M.D. UNIVERSITY, ROHTAK

(NAAC Accredited 'A+' Grade)

SCHEME OF STUDIES AND EXAMINATION

B.TECH (Electronics & Telecommunication Engineering)

SEMESTER 5th AND 6th

Scheme effective from 2020-21

COURSE CODE AND DEFINITIONS:

Course Code	Definitions
L	Lecture
T	Tutorial
P	Practical
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management courses
PCC	Professional Core Courses
LC	Laboratory Courses
MC	Mandatory Courses
PT	Practical Training
S	Seminar
TH	Theory
Pr	Practical

General Notes:

1. Mandatory courses are non credit courses in which students will be required passing marks in internal assessments.
2. Students will be allowed to use non programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.
3. Students will be permitted to opt for any elective course run by the department. However, the department shall offer those electives for which they have expertise. The choice of the students for any elective shall not be binding for the department to offer, if the department does not have expertise. To run the elective course a minimum of 1/3rd students of the class should opt for it.

Scheme of Studies and Examination
B.Tech (Electronics &Telecommunication Engineering) – 5th Semester
w.e.f. 2020-21

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
				L	T	P			Internal Assessment	External Examination	Practical	Total	
1	Engineering Science Course	PCC-ECE301G (Common with ECE)	Electromagnetic Waves	3	1	0	4	4	25	75		100	3
2	Professional Core Course	PCC-ECE303G (Common with ECE)	Computer Organization &Architecture	3	0	0	3	3	25	75		100	3
3	Professional Core Course	PCC-ETE301G	Digital Communication	3	1	0	4	4	25	75		100	3
4	Professional Core Course	PCC-ECE307G (Common with ECE)	Digital Signal Processing	3	1	0	4	4	25	75		100	3
5	Program Elective Course	Refer to Annexure I	Program Elective–I	3	1	0	4	4	25	75		100	3
6	Open Elective Course	Refer to Annexure I	Open Elective-I	3	0	0	3	3	25	75		100	3
7	Professional Core Course	LC-ECE323G (Common with ECE)	Electromagnetic Waves Lab	0	0	3	3	1.5	25		25	50	3
8	Professional Core Course	LC-ECE325G (Common with ECE)	Digital Signal Processing Lab	0	0	3	3	1.5	25		25	50	3
9	Training	PT-ETE-327G	Practical Training – 1	-	-	-	-	-	-	-	* Refer Note 1		
		TOTAL CREDIT						**25**				**700**	

Note:

1. The evaluation of Practical Training-I will be based on seminar, viva-voce, report submitted by the students. According to performance, the students are awarded grades A, B, C, F. A student who is awarded 'F' grade is required to repeat Practical Training.
2. Choose any one from Program Elective-I
3. Choose any one from Oepn Elective-I

Excellent: A; Good : B; Satisfactory: C; Not Satisfactory: F.

Annexure I

Elective–I

PEC-ETE303G	Information Theory and Coding
PEC-ECE311G	Nano Electronics (Common with ECE)
PEC-ECE313G	Linear IC Applications (Common with ECE)
PEC-ECE315G	Scientific Computing (Common with ECE)

Open Elective-I

OEC-ECE317G	Object Oriented Programming with C++ (Common with ECE)
OEC-ECE319G	Additive Manufacturing (Common with ECE)
OEC-ECE321G	Measurements and Instrumentation (Common with ECE)

Scheme of Studies and Examination
B.Tech (Electronics & Telecommunication Engineering) – 6th Semester
w.e.f. 2020-21

Sr. No.	Category	Course Code	Course Title	Hours per week			Total Contact Hrs. per week	Credit	Examination Schedule (Marks)				Duration of Exam (Hours)
				L	T	P			Internal Assessment	External Examination	Practical	Total	
1	Professional Core Course	PCC-ECE302G (Common with ECE)	Control Systems	3	1	0	4	4	25	75		100	3
2	Professional Core Course	PCC-ECE304G (Common with ECE)	Computer Network	3	1	0	4	4	25	75		100	3
3	Humanities/ Basic Science	HUM-ECE306G (Common with ECE)	Engineering Ethics	3	0	0	3	3	25	75		100	3
4	Professional Core Course	PCC-ECE308G (Common with ECE)	CMOS Design	3	1	0	4	4	25	75		100	3
5	Program Elective Course	Refer to Annexure II	Program Elective–II	3	1	0	4	4	25	75		100	3
6	Open Elective Course	Refer to Annexure II	Open Elective-II	3	0	0	3	3	25	75		100	3
7	Professional Core Course	LC-ECE322G (Common with ECE)	Computer Network Lab	0	0	4	4	2	25		25	50	3
8	Professional Core Course	LC-ECE324G (Common with ECE)	Control System Lab	0	0	3	3	1.5	25		25	50	3
9	Professional Core Course	LC-ECE326G (Common with ECE)	MiniProject/ElectronicDesignworkshop	0	0	4	4	2	25		25	50	3
		TOTAL CREDIT						**27.5**				**750**	

