRO IC Chips, 8255 PPI, 8253/8254 programmable interval timers, need f DMA and interfacing with DMA controller (8257 IC), Keyboard & displ controller (8279) interfacing, programmable communication interfa (8251). Serial and parallel data transmission formats, USART interfaci

Unit-IV

8051 Microcontroller: Classification, Internal architecture of 8051 a its pin configuration, Memory organization and expansion. 8051 instructi set, addressing modes and bit addressable features. Data transf arithmetic, logical and branching groups. Interrupt and I/O port structu and their operations. Assembly language Programming with 8051. 80 timer and counter and its programming.

Unit-V

Interfacing and Applications: 8051 Serial data communication and interrupt programming. 8051 Interfacing with external memory, expansion of I/O ports. A/D converter, D/A converter, Seven- segment display, LCD module, Keyboard and Stepper Motor interfacing with 8051.

Suggested Reading:

1. Ray A.K & Bhurchandhi K.M, "*Advanced Microprocessor and Peripherals,*" 2/e, TMH, 2007.
2. Douglas V Hall, "*Microprocessors and Interfacing Programming and Hardware,*" 2/e, THM, 2007.
3. Walter A. Triebal and Avtar Singh, "*The 8088 and 8086 Microprocessors Programming, Interfacing, Software, Hardware and Applications,*" 4/e, Pearson Education, 2007.
4. Mazidi M.A, Mazidi J.G & Rolin D. Mckinlay, "*The 8051 Microcontroller & Embedded Systems using Assembly and C,*" 2/e, Pearson Education, 2007.
5. Ayala K.J, "*The 8051 Micro Controller Architecture, programming and Application,*" Penram International, 2007.

EC 331

INTEGRATED CIRCUITS LAB

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

Lab Experiments:

Part-A

1. Measurement of parameters of Op-Amp. Voltage Follower, Inverting and Non Inverting Amplifiers, Level Translators using Op-Amp.
2. Arithmetic Circuits: Summer, Integrator Differentiator Op-Amp.
3. Active filters: LP, HP and BP using Op-Amp.
4. Op-Amp Oscillators: Astable, Monostable.
5. Triangle and Square wave Generators. Schmitt Trigger using Op-Amp.
6. Voltage Controlled Oscillator Using LM 566.
7. IC Regulators and current boosting.
8. Applications of 555 Timer.

Part-B

1. Measurement of propagation delay, fan-out, Noise margin and transfer Characteristics of TTL and CMOS IC gates and open collector / drain gates.
2. Designing code converters using logic gates and standard code converters. Parity generator and checker circuit.
3. Flip-Flop conversions and latches using gates and ICs.
4. Designing Synchronous, Asynchronous up/down counters
5. Shift registers and ring counters using IC Flip-Flops & Standards IC counters.
6. Full adders, subtractors using logic gates and multiple bits IC Adder/ Subtractor and arithmetic Circuits.

7. Mux - Demux applications.
8. Interfacing counters with 7-segment LED/LCD display units.

General Note:

1. At least 5 experiments from each part.
2. A total of not less than 10 experiments must be carried out during the semester.
3. Analysis and design of circuits, wherever possible, should be carried out using SPICE tools.

EC 332

ANALOG COMMUNICATION LAB

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

Lab Experiments:

1. AM generation and detection
2. Balanced Modulator
3. FM generation and detection
4. Pre emphasis and De-emphasis circuits
5. Radio Receiver Measurements: Sensitivity, Selectivity and Fidelity
6. Sampling and reconstruction
7. PAM, PWM, and PPM generation and detection
8. Time Division Multiplexing and De-multiplexing
9. Frequency Division Multiplexing and De-multiplexing
10. PLL Characteristics
11. Spectral Analysis of Video signals generated by TV demonstrator Kit and Pattern Generator using Spectrum analyzer
12. Mixer Characteristics

General Note: *At least 10 experiments are to be conducted.*

EC 333

MICROPROCESSORS AND MICROCONTROLLERS LAB

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

PART-A

[Experiments on assembly language programming for 8086 using Assembler]

1. Study and use of 8086 microprocessor trainer kit and execution of programs.
2. Programs using different addressing modes.
3. Multiplication and division.
4. Single byte, multi byte binary and BCD addition and Subtraction.
5. Code conversions.
6. String Searching and Sorting
7. Generation of waveforms and gating applications using 8253/8254 timers.
8. Generation of waveforms using DAC interface.
9. Monitor utilities of 8086 kit for Keyboard/displaying results.

PART-B

[Experiments on assembly language programming for 8051 using Assembler.]

10. Familiarity and use of 8051/8031 Microcontroller trainer kit, and execution of programs
11. Programs using different addressing modes.
12. Timer and counter programming.
13. Interfacing for D/A applications.
14. Interfacing for A/D applications.
15. Interfacing traffic signal control.
16. Program to control stepper motor.
17. 7-segment display/LCD display interfacing.
18. Keyboard interfacing.

General Note:

1. At least 5 experiments from each part.
2. A total of not less than 10 experiments must be carried out during the semester.
3. Analysis and design of circuits, wherever possible should be carried out using SPICE tools.

SCHEME OF INSTRUCTION & EXAMINATION

B.E. IIIrd YEAR

(ELECTRONICS & COMMUNICATION ENGINEERING

SEMESTER - II

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration In Hours	Maximu Marks	
			L	D/P		Univ. Exam	Ses ons
		THEORY					
1.	EC 351	Digital Communication	4	-	3	75	2
2.	EC 352	Digital Signal Processing	4	-	3	75	2
3.	EC 353	Antennas and Wave Propogation	4	-	3	75	2
4.	EC 354	Computer Organization and Architecture	4	-	3	75	2
5.	EC 355	Electronic Instrumentation	4	-	3	75	2
6.	CM 371	Managerial Economics and Accountancy	4	-	3	75	2
		PRACTICALS					
6.	EC 381	Digital Communication Lab	-	3	3	50	2
7.	EC 382	Digital Signal Processing Lab	-	3	3	50	2
8.	EC 383	Industrial Visit / Study	-	-	-	-	*(
		Total	**24**	**6**	**--**	**550**	**20**

EC 351

DIGITAL COMMUNICATION

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

Unit-I

Elements of Digital Communication System, Comparison of Digital and Analog Communication Systems. Analog to Digital Conversion, Quantization and Encoding techniques, PCM. Companding in PCM systems: μ-law and A-law. Applications of PCM: PCM-TDM. Introduction to Linear Prediction Theory. Modulation and demodulation of DPCM and DM. Quantization noise and Slope overload error in DM. Modulation and demodulation of ADM. Comparison of PCM, DPCM, DM and ADM. SNR of PCM and DM. Vocoders.

Unit-II

Uncertainty, Information and entropy. Source coding, Shannon – Fano algorithm and Huffman coding. Discrete memoryless channels, Probability relations in a channel, priori & posteriori entropies, cascaded channels, mutual information, Channel capacity, information rate and information capacity. Rate distortion.

