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***

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