Note:

1. Each student has to undergo practical training of 6 weeks during summer vacation after 6th semester and its evaluation shall be carried out in 7th Semester.
2. Choose any one from Program Elective-II
3. Choose any one from Open Elective-II

Annexure II

Elective–II

PEC-ECE310G	Bio-Medical Electronics (Common with ECE)
PEC-ECE312G	VHDL and Digital Design (Common with ECE)
PEC-ECE314G	Introduction to MEMS (Common with ECE)
PEC-ECE316G	Speech and Audio Processing (Common with ECE)

Open Elective-II

OEC-ECE318G	Python Programming(Common with ECE)
OEC-ECE320G	Probability and Stochastic Processes(Common with ECE)

PCC-ECE301G ELECTROMAGNETIC WAVES

L T P
3 1 -

Theory: 75 Marks
Class work : 25 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit I

Transmission Lines- Equations of Voltage and Current on TX line, Propagation constant, characteristic impedance, reflection coefficient and VSWR, Impedance Transformation on Loss-less and Low loss Transmission line, Power transfer on TX line, Smith Chart, Admittance Smith Chart, Applications of transmission lines: Impedance Matching, use transmission line sections as circuit elements.

Unit II

Maxwell's Equations - Basic laws of Electromagnetics, Maxwell's Equations, Boundary conditions at Media Interface. Uniform plane wave, Propagation of plane wave, Wave polarization, Wave propagation in conducting medium, phase and group velocity, Power flow and Poynting vector, Plane Waves at a Media Interface- Plane wave in arbitrary direction, Reflection and refraction at dielectric interface, Total internal reflection.

Unit III

Wave propagation in parallel plane waveguide, Analysis of waveguide general approach, Rectangular waveguide, Modal propagation in rectangular waveguide, Surface currents on the waveguide walls, Field visualization, Attenuation in waveguide.

Unit IV

Radiation: Solution for potential function, Radiation from the Hertz dipole, Power radiated by hertz dipole, Radiation Parameters of antenna, receiving antenna, Monopole and Dipole antenna

References:

1. R.K. Shevgaonkar, Electromagnetic Waves, Tata McGraw Hill India, latest edition
2. E.C. Jordan & K.G. Balmain, Electromagnetic waves & Radiating Systems, Prentice Hall, India
3. Narayana Rao, N: Engineering Electromagnetics, latest edition, Prentice Hall, latest edition
4. David Cheng, Electromagnetics, Prentice Hall

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand characteristics and wave propagation on high frequency transmission lines
2. Carryout impedance transformation on TL
3. Characterize uniform plane wave
4. Calculate reflection and transmission of waves at media interface
5. Analyze wave propagation on metallic waveguides in modal form
6. Understand principle of radiation and radiation characteristics of an antenna

PCC-ECE303G COMPUTER ORGANIZATION & ARCHITECTURE

L T P	
3 - -	Theory: 75 Marks
	Class work : 25 Marks
	Total: 100 Marks
	Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit I

Data representation: Data Types, Complements, Fixed-Point Representation, Conversion of Fractions, Floating-Point Representation, Gray codes, Decimal codes, Alphanumeric codes, Error Detection Codes.

Register Transfer and Microoperations: Register Transfer Language, Register Transfer, Bus and Memory Transfers, Arithmetic Microoperations, Logic Microoperations, Shift Microoperations, Arithmetic Logic Shift Unit.

Unit II

Basic Computer Organization and Design : Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instruction, Input-Output Instruction, Complete Computer Description, Design of Basic Computer, Design of Accumulator Logic.

Central Processing Unit : General Register Organization, Stack organization, Instruction Format, Addressing Modes, Data Transfer and Manipulation, Program Control, RISC, CISC.