Unit-III

Types of transmission errors, need for error control coding, Linear Block Codes (LBC): description of LBC, generation, Syndrome and error detection, minimum distance of a block code, error correcting and error detecting capabilities, Standard array and syndrome decoding, Hamming codes. Binary cyclic codes (BCC): description of cyclic codes, encoding, decoding and error correction of cyclic codes using shift registers, BCH codes. Convolution codes: description, encoding and decoding.

Unit-IV

Base band digital data transmission, error probability, matched filter, correlation receiver, coherent and non-coherent ASK, FSK, PSK, DPSK

and QPSK, and error probability. Need for MSK Modulation, Comparison of digital carrier modulation schemes. M-ary signaling schemes. Synchronization methods.

Unit-V

Need for spreading a code, generation and characteristics of PN sequences. Direct Sequence Spread Spectrum and Frequency hopping spread spectrum systems and their applications. Acquisition schemes for spread spectrum receivers, Tracking of FH and DS signals.

Suggested Reading:

1. Simon Haykin, "*Communication Systems*," 4/e, Wiley India, 2011.
2. Herbert Taub, Donald L. Shilling & Goutam Saha, "*Principles of Communication Systems*," 3/e, TMH, 2008.
3. P. Ramakrishna Rao, "*Digital Communication*," 1/e, TMH, 2011.
4. A. Bruce Carlson and Paul B. Crilly, "*Communication Systems*," 5/e, 2011.
5. Sam Shanmugham.K., "*Digital and Analog Communication Systems*," Wiley, 1979.

EC 352

DIGITAL SIGNAL PROCESSING

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

Unit-I

Fast Fourier Transform: Overview of Discrete time Fourier Transform (DTFT), Discrete Fourier transform (DFT), – Efficient computation of DFT- Properties of DFT .

FFT algorithms –Radix-2 FFT algorithms – Decimation in Time – Decimation in Frequency algorithms - in place computation- bit reversal- Use of FFT algorithms in Linear Filtering and Correlation.

Unit-II

Digital filters (FIR) Design: Amplitude and phase responses of FIR filters – Linear phase filters – Windowing techniques for design of Linear phase FIR filters – Rectangular, Bartlet, hamming, Blackman, Kaiser – realization and finite word length effects.

Unit-III

Digital filters (IIR) Design: Butterworth and Chebychev approximation- IIR digital filter design techniques- Impulse Invariant transformation - Bilinear transform techniques- Digital Butterworth- Chebychev filters,-comparisons between FIR and IIR filters.

Unit-IV

Multirate Digital Signal Processing : Introduction -Decimation by a Factor D- Interpolation by a Factor I- Sampling Rate Conversion by a Rational Factor I/D- Implementation of Sampling Rate Conversion- Multistage implementation of Sampling Rate Conversion- Sampling Rate Conversion by an Arbitrary factor- Application of Multirate Signal Processing.

Unit-V

Introduction to DSP Processors: Difference between DSP and other microprocessors architectures- their comparison and need for ASP, RISC and CPU- General purpose DSP processors- TMS 320C 54XX processors, architecture, addressing modes-instruction set.

Suggested Reading:

1. Alan V. Oppenheim & Ronald W. Schafer, "*Digital Signal Processing*," PHI, 2/e, 2010.
2. John G. Proakis & Dimtris G. Manolakis, "*Digital Signal Processing: Principles, Algorithms and Application*," PHI, 3/e, 2000.
3. Ashok Ambardar, "*Digital Signal Processing: A Modern Introduction*," Cengage Learning, 2009.
4. Li Tan, "*Digital Signal Processing: Fundamentals and Applications*," Elsevier, 2012.
5. B.Venkataramani & M. Bhaskar, "*Digital Signal Processors Architecture, Programming and Application*," TMH, 2002.

EC 353

ANTENNAS AND WAVE PROPAGATION

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

Unit-I

Principles of radiation, retarded potential and isotropic radiator, Basic antenna parameters: patterns, radiation intensity, far field, near field, Gain and directivity, Antenna Polarization, effective aperture, aperture efficiency. Point sources, Current distribution, infinitesimal dipole.

Unit-II

Half-wave dipole, quarter wave monopole, Effect of earth on vertical patterns, Loop antenna, Far field pattern of circular loop with uniform current. Helical Antennas: Axial mode pattern, wideband characteristics, radiation efficiency, Q, Bandwidth, S/N ratio.

Unit-III

Arrays of point sources, two element array with equal and unequal amplitudes, different phases. Linear array with uniform distribution, binomial array, principle of pattern multiplication. Broadside and End fire arrays, effect of inter element phase shift on beam scanning.

Unit-IV

VHF,UHF turnstile antennas, Rhombic Antenna, Yagi - Uda Array, Log periodic Antenna, Horn, Parabolic Reflector, Lens antennas. Microstrip antennas: different types, advantages and disadvantages of Microstrip antennas (Working principle and characteristics only).

Antenna Measurements: Antenna Test Site, impedance, radiation pattern and gain measurement techniques, Antenna temperature.

Unit-V

Ground wave propagation, Space and Surface waves, Tropospheric refraction and reflection, Duct propagation, Sky wave propagation, Regular

and irregular variations in ionosphere. Friis transmission formula, Line o
sight propagation.

Suggested Reading:

1. John D. Krauss, Ronald J. Marhefka & Ahmad S. Khan, "*Antenna and Wave Propagation,*" 4/e, TMH, 2010.
2. Constantine A. Balanis, "*Antenna Theory: Analysis and Design*," 3/e, John Wiley, 2005.
3. Edward C. Jordan and Kenneth G. Balmain, "*Electromagneti Waves and Radiating Systems,*" 2/e, PHI, 2001.
4. Chatterjee, R., "*Antenna Theory and Practice,*" New Ag Publishers, 2008.

EC 354

COMPUTER ORGANIZATION AND ARCHITECTURE

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

Unit-I

Data representation and Computer arithmetic: Introduction to Computer Systems, Organization and architecture, evolution and computer generations; Fixed point representation of numbers, digital arithmetic algorithms for Addition, Subtraction, Multiplication using Booth's algorithm and Division using restoring and non restoring algorithms. Floating point representation with IEEE standards and its arithmetic operations.

Unit-II

Basic Computer organization and Design: Instruction codes, stored program organization, computer registers and common bus system, computer instructions, timing and control, instruction cycle: Fetch and Decode, Register reference instructions; Memory reference instructions. Input, output and Interrupt: configuration, instructions, Program interrupt, Interrupt cycle, Micro programmed Control organization, address sequencing, micro instruction format and microprogram sequencer.

Unit-III

Central Processing Unit: General register organization, stack organization, instruction formats, addressing modes, Data transfer and manipulation, Program control. CISC and RISC: features and comparison. Pipeline and vector Processing , Parallel Processing, Pipelining, Instruction Pipeline, Basics of vector processing and Array Processors.

Unit-IV

Input-output organization: I/O interface. I/O Bus and interface modules, I/O versus Memory Bus. Asynchronous data transfer: Strobe control, Handshaking, Asynchronous serial transfer. Modes of Transfer: Programmed I/O, Interrupt driven I/O, Priority interrupt; Daisy chaining,

Parallel Priority interrupt. Direct memory Access, DMA controller and transfer. Input output Processor , CPU-IOP communication, I/O channel.

Unit-V

Memory organization: Memory hierarchy, Primary memory, Auxiliary memory, Associative memory, Cache memory: mapping functions, Virtual memory: address mapping using pages, Memory management.

Suggested Reading:

1. Morris Mano, M., "*Computer System Architecture*," 3/e, Pearson Education, 2005.
2. Hamacher, Vranesic, Zaky, "*Computer Organization*," 5/e, McGraw Hill, 2007.
3. William Stallings, "*Computer Organization and Architecture: Designing for performance*," 7/e, Pearson Education, 2006.
4. John P. Hayes, "*Computer Architecture and Organization*," 3/e, TMH, 1998.
5. Govindarajulu, B., "*Computer Architecture and Organization*," 2/e, TMH, 2010.

EC 355

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.

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. Albert D. Helfric, and William D. Cooper, "*Modern Electronic Instrumentation and Measurement Techniques*", PHI, 2010.
2. H S Kalsi, "*Electronic Instrumentation*", 3/e, TMH, 2011.
3. Robert A Witte, "*Electronic Test Instruments: Analog and Digital Measurements*", 2/e, 2002.
4. Nakra B.C, and Chaudhry K.K., "*Instrumentation, Measurement and Analysis*", TMH, 2004
5. Khandpur. R.S.,"*Handbook of Bio-Medical Instrumentation*", TMH, 2003.

CM 371

MANAGERIAL ECONOMICS AND ACCOUNTANCY

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

UNIT-I

Meaning and Nature of Managerial Economics: Managerial Economics its usefulness to Engineers, Fundamental Concepts of Managerial Economics, Scarcity, Marginalism, Equi-marginalism, Opportunity costs, Discounting, Time Perspective, Risk and Uncertainty, Profits, Case study method.

UNIT-II

Consumer Behaviour: Law of Demand, Determinants, Kinds; Elasticity of Demand (Price, Income and Cross-Elasticity); Demand Forecasting, Law of Supply, Concept of Equilibrium. (Theory questions and small numerical problems can be asked).

UNIT-III

Theory of Production and Markets: Production Function, Law of Variable Proportion, ISO quants, Economics of Scale, Cost of Production (Types and their measurement). Concept of Opportunity Cost, Concept of Revenue, Cost-Output relationship, Break-Even Analysis, Price – Output determination under Perfect Competition and Monopoly (theory and problems can be asked).

UNIT-IV

Capital Management: Its significance, determination and estimation of fixed and working capital requirements, sources of capital, Introduction to capital budgeting, methods of payback and discounted cash flow methods with problems. (Theory questions are numerical problems on estimating working capital requirements and evaluation of capital budgeting opportunities can be asked).

UNIT-V

Book-keeping: Principles and significance of double entry book keeping, Journal, Subsidiary books, Ledger accounts Trial Balance, concept and

preparation of Final Accounts with simple adjustments, Analysis and interpretation of Financial Statements through Ratios.

(Theory questions and numerical problems on preparation of final accounts, cash book, petty cash book, bank reconciliation statement, calculation of some ratios).

Suggested Reading:

1. Mehta P.L., "*Managerial Economics – Analysis, Problems and Cases*", Sulthan Chand & Son's Educational publishers, 2011.
2. Maheswari S.N. "*Introduction to Accountancy*", Vikas Publishing House, 2005.
3. Panday I.M. "*Financial Management*", Vikas Publishing House, 2009.

EC 381

DIGITAL COMMUNICATION LAB

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

1. PCM generation and detection
2. Error control coding
3. Data formats / channel encoding and decoding.
4. Linear Delta Modulation and Demodulation.
5. Adaptive Delta Modulation and demodulation.
6. ASK generation and Detection.
7. FSK generation and Detection.
8. BPSK generation and detection
9. QPSK generation and detection
10. Minimum Shift Keying generation & detection
11. Optical Fibre measurements:
    Numerical aperture, Attenuation, E-O and O-E characteristics
12. Digital Fibre Optic Multiplexed Link
13. Modem characteristics.
14. Wavelength Division Multiplexing

General Note: At least 10 experiments are to be conducted.

EC 382

DIGITAL SIGNAL PROCESSING LAB

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

(A) Experiments on DSK and CCS

1. Solutions of difference equations
2. Impulse Response
3. Linear Convolution.
4. Circular Convolution
5. Study of procedure to work in real- time.
6. Fast Fourier Transform Algorithms: (DIT, DIF)
7. Design of FIR (LP/HP) using windows,(a) Rectangular , (b)Triangular (c) Hamming window
8. Design of IIR (HP/LP) filters.

(B) Experiments on signal processing.

1. DFT and FFT algorithm
2. Linear Convolutions
3. Circular Convolutions
4. FIR filter design using different data windows
5. IIR filter design: Butter worth, chebysheve type 1 and 2 and Bilinear transformation Methods.
6. Interpolation and Decimation.

Note:

1. Minimum of **5** from Part A and **5** from Part B is mandatory.
2. For section 'B', MATLAB with different toolboxes like Signal Processing, Signal Processing block set, and SIMULINK/ MATHEMATICA/ any popular software can be used.

EC 383

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 about the industrial visit/ study. The department should evaluate the reports through a committee consisting of i)Head of the department ii) two faculty members to award the Grade.

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

* * *

WITH EFFECT FROM THE ACADEMIC YEAR 2013 - 2014

SCHEME OF INSTRUCTION & EXAMINATION

B.E. IV - YEAR

(ELECTRONICS & COMMUNICATION ENGINEERING)

SEMESTER - I

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration In Hours	Maximum Marks	
			L	D/P		Univ. Exam	Sessionals
		THEORY					
1.	EC 401	Microwave Engineering	4	-	3	75	25
2.	EC 402	VLSI Design	4	-	3	75	25
3.	EC 403	Computer Networks	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 and Financial Management	4	-	3	75	25
		PRACTICALS					
7.	EC 431	Microwave Engineering Lab.	-	3	3	50	25
8.	EC 432	Electronic Design and Automation Lab	-	3	3	50	25
9.	EC 433	Project Seminar	-	3	-	-	25
		Total	24	9	-	**550**	**225**

ELECTIVE-I

EC 411 Embedded Systems
EC 412 Optical Fiber Communication
EC 413 Digital Image Processing
EC 414 Multi Rate Signal Processing
EC 415 System Automation and Control
CS 403 Information Security

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.

UNIT-II

Waveguides: TE and TM waves in rectangular and circular waveguides, Wave Impedance, Characteristic Wave Impedance, Attenuation and Q of waveguides. 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, S parameters 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 and Reflex Klystron.