UnitIII

Pipeline and Vector Processing: Introduction to Parallel Processors, Amdahl's Law, Pipelining, Arithmetic Pipeline, Instruction Pipeline, RISC Pipeline, Vector Processing, Array Processors, SIMD Array Processors, Pipeline Hazards.

Unit IV

Input-output Organization: I/O deviceinterface, I/O transfers–program controlled, interrupt driven and DMA, Privileged and Non-Privileged Instructions, Software Interrupts.

Memory organization: Memory Hierarchy, Main Memory, Auxiliary Memory, Associative Memory, Cache Memory, Associative Mapping, Direct Mapping, Set-Associative Mapping, Writing into Cache, Cache Initialization, Virtual Memory.

References:

1) "Computer System Architecture", 3rd Edition by M.Morris Mano, Pearson.
2) "Computer Organization and Design: The Hardware/Software Interface", latest Edition by David A. Patterson and John L. Hennessy, Elsevier.
3) "Computer Organization and Embedded Systems", latest Edition by CarlHamacher, McGraw Hill Higher Education.
4) "Computer Architecture and Organization", latest Edition by John P. Hayes, WCB/McGraw-Hill

5) "Computer Organization and Architecture: Designing for Performance", latest Edition by William Stallings, Pearson Education
6) "Computer System Design and Architecture", latest Edition by Vincent P. Heuring and Harry F. Jordan, PearsonEducation.

CourseOutcomes:

Attheendofthis coursestudentswilldemonstratetheability to

1 Understand the basics structure of computers, operations and instruction
2 Design arithmetic and logic unit.
3 Understand pipelined execution and design control unit.
4 Understand parallel processing architectures.
5 Understand the various memory systems and I/O communication.

PCC-ETE301G DIGITAL COMMUNICATION

L T P
3 1 -

Theory: 75 Marks
Class work : 25 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT-I

Pulse modulation: sampling process, PAM and TDM; aperture effect. PPM noise inPPM, channel Bandwidth, Recovery of PAM and PPM signals Quantization process, quantization noise, PCM, μ Law and A- law compressors. Encoding, Noise in PCM,DM, delta sigma modulator, DPCM, ADM.

UNIT-II

Base band pulse transmission: Matched filter and its properties average probability of symbol error in binary enclosed PCM receiver, Intersymbol interference, Nyquist criterion for distortionless base band binary transmission, ideal Nyquist channel raised cosine spectrum, correlative level coding Duo binary signalling, tapped delay line equalization, adaptive equalization, LMS algorithm, Eye pattern.

UNIT-III

Digital pass band transmission: Pass band transmission model; gram Schmidt orthogonalization procedure, geometric Interpretation of signals, Response of bank ofcorrelaters to noise input, detection of known signal in noise, Hierarchy of digital modulation techniques, BPSK, DPSK, DEPSK, QPSK, systems; ASK, FSK, QASK, Many FSK, MSK, Many QAM, Signal space diagram and spectra of the above systems, effect of intersymbol interference, bit symbol error probabilities, synchronization.

UNIT-IV

Spread spectrum modulation: Pseudonoise sequence, A notion of spread spectrum, direct sequence spread spectrum with coherent BPSK, signal space dimensionality & processing gain, probability of error, frequency spread spectrum, CDM.

References:

1. John G. Proakis, Digital Communication, PHI
2. Taub & Schilling, Principles of Communication, TMH
3. Simon Haykin, Communication systems, John Wiley & Sons

CourseOutcomes:

Attheendofthis coursestudentswilldemonstratetheability to

1. Design PCM systems
2. Design and implement base band transmission schemes
3. Design and implement band pass signaling schemes
4. Analyze the spectral characteristics of band pass signaling schemes and their noise performance
5. Design digital modulation techniquesschemes

PCC-ECE307G DIGITAL SIGNAL PROCESSING

L T P
3 1 -

Theory: 75 Marks
Class work : 25 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit I

Discrete-Time Signals and Systems: Sequences; representation of signals on orthogonal basis; representation of discrete systems using difference equations, Sampling and reconstruction of signals - aliasing; Sampling theorem and Nyquist rate.

Z-Transform: Z-Transform, Region of Convergence, Analysis of Linear Shift Invariant systems using z- transforms, Properties of z-transform for causal signals, Interpretation of stability in z-domain, Inverse z-transforms.