Theory of crossed field interaction; Principles and operation of magnetrons and crossed field amplifiers, TWT and BWO.

UNIT-V

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

Elements of strip lines, micro strip lines, slot lines and fin–lines.

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. Rizzi P, *"Microwave Devices and Circuits"*, 3/e, Pearson Education, 2003.
4. R. E. Collins, *"Foundations for Microwave Engineering"*, 2/e, Wiley India Pvt. Ltd., 2012.

EC 402

VLSI DESIGN

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

UNIT-I

Introduction to HDLs, Basic Concepts of Verilog, Data Types, System Tasks and Compiler Directives.

Gate Level Modeling: Gate Types and Gate Delays. Dataflow Modeling: Continuous assignment and Delays. Design of Stimulus Block.

UNIT-II

Behavioral Modeling: Structured Procedures, Procedural Assignments, Timing control, Conditional statements, Sequential and Parallel Blocks, Generate Blocks. Switch level Modeling.

Tasks, Functions, Procedural Continuous Assignments, Design of Mealy and Moore state models using Verilog.

Logic Synthesis, Synthesis Design flow, Gate level Net list.

UNIT-III

Introduction to MOS Technology, Basic MOS Transistor action: Enhancement and Depletion Modes. Basic electrical properties of MOS, Threshold voltage and Body Effect. Design of MOS inverters with different loads, Basic Logic Gates with CMOS: INVERTER, NAND, NOR, AOI and OAI gates. Transmission gate logic circuits, Bi-CMOS inverter.

UNIT-IV

MOS and CMOS circuit Design Process: MOS Layers, Stick diagrams, Lambda based Design rules and Layout diagrams. Basic Circuit Concepts: Sheet Resistance, Area Capacitance and Delay calculation.

UNIT-V

Combinational Logic: Manchester, Carry select and Carry Skip adders, Crossbar and barrel shifters, Multiplexer.

Sequential Logic: Design of Dynamic Register Element, 3T, 1T Dynamic RAM Cell, 6T Static RAM Cell.

D flip flop using Transmission gates. NOR and NAND based ROM Memory Design.

Suggested Reading:

1. Samir Palnitkar, *"Verilog HDL: A Guide to Digital Design and Synthesis"*, 2/e , Pearson Education, 2008.
2. Michael D. Ciletti, *" Advanced Digital Design with Verilog HDL"*, PHI, 2005.
3. Kamran Eshraghian, Douglas A. Pucknell, and Sholeh Eshraghian, *"Essentials of VLSI circuits and systems"*, PHI, 2011.
4. John P. Uyemura, *"Introduction to VLSI Circuits and Systems"*, Wiley India Pvt. Ltd., 2011.

EC 403

COMPUTER NETWORKS

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

UNIT-I

Data communication, Network Topologies: LAN, WAN, MAN, Types- Bus, Star, Ring, Hybrid. Line configurations. Reference Models: OSI, TCP/IP.

Data Link Layer: Design issues, Framing, Error Detection and Correction, Flow control Protocols: Stop and Wait, Sliding Window, ARQ Protocols, HDLC.

UNIT-II

MAC Sub Layer: Multiple Access Protocols: ALOHA, CSMA, Wireless LAN. IEEE 802.2, 802.3, 802.11, 802.16 standards. Bluetooth, Bridges and Routers.

Circuit switching: Circuit Switching Principles and concepts.

Packet switching: Virtual circuit and Datagram subnets.

UNIT-III

Network Layer: Network layer Services, Routing algorithms : Shortest Path Routing, Flooding, Hierarchical routing, Broadcast, Multicast, Distance Vector Routing, and Congestion Control Algorithms.

Internet Working: The Network Layer in Internet and ATM Networks.

UNIT-IV

Transport Layer: Transport Services, Elements of Transport Layer, Connection management, TCP and UDP protocols, ATM AAL Layer Protocol.

UNIT-V

Application Layer: Domain Name System, SNMP, Electronic Mail, World Wide Web.

Network Security: Cryptography Symmetric Key and Public Key algorithms, Digital Signatures, Authentication Protocols.

Suggested Reading:

1. Andrew S Tanenbaum, *"Computer Networks,"* 5/e, Pearson Education, 2011.
2. Behrouz A. Forouzan, *"Data Communication and Networking,"* 3/e, TMH, 2008.
3. William Stallings, *"Data and Computer Communications,"* 8/e, PHI, 2004.
4. S.Keshav, *"An Engineering Approach to Computer Networks,"* 2/e, Pearson Education.

EC 404

MOBILE CELLULAR COMMUNICATIONS

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

UNIT-I

Basic Cellular system and its operation, frequency reuse, channel assignment strategies, Handoff process, factors influencing handoffs, handoffs in different Generations, Interference and system capacity, Cross talk, Enhancing capacity and cell coverage, Trunked radio system.

UNIT-II

Free space propagation model, three basic propagation mechanisms, practical link budget design using path loss models, outdoor propagation models: Durkin's model and indoor propagation model, partition losses. Small scale multipath propagation, Parameters of mobile multipath channels, types of small scale fading.

UNIT-III

FDMA, TDMA, SSMA, FHMA, CDMA, SDMA, Packet radio protocols, CSMA, Reservation protocols.

UNIT-IV

GSM: Services and Features, System architecture, Radio Sub system, Channel Types, Frame structure and Signal processing.

CDMA: Digital Cellular standard IS-95, Forward Channel, Reverse Channel.

UNIT-V

Comparison of 1G, 2G and 2.5G, technology Features of 3G and 4G, WLAN, Bluetooth, PAN, Trends in Radio and Personal Communications, UMTS system architecture and Radio Interface, introduction to CDMA 2000.

Suggested Reading:

1. Theodore.S. Rappaport, *"Wireless Communications: Principles and Practice,"* 2/e, Pearson Education, 2010.
2. William. C.Y.Lee, *"Mobile Communication Engineering,"* 2/e, Mc-GrawHill, 2011.
3. T.L.Singal *"Wireless Communication Systems,"* 1/e, TMH Publications, 2010.
4. William.C.Y.Lee, *"Mobile Cellular Telecommunications: Analog and Digital Systems,"* 2/e, Mc-Graw Hill, 2011.

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 to 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 Pulications House, New Delhi, 1994.
2. Khanna O.P., *"Industrial Engineering and Management"*, Dhanapat Rai & Sons.
3. Marshall/Bansal, *"Financial Engineering"*, PHI.
4. Keown, *"Financial Management"*, 9/e, PHI.
5. Chandra Bose, *"Principles of Management & Administration"*, PHI.

EC 431

MICROWAVE ENGINEERING 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 $(1/l_g)^2$ and $(1/l_0)^2$ 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 finding the gain, bandwidth and beam width 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 simulation software tools.

ii. To design antenna arrays such as: Binomial, Chebyshev, using software tools.

EC 432

ELECTRONIC DESIGN AND AUTOMATION LAB

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

Part A

Write the Code using VERILOG, Simulate and synthesize the following

1. Arithmetic Units: Adders and Subtractors.
2. Multiplexers and De-multiplexers.
3. Encoders, Decoders, Priority Encoder and Comparator.
4. 8-bit parallel adder using 4-bit tasks and functions.
5. Arithmetic and Logic Unit with minimum of eight instructions.
6. Flip-Flops.
7. Registers/Counters.
8. Sequence Detector using Mealy and Moore type state machines.

Note:-

1. All the codes should be implemented appropriately using Gate level, Dataflow and Behavioral Modeling.
2. All the programs should be simulated using test benches.
3. Minimum of two experiments to be implemented on FPGA/CPLD boards.

Part B

Transistor Level implementation of CMOS circuits

1. Basic Logic Gates----------: Inverter, NAND and NOR.
2. Half Adder and Full Adder. 3. 4:1 Multiplexer.
4. 2:4 Decoder.

Mini Project:

i) 8 bit CPU (ii) Generation of different waveforms using DAC

iii) RTL code for Booth's algorithm for signed binary number multiplication

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

v) Design of 4-bit thermometer to Binary Code Converter

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 / PC 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, Power PoinT Presentation 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 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 two faculty members on the basis of an oral and written presentation as well as their involvement in the discussions.

EC 411

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: Classification, Embedded Processor in a system, Embedded hardware, Software and devices in a system. Embedded System–On–Chip, Design process in Embedded System, Challenges in Embedded System design.

UNIT-II

Introduction to RISC Processors, RISC concepts with ARM Processors, Registers, Current Program Status Register, Pipeline, Exceptions, Interrupts and vector table, Core Extensions, Architectural Revisions, ARM Processor Families. Introduction to ARM Instruction Set.

UNIT-III

Serial Bus Communication protocols: I^2C, CAN, USB, Firewire-IEEE 1394 Bus standard, Advanced serial high speed buses. Parallel Bus device protocols: ISA, PCI, PCI-X , ARM Bus, Advanced parallel high speed buses. Internet Enabled Systems-Network protocols: HTTP, TCP/IP, Ethernet.

UNIT-IV

Embedded System design and co-design issues in system development process, Design cycle in the development phase for an Embedded Systems. Embedded software development tools: Host and Target Machines, Linker/Locators for embedded software, Embedded Software into the Target system.

UNIT-V

Testing on Host machine, Instruction Set Simulators, In-Circuit Emulator, Laboratory tools: Logic Analyzer IDE tool: Keil microvision for 8051 and ARM.

Case Study: Embedded Systems design for automatic vending machines and digital clock.

Suggested Reading:

1. Raj Kamal, *"Embedded Systems-Architecture, Programming and Design,"* 2/e, TMH, 2012.
2. Tammy Noergaard, *"Embedded Systems-Architecture"* A comprehensive Guide for Engineers and Programmers" Elsevier Publishers 2nd Edition, 2013.
3. David E.Simon, *"An Embedded software primer,"* Pearson Education, 2004.
4. Steve Furber, *"ARM System on chip Architecture."* 2/e, Pearson Education.

EC 412

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

Evolution of fiber optic system, Elements of Optical Fiber Transmission link, Ray Optics, Optical Fiber Modes and Configurations, Mode theory of Circular Waveguides, Overview of Modes and Key concepts, Linearly Polarized Modes, Single Mode Fibers and Graded Index fiber structure.

UNIT-II

Attenuation - Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Waveguides-Information Capacity determination, Group Delay, Material Dispersion, Waveguide Dispersion, Signal distortion in SM fibers-Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in Guided Index fibers, Mode Coupling, Design Optimization of Single Mode fibers-Refractive Index profile and cut-off wavelength.

UNIT-III

Direct and indirect Band gap materials, LED structures, Light source materials, Quantum efficiency, LED power, Modulation of LED, laser Diodes, Modes and Threshold condition, Rate equations, External Quantum efficiency, Resonant frequencies, Laser Diodes, Temperature effects, Introduction to Quantum laser, Fiber amplifiers, Power Launching and coupling, Lensing schemes, Fiber-to-Fiber joints, Fiber splicing.

UNIT-IV

PIN and APD diodes, Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise, Comparison of Photo detectors, Fundamental Receiver Operation, preamplifiers, Error Sources, Receiver Configuration, Probability of Error, Quantum Limit.

UNIT-V

Point-to-Point link system considerations -Link Power budget, Rise - time budget, Noise Effects on System Performance, Operational Principles of WDM and Applications. Erbium-doped Amplifiers. Introductory concepts of SONET/SDH Network.

Suggested Reading:

1. Gourd Keiser, *"Optical Fiber Communication,"* 4/e, TMH, 2000.
2. J.Senior, *"Optical Communication, Principles and Practice,"* PHI, 1994.
3. J.Gower, *"Optical Communication System,"* PHI, 2001.
4. Binh, *"Digital Optical Communications,"* First Indian Reprint 2013, (Taylor & Francis), Yesdee Publications.

EC 413

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

Elements of Digital Image Processing Systems, Digital image representation, elements of visual perception, Image sampling and Quantization, Basic Relationships between pixels.

UNIT-II

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

UNIT-III

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 Degradation model, Algebraic approach to restoration, inverse filtering, Least mean square filter, Constrained least square restoration and interactive restoration. Speckle noise and its removal techniques.

UNIT-V

Redundancies for image compression, Huffman Coding, Arithmetic coding, Bit-plane coding, loss less and lossy predictive coding.

Transform coding techniques: Zonal coding and Threshold coding.

Suggested Reading:

1. Gonzalez R.C. and Woods R.E., *"Digital Image Processing,"* 2/e, PHI, 2005.

2. Vipul Singh, *"Digital Image Processing with Matlab and Lab view"* Elsevier 2013.
3. Madhuri A.Joshi, *"Digital Image Processing: An algorithmic Approach,"* PHI, 2006.
4. Qidwai, *"Digital Image Processing,"* First Indian Reprint 2013, (Taylor & Francis), Yesdee Publications.

EC 414

MULTI RATE 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 fundamentals of Multirate Systems: Decimation by a integer factor D, Interpolation by a integer factor I, Sampling rate conversion by a rational factor I/D, Inter connection of building blocks, Polyphase representation, Multi stage implementation of sampling-rate conversion, Applications of Multirate systems.

UNIT-II

Multirate Filter banks: Digital filter banks, Uniform DFT filter banks, Polyphase implementation of Uniform filter banks.
Nyquist filters: L^{th} -band filters, half band filters, design of Linear-phase L^{th} band FIR filters.

UNIT-III

Quadrature - Mirror Filter banks : Two Channel QMF structure and analysis, Alias free filter bank, Alias - free realization, Alias - free FIR QMF bank, Alias - free IIR QMF bank, perfect reconstruction (PR) two - channel FIR filter bank, Alias - free L - Channel filter bank.