Unit II

Frequency Representation of Signal and Systems: Frequency Domain analysis concept, Discrete Fourier Transform (DFT), Properties of DFT, Convolution of signals, Circular convolution, Linear Filtering using DFT, Fast Fourier Transform Algorithm, Decimation in time and Decimation in frequency algorithms, Computations Complexity Calculations, Parsevals Identity.

Unit III

Design of Digital Filter : Ideal Filter vs Practical Filters, General Specifications and Design Steps, Comparison of FIR & IIR Filters, Design of FIR Filters using Window technique, Frequency sampling Method, Park-McClellan's method, Design of IIR Filters using Impulse Invariance technique, Bilinear Transformation, Design of IIR Filters using Butterworth, Chebyshev and Elliptic filter, Digital frequency transformation.

Unit IV

Implementation of Discrete Time Systems: Block diagrams and signal flow graphs for FIR and IIR systems, Direct form, Cascade form, Frequency Sampling Structures, and Lattice structures for FIR systems, Direct form, Cascade form, Parallel form, and Lattice and Lattice-Ladder Structures for IIR systems, Representation of fixed point and floating point numbers, Finite word length effects, Parametric and non-parametric spectral estimation. Applications of Digital Signal Processing

Multirate Digital Signal Processing: Introduction to multirate digital signal processing, Multi rate structures for sampling rate conversion, Multistage decimator and interpolators, Polyphase decomposition, Digital Filter Banks

References :

1 John G. Proakis and D.G. Manolakis, Digital Signal Processing: Principles, Algorithms And Applications, Prentice Hall, latest edition
2. A.V. Oppenheim and Schafer, Discrete Time Signal Processing, Prentice Hall, latest edition
3. S.K.Mitra, Digital Signal Processing: A computer based approach.TMH
4. Digital Signal Processing: Salivahanan, Vallavaraj and Gnanapriya;TMH
5. L.R. Rabiner and B. Gold, Theory and Application of Digital Signal Processing, Prentice Hall, latest edition
6. J.R. Johnson, Introduction to Digital Signal Processing, Prentice Hall, latest edition
7. D.J.DeFatta, J. G. Lucas andW.S.Hodgkiss, Digital Signal Processing, John Wiley& Sons, latest edition

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. To get an introduction of basics like Sampling, Interpolation, Aliasing and operations, Convolution and Correlation.
2. To Study the basics, mathematical analysis and applications of DFT and FFT
3. To study the design and implementation of Digital Filters.
4. To impart practical knowledge of signal processing operations in MATLAB.

LC-ECE323G ELECTROMAGNETIC WAVES LAB

L T P
- - 3

Practical Exam: 25 Marks
Lab work : 25 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

Hands-onexperimentsrelatedtothecoursecontentsPCC-ECE301G

LC-ECE325G DIGITAL SIGNAL PROCESSING LAB

L T P
- - 3

Practical Exam: 25 Marks
Lab work : 25 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments

Experiments to be performed:

1. Represent basic signals (unit step, unit impulse, ramp, exponential, sine and cosine)
2. To develop program for Z-Transform
3. To develop program for Convolution of sequences
4. To develop program for Correlation of sequences
5. To develop program for DFT & IDFT of two sequences
6. To develop program for FFT of two Sequences
7. To develop program for Circular Convolution
8. To design analog filter (low-pass, high pass, band-pass, band-stop).
9. To design digital IIR filters (low-pass, high pass, band-pass, band-stop).
10. To develop program for Interpolation and Decimation of sequences
11. To design FIR filters using windows technique.
12. Detection of Signals buried in Noise
13. Effect of noise on signals

PCC-ECE302G **CONTROL SYSTEMS**

L T P Theory : 75 Marks

3 1 - Class work : 25 Marks

Total : 100 Marks

Duration of Exam : 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit I

Systems Components and Their Representation

Control System: Terminology and Basic Structure-Feed forward and Feedback control theory-Electrical and Mechanical Transfer Function Models-Block diagram Models-Signal flow graphs models-DC and AC servo Systems-Synchronous -Multivariable control system

Unit II

Time Response Analysis And Stability Concept

Transient response-steady state response-Measures of performance of the standard first order and second order system-effect on an additional zero and an additional pole-steady error constant and system- type number-PID control.

Concept of stability-Bounded - Input Bounded - Output stability-Routh stability criterion-Relative stability-Root locus concept-Guidelines for sketching root locus.