UNIT-IV

Polyphase Representation. Condition for Perfect Reconstruction. Cosine - Modulated L -channel filter banks, Multilevel filter banks - filter with equal and unequal passband widths.

UNIT-V

Introduction to wavelet theory, wavelet transform, Definition and Properties, Introduction to multi dimensional Multirate signal processing.

Suggested Reading:

1. Mitra SK *"Digital Signal Processing. A Computer Approach,"* TMH, 3/e, 2006.

2. Vaidyanathan PP *"Multirate Systems and Filter Banks,"* Pearson Education.2008.
3. Emmanuel C, Ifeachor and Barrie W. Jervis, *" Digital Signal Processing: A Practical Approach,"* 2 /e, Pearson Education, 2004.
4. Bruce W. Suter, *"Multirate and Wavelet Signal Processing,"* Volume 8, Academic Press,1998.

EC 415

SYSTEM AUTOMATION AND CONTROL

(Elective - I)

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.
4. De Silva, *"Mechatronics,"* First Indian Reprint 2013, Sesi (Taylor & Francis), Yesdee Publications.

CS 403

INFORMATION SECURITY

(Elective – I)

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

UNIT- I

Introduction: History, critical characteristics of information, NSTISSC security model, Components of an information system, Securing the components, balancing security and access, The SDLC, The security SDLC

Need for Security: Business needs, Threats, Attacks-secure software development

UNIT-II

Legal, Ethical and Professional Issues: Law and ethics in information security, relevant U.S laws-international laws and legal bodies, Ethics and information security Risk Management: Overview, Risk Identification, risk assessment, Risk Control strategies, selecting a risk control strategy, Quantitative versus qualitative risk control practices, Risk management discussion points, recommended risk control practices

UNIT-III

Planning for Security: Security policy, Standards and practices, Security blue print, Security education, Continuity strategies.

Security Technology: Firewalls and VPNs: Physical design, firewalls, protecting remote connections.

UNIT-IV

Security Technology: Intrusion detection, Access control and other security tools: Intrusion detection and prevention systems, Scanning and analysis tools, Access control devices.

Cryptography: Foundations of cryptology, cipher methods, Crypryptographic Algorithms, Cryptographic tools, Protocols for secure communications, Attacks on cryptosystems

UNIT-V

Implementing Information Security: information security project management, technical topics of implementation, Non- technical aspects of implementation, Security certification and accreditation Security and Personnel: Positioning and staffing security function, Employment policies and practices, internal control strategies. Information security Maintenance: Security management models. The maintenance model, Digital forensics

Suggesting Reading:

1. Michael E. Whitman and Hebert J Mattord, *Principles of Information Security,* 4th edition Ed. Cengage Learning 2011.
2. Thomas R Peltier, Justing Peltier, John Blackley, *Information Security. Fundamentals,* Auerbacj Publications 2010 .
3. Detmar W Straub, Seymor Goodman, Richard L Baskerville, *Information Security. Policy proceses and practices* PHI 2008
4. Marks Merkow and Jim Breithaupt, *Information Security. Principle and Practices,* Pearson Education, 2007.

SCHEME OF INSTRUCTION & EXAMINATION

B.E. IV - YEAR

(ELECTRONICS & COMMUNICATION ENGINEERING)

SEMESTER - II

Sl. No.	Syllabus Ref. No.	SUBJECT	Scheme of Instruction		Scheme of Examination		
			Periods per week		Duration In Hours	Maximum Marks	
			L	D/P		Univ. Exam	Sessionals
		THEORY					
1.	EC 451	Radar and Satellite Communication	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 Voce	Gr*	50
		Total	12	9	-	**225**	**150**

ELECTIVE-II

EC 461 Real Time Operating Systems
EC 462 Coding Theory and Techniques
EC 463 Design of Fault Tolerant Systems
EC 464 Speech Processing
EC 465 Wireless Sensor Networks
ME 411 Entrepreneurship

ELECTIVE-III

EC 471 Nano Technology
EC 472 Global Positioning Systems
EC 473 Neural Networks and Fuzzy Logic
EC 474 Spectral Estimation Techniques
LA 454 Intellectual Property Rights
CE 452 Disaster Mitigation And Management

EC 451

RADAR AND SATELLITE COMMUNICATION

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. Radar 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. Mark A. Richards, James A. Scheer and William A. Holm, *"Principles of Modern Radar: Basic Principles,"* YesDee Publishing Pvt. Ltd., India, 2012.
3. Byron Edde, *"Radar: Principles, Technology, Applications"*, Pearson, 2008.
4. Timothy Pratt and Charles Bostian, *"Satellite Communications"*, John Wiley, 1986.
5. Dennis Roddy, *"Satellite Communications"*, MGraw Hill, Millan, 4th edition, 2013.

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 specialization.

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 / PC 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	6 Periods per week
Duration of University Examination	Viva - Voce
University Examination	Grade *
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 3 ´ 108 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.

Grade : Excellent / Very Good / Good / Satisfactory / Unsatisfactory.

EC 461

REAL TIME OPERATING SYSTEMS

(ELECTIVE-II)

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

UNIT-I : Introduction to OS and RTOS

Architecture of OS (Monolithic, Microkernel, Layered, Exo-kernel and Hybrid kernel structures), Operating system objectives and functions, Virtual Computers, Interaction of O. S. & hardware architecture, Evolution of operating systems, Batch, multi programming, Multitasking, Multiuser, parallel, distributed & real –time O.S.

UNIT-II : Process Management of OS/RTOS

Uniprocessor Scheduling: Types of scheduling, scheduling algorithms: FCFS, SJF, Priority, Round Robin, UNIX Multi-level feedback queue scheduling, Thread Scheduling, Multiprocessor Scheduling concept, Real Time Scheduling concepts.

UNIT-III : Process Synchronization

Concurrency: Principles of Concurrency, Mutual Exclusion H/W Support, software approaches, Semaphores and Mutex, Message Passing, Monitors, Classical Problems of Synchronization: Readers-Writers Problem, Producer Consumer Problem, Dining Philosopher problem. Deadlock: Principles of deadlock, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, An Integrated Deadlock Strategies.

UNIT-IV : Memory & I/O Management:

Memory Management requirements, Memory partitioning: Fixed, dynamic, partitioning, Buddy System Memory allocation Strategies (First Fit, Best Fit, Worst Fit, Next Fit), Fragmentation, Swapping, Segmentation, Paging, Virtual Memory, Demand paging, Page Replacement Policies (FIFO, LRU, Optimal, clock) ,Thrashing, Working Set Model.

I/O Management and Disk Scheduling: I/O Devices, Organization of I/O functions, Operating System Design issues, I/O Buffering, Disk Scheduling (FCFS, SCAN, C-SCAN, SSTF), Disk Caches.

UNIT-V : RTOS APPLICATION DOMAINS

Comparison and study of RTOS: Vxworks and µCOS – Case studies: RTOS for Image Processing – Embedded RTOS for voice over IP – RTOS for fault Tolerant Applications – RTOS for Control Systems.