Unit III

Frequency Domain Analysis

Bode Plot - Polar Plot- Nyquist plots-Design of compensators using Bode plots-Cascade lead compensation-Cascade lag compensation-Cascade lag-lead compensation

Unit IV

Control System Analysis Using State Variable Methods

State variable representation-Conversion of state variable models to transfer functions-Conversion of transfer functions to state variable models-Solution of state equations-Concepts of Controllability and Observability-Stability of linear systems-Equivalence between transfer function and state variable representations.

References:

1. Gopal.M.,“ControlSystems:PrinciplesandDesign”,TataMcGraw-Hill,latest edition
2. Kuo,B.C.,“AutomaticControl System”,PrenticeHall,sixthedition,latest edition
3. Ogata,K.,“ModernControlEngineering”,PrenticeHall,secondedition,latest edition
4. Nagrath&Gopal,“ModernControlEngineering”, NewAgeInternational,NewDelhi

CourseOutcomes:

Attheendofthis coursestudentswilldemonstratethe ability to

1. Characterizeasystemandfinditssteadystatebehaviour
2. Analyse the time domain specification and calculate steady state errors..
3. Investigatestabilityofasystemusingdifferenttests
4. Illustrate the state space model of a physical system.

PCC-ECE304G **COMPUTER NETWORK**

L T P
3 1 -

Theory: 75 Marks
Class work : 25 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT I

Introduction and Physical Layer

Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model - Network Hardware – LAN –MAN – WAN, Internetworks – Network Software – Protocol hierarchies — Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.

UNIT II

Data-Link Layer & Media Access

Introduction – Link-Layer Addressing – DLC Services – Data-Link Layer Protocols – HDLC – ALOHA protocols - Overview of IEEE standards – Media Access Control – Sliding Window protocols, Error Handling - Bridges - Switches – High Speed LANs - Gigabit Ethernet - Wired LANs: Ethernet – Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices - Multiplexing.

UNIT III

Network Layer

Network Layer Services –Performance – IPV4 Addresses –Network Layer Protocols: IP, Internet Control Protocols – ICMP, ARP, RARP, BOOTP. Internet Multicasting – IGMP-ICMP v4 – IP Addressing – Classless and Classfull Addressing - Sub-netting - Congestion control– QoS.- Overview of IPv6

UNIT IV

Transport Layer and Application Layer

Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol – Transmission Control Protocol –Connectionless vsConnection-oriented transport - RemoteProcedureCall.

WWW and HTTP – FTP –Telnet –SSH – DNS –Electronic mail, MIME, SNMP.

References:

1. J.F.KuroseandK.W.Ross,“ComputerNetworking–Atopdownapproachfeaturing theInternet”,PearsonEducation,latestEdition
2. L. Peterson andB. Davie, “Computer Networks – A Systems Approach” Elsevier MorganKaufmannPublisher,latestEdition.
3. T.Viswanathan,“TelecommunicationSwitchingSystemandNetworks”,Prentice Hall
4. B. A. Forouzan, “Data Communications and Networking”, Tata McGraw Hill, latest Edition
5. AndrewTanenbaum,“Computernetworks”,PrenticeHall

6. D.Comer,“ComputerNetworksandInternet/TCP-IP”, PrenticeHall
7. WilliamStallings,“Dataandcomputercommunications”,PrenticeHall

CourseOutcomes:

Attheendofthis coursestudentswilldemonstratetheability to:

i. Visualise the different aspects of networks, protocols and network design models.
ii. Examine various Data Link layer design issues and Data Link protocols.
iii. Analyse and compare different LAN protocols.
iv. Compare and select appropriate routing algorithms for a network.
v. Examine the important aspects and functions of network layer, transport layer and application layer in internetworking.

HUM-ECE306G ENGINEERING ETHICS

L T P Theory: 75 Marks
3 - - Class work : 25 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT I

Ethics and Professionalism: Ethics and Excellence in Engineering, Micro and Macro Issues, Dimensions of Engineering, Potential Moral Problems, What Is Engineering Ethics, Why Study Engineering Ethics? Responsible Professionals, Professions, and Corporations: Saving Citicorp Tower, Meanings of Responsibility, Engineering as a Profession, Ethical Corporations and Senses of Corporate Responsibility. Moral Reasoning and Codes of Ethics, Moral Choices and Ethical Dilemmas, Rights Ethics, Duty Ethics, Utilitarianism, Virtue Ethics, Self-Realization Ethics, Ethical Egoism, Which Ethical Theory Is Best?