Suggested Reading:

1. Wayne Wolf, *"Computers as Components: Principles of Embedded Computing System Design,"* 2/e, Kindle Publishers, 2005.
2. Tanenbaum, *"Modern Operating Systems,"* 3/e, Pearson Edition, 2007.
3. Jean J Labrosse, *"Embedded Systems Building Blocks Complete and Ready-to-use Modules in C,"* 2/e, 1999.
4. C.M.Krishna and G.Shin, *"Real Time Systems,"* McGraw-Hill International Edition, 1997.

EC 462

CODING THEORY AND TECHNIQUES

(ELECTIVE–II)

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

UNIT-I : Introduction

Coding for Reliable Digital Transmission and Storage, Types of codes, Modulation and Coding, Maximum Likelyhood Decoding, Types of errors, Source coding: Shannon-Fano coding, Huffman codes, Run-Length Encoding, Lampel-Ziv codes.

UNIT-II : Block codes

Important Linear Block Codes, Repetition codes, Hamming codes, a class of single error-correcting and double-error correcting codes, Reed-Muller codes, the (24,12) Golay code, Product codes, Interleaved codes.

UNIT-III: Convolutional codes

Encoding, Structural properties, State diagram, Code tree diagram, Maximum-Likelihood decoding, Soft decision and hard decision decoding, the Viterbi algorithm.

UNIT-IV: Low Density Parity Check codes

Introduction, Galleger's method of construction, Regular and Irregular LDPC codes, other methods of constructing LDPC codes, Tanner graphs, Decoding of LDPC codes.

Unit V: BCH and RS codes

Groups, Fields, Binary arithmetic, Construction of Galois Fields GF(2^m), Basic properties of Galois Fields, Introduction to BCH and RS codes.

Suggested Reading:

1. Shu Lin and Daniel J. Costello, Jr. *"Error Control Coding,"* 2/e, Pearson, 2011.
2. K Sam Shanmugum, *"Digital and Analod Communication Systems,"* Wiley, 2010.
3. Simon Haykin, *"Digital Communication,"* TMH, 2009.

EC 463

DESIGN OF FAULT TOLERANT SYSTEMS

(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. Modeling of faults. Test generation for combinational logic circuits :conventional methods (path sesitisation,Boolean difference), Random testing, transition count testing and signature analysis.

UNIT-II

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

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 a 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-testing design.

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,* 2002.

EC 464

SPEECH PROCESSING

(ELECTIVE –II)

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 465

WIRELESS SENSOR NETWORKS

(ELECTIVE –II)

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

UNIT-I : OVERVIEW OF WIRELESS SENSOR NETWORKS

Challenges for Wireless Sensor Networks-Characteristics requirements-required mechanisms, Difference between mobile ad-hoc and sensor networks, Applications of sensor networks- Enabling Technologies for Wireless Sensor Networks

UNIT-II : ARCHITECTURES

Single-Node Architecture - Hardware Components, Energy Consumption of Sensor Nodes, Operating Systems and Execution Environments, Network Architecture - Sensor Network Scenarios, Optimization Goals and Figures of Merit, Gateway Concepts.

UNIT-III : NETWORKING SENSORS

Physical Layer and Transceiver Design Considerations, MAC Protocols for Wireless Sensor Networks, Low Duty Cycle Protocols And Wakeup Concepts - S-MAC, Zigbee: IEEE 802.15.4 MAC Layer, The Mediation Device Protocol, Wakeup Radio Concepts, Address and Name Management, Assignment of MAC Addresses, Routing Protocols- Energy-Efficient Routing, Geographic Routing.

UNIT-IV : INFRASTRUCTURE ESTABLISHMENT

Topology Control, Clustering, Time Synchronization, Localization and Positioning, Sensor Tasking and Control.

UNIT-V : SENSOR NETWORK PLATFORMS AND TOOLS

Operating Systems for Wireless Sensor Networks, Sensor Node Hardware – Berkeley Motes, Programming Challenges, Node-level software platforms, Node-level Simulators, State-centric programming.

Suggested Reading:

1. Holger Karl and Andreas Willig, *"Protocols And Architectures for Wireless Sensor Networks,"* John Wiley, 2005.
2. Feng Zhao and Leonidas J. Guibas, *"Wireless Sensor Networks - An Information Processing Approach,"* Elsevier, 2007.
3. Kazem Sohraby, Daniel Minoli, and Taieb Znati, *"Wireless Sensor Networks- Technology, Protocols and Applications,"* John Wiley, 2007.
4. Anna Hac, *"Wireless Sensor Network Designs,"* John Wiley, 2003.

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 471

NANO TECHNOLOGY
(ELECTIVE –III)

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

UNIT-I

Introduction to Physics of the Solid State: Structure, Size dependence of properties, Crystal structures, Face-Centered cubic nano particles, Tetrahedral Bonded semiconductor structures, Lattice Vibrations, energy Bands, Effective masses, Fermi surfaces, Localized particles, Donors, Acceptors and Deep Traps, Mobility, Excitations. Introduction to Semiconducting Nano particles, Introduction to Quantum Dots, wells, Preparation of Quantum Nanostructures.

UNIT-II

TEM, Infrared and Raman spectroscopy, Photoemission and X-RAY spectroscopy, Electron microscopy, SPMs, AFMs, Electrostatic force Microscope, Magnetic force microscope.

UNIT-III

Biological analogies of Nano and Micro-electromechanical systems (NMEMS)-Applications Fabrication of MEMS-assembling and packaging - applications of NMEMS.

UNIT-VI

Mathematical models and design of NMEMS-architecture-electromagnetic and its applications for Nano and Micro-electromechanical motion devices Molecular and Nano structure dynamics-molecular wires and molecular circuits.

Unit –V

Carbon nano tubes and nano devices-structural design of nano and MEM actuators and sensors configurations and structural design of motion nano- and micro-structures. Introduction to Intelligent control of Nano and Microelectronic Systems.

Suggestion Reading:

1. G.Timp, *"Nanotechnology,"* Bell Labs, Murray Hill , NJ, USA.
2. Charles P. Poolem, *"Introduction to nanotechnology,"* Wiley International.
3. Eric Drexler, *"Nano Systems; Molecular machinery, manufacturing and computation,"* John Wiley and Sons.
4. Lyschevski and Sergey Edward, *"Nano and Microelectro mechanical Systems: Fundamentals of Nano and Micro Engineering,"* CRC Press, 2000.

EC 472

GLOBAL POSITIONING SYSTEM

(ELECTIVE –III)

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, Orbits mechanics and satellite position determination, time references. Geometric dilution of precision : GDOP, VDOP, PDOP.

UNIT-II

Coordinate Systems: Geometry of ellipsoid, geodetic reference system. Geoids, Ellipsoid and Regional datum, WGS-84, IGS ECI, ECEF.

Various error sources in GPS: Satellite and Receiver clock errors, ephemeris error, atmospheric errors, the receiver measurement noise and UERE.

UNIT-III

GPS measurement: GPS signal structure, C/A and P-code and carrier phase measurement, position estimation with pseudo range measurement, Spoofing and anti Spoofing, GPS navigation, observation data formats.

UNIT-VI

GPS Augmentation systems: Principle of DGPS, Types of DGPS: LADPS, WADGPS.

Satellite Based Augmentation system (SBAS) : WAAS, GAGAN.

Ground Based Augmentation System (GBAS): LAAS.

UNIT-V

GPS Application: Surveying Mapping Marine, air and land Navigation, Military and Space Application. GPS Integration with GIS, INS, Pseudolite and Cellular.

New Satellite Navigation system; GLONASS, Galileo System.

Suggestion Reading:

1 Satheesh Gopi, *"Global positioning system: Principles and Application"*, TMH, 2005.

2. Pratap Misra and Per Enge, *"Global Positioning System Signals, Measurement, and Performance,"* Ganga- Jamuna Press, 2/e, Massachusetts, 2010.

3. B.Hofmann-Wellenhof, H.Lichtenegger, and J.Collins, *"GPS Theory and Practice,"* Springer Verlog, 2008.

4. Bradford W.Parkinson and James J. Spilker, *"Global Positioning System: Theory and Application,"* Vol.II, American Institution of Aeronautices and Astronautics Inc., Washington, 1996.

EC 473

NEURAL NETWORKS AND FUZZY LOGIC

(ELECTIVE - III)

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

UNIT-I

Evolution of neural networks; Artificial Neural Network: Basic model, Classification, Feed forward and Recurrent topologies, Activation functions; Learning algorithms: Supervised, Un-supervised and Reinforcement; Fundamentals of connectionist modeling: McCulloach – Pits model, Perceptron, Adaline, Madaline.

UNIT–II

Topology of Multi-layer perceptron, Back propagation learning algorithm, limitations of Multi-layer perceptron. Radial Basis Function networks: Topology, learning algorithm; Kohenen's self-organising network: Topology, learning algorithm; Bidirectional associative memory Topology, learning algorithm, Applications.

UNIT–III

Recurrent neural networks: Basic concepts, Dynamics, Architecture and training algorithms, Applications; Hopfield network: Topology, learning algorithm, Applications; Industrial and commercial applications of Neural networks: Semiconductor manufacturing processes, Communication, Process monitoring and optimal control, Robotics, Decision fusion and pattern recognition.

UNIT–IV

Classical and fuzzy sets: Introduction, Operations and Properties, Fuzzy Relations: Cardinality, Operations and Properties, Equivalence and tolerance relation, Value assignment: cosine amplitude and max-min method; Fuzzification: Membership value assignment- Inference, rank ordering, angular fuzzy sets. Defuzzification methods, 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. Limin Fu, *"Neural Networks in Computer Intelligence."* McGraw Hill, 2003.
2. Fakhreddine O. Karray and Clarence De Silva., *"Soft Computing and Intelligent Systems Design, Theory, Tools and Applications."* Pearson Education, India, 2009.
3. Timothy J. Ross, *"Fuzzy Logic with Engineering Applications,"* McGraw Hill,1995.
4. B.Yegnanarayana, *"Artificial Neural Networks,"* PHI, India, 2006.

EC 474

SPECTRAL ESTIMATION TECHNIQUES

(ELECTIVE –III)

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

UNIT-I

Random variable, Random processes, stationary random processes, statistical average, statistical averages for joint random processes, Discrete-Time Random signals, Time averages for a Discrete Time Random processes, Mean-Ergodic Process, Correlation Ergodic Processes, Power density Spectrum, Representation of a Stationary Random Processes, Rational power spectra, Relation between the filter parameters and autocorrelation.

UNIT-II

Forward and Backward linear prediction-Forward and Backward linear prediction, Relationship of an AR process to linear prediction, Solution of linear equations- The Levinson- Durbin algorithm, Wiener Filters- Wiener filters for Filtering and Prediction, FIR Wiener filter, Orthogonality Principle in linear Mean square Estimation, IIR Weiner Filter, Noncausal Weiner filter.

UNIT-III

Power Spectrum Estimation: Estimation of Spectra from finite duration observation of a signal. Periodogram, DFT in power spectrum estimation. Non-parametric methods – Bartlett's, Welch's and Blackman-Tukey methods, Performance Characteristics of Nonparametric Power Spectrum Estimators, Computational requirements and performance characteristics.

UNIT-IV

Parametric methods – Relation between auto correlation sequence and model parameters. Methods for AR model parameters. Yule – Walker method, Burg method, unconstrained Least squares methods. Sequential estimation methods. Selection of AR model order, Moving average (MA) and ARMA models for Power spectrum estimation.

UNIT-V

Eigen Analysis algorithms for Spectrum estimation- Pisarenko's harmonic decomposition method. Eigen structure methods – Music and ESPIRIT. Order selection criteria. Filter Bank methods- Filter bank realization of the periodogram, Capon's minimum variance method.

Suggested Reading:

1. John G. Proakis and Dimitris G. Manolakis, *"Digital Signal Processing-Principles, Algorithms and Applications,"* 4/e, Pearson/PHI, 2007.
2. D.G. Manolakis, Ingle and S.M. Kogon, *"Statistical and Adaptive Signal Processing,"* McGraw Hill, 2000.
3. John G. Proakis, Rader, et al, *"Algorithms for Statistical Signal Processing,"* Pearson Education, Asia Publishers, 2002.
4. Emmanuel Ifeachor and Barrie W. Jervis, *"Digital Signal Processing - A Practical Approach,"* Pearson, 2004.

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, Rights, 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 Designs. Rights and Duties of Proprietor of Design, Piracy of Registered designs.

UNIT-IV

Trademarks: 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 program, 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.

CE 452

DISASTER MITIGATION AND MANAGEMENT

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

UNIT-I

Introduction - Natural, human induced and human made disasters -international decade of disaster reduction.

UNIT-II

Natural Disasters - Hydrometereological based disasters - Trophical cyclones, floods, drought and desertification - Zones Geographical based disasters - Earth quake, Tsunammis, Landslides and avalanches.

UNIT-III

Human induced hazards - chemical industrial hazards, major power breakdowns, traffic accidents, etc.

UNIT-IV

Use ofremote sensing and GISI disaster mitigation and management.

UNIT-V

Rich and vulnerability to disaster - mitigation and management options -warning and forecasting.

Suggested Reading :

1. Rajib, S and Krishna Murthy, R. R (2012) *"Disaster Management Global Challenges and Local Solutions"* Universities Press, Hyderabad.
2. Navele, P & Raja, C. K (2009), *Earth and Atmospheric Disasters Management,* Natural and Manmade. B. S. Publications, Hyderabad.
3. Fearn-Banks, K (2011), *Crises computations approach: A case book approach.* Route ledge Publishers, Special Indian Education, New York & London.
4. Battacharya, T. (2012), *Disaster Science and Management.* Tata McGraw hill Company, New Delhi.