UNIT II

Engineering as Social Experimentation: Engineering as Experimentation, Engineers as Responsible Experimenter, Commitment to Safety: The Concept of Safety, Risks, Acceptability of Risk, Assessing and Reducing Risk: Uncertainties in Design, Risk-Benefit Analyses, Personal Risk versus Public Risk, Examples of Improved Safety, Three Mile Island, Safe Exits.

UNIT III

Truth and Truthfulness: Whistle-Blowing, Moral Guidelines, Protecting Whistle-Blowers, Common Sense Procedures, Beyond Whistle-Blowing, Honesty and Research Integrity: Truthfulness, Trustworthiness, Academic Integrity: Students, Research Integrity, Bias and Self-Deception, Protecting Research Subjects, Giving and Claiming Credit.
Computer Ethics: The Internet and Free Speech, Power Relationships, Property, Privacy,Additional Issues.

UNIT IV

Environmental Ethics: Engineering, Ecology, and Economics, Environmental Moral Frameworks, Human-Centered Ethics, Sentient-Centered Ethics, Biocentric Ethics, Ecocentric Ethics, Religious Perspectives.
Global Justice: Multinational Corporations, Technology Transfer and Appropriate Technology, Bhopal, “When in Rome”, International Rights, Promoting Morally Just Measures, Weapons Development and Peace, Involvement in Weapons Work, Defense Industry Problems, Peace Engineering.

References:

1. Mike W. Martin and Roland Schinzinger, “Introduction to Engineering Ethics”, Second Edition, McGraw Hill, New Delhi, latest edition
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, “Engineering Ethics”, Prentice Hall of India, New Delhi, latest edition

3. Charles B. Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, New Jersey, latest edition
4. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, “Engineering Ethics – Concepts and Cases”, Cengage Learning, latest edition
5. John R Boatright, “Ethics and the Conduct of Business”, Pearson Education, New Delhi, latest edition
6. Edmund G Seebauer and Robert L Barry, “Fundametals of Ethics for Scientists and Engineers”, Oxford University Press, Oxford, latest edition
7. Laura P. Hartman and Joe Desjardins, “Business Ethics: Decision Making for Personal Integrity and Social Responsibility” Mc Graw Hill education, India Pvt. Ltd.,New Delhi latest edition
8. World Community Service Centre, " Value Education", Vethathiri publications, Erode, latest edition
9 Web sources:
  i. www.onlineethics.org
  ii. www.nspe.org
  iii. www.globalethics.org
  iv. www.ethics.org

Outcomes:

Upon completion of the course, the student should be able to

1. apply ethics in society
2. discuss the ethical issues related to engineering
3. realize the responsibilities and rights in the society
4. realize the importance of sustainable development

PCC-ECE308G **CMOS DESIGN**

L T P Theory : 75 Marks

3 1 - Class work : 25 Marks

Total : 100 Marks

Duration of Exam : 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT I

Introduction of MOS Transistor

MOS Transistor, CMOS logic, Inverter, Pass Transistor, Transmission gate, Layout Design Rules, Gate Layouts, Stick Diagrams, Long-Channel I-V characteristics, C-V characteristics, Non ideal I-V Effects, DC Transfer characteristics, RC Delay Model, Elmore Delay, Linear Delay Model, Logical effort, Parasitic Delay, Delay in Logic Gate, Scaling.

UNIT II

CombinationalCircuitDesign

Circuit Families: Static CMOS, Ratioed Circuits, Cascode Voltage Switch Logic, Dynamic Circuits, Pass Transistor Logic, Transmission Gates, Domino, Dual Rail Domino, CPL, DCVSPG, DPL, Circuit Pitfalls.

Power: Dynamic Power, Static Power, Low Power Architecture.

Interconnect: Interconnect Modelling and Impact

UNITIII

Sequential Circuit Design

Static latches and Registers Dynamic latches and Registers, Pulse Registers, Sense Amplifier Based Register, Pipelining, Schmitt Trigger, Monostable Sequential Circuits, Astable Sequential Circuits.

Timing Issues: Timing Classification of Digital System, Synchronous Design

UNIT IV

Design of Arithmetic Building Blocks and Subsystem

Arithmetic Building Blocks: Data Paths, Adders, Multipliers, Shifters, ALUs, power and speed tradeoffs, Case Study: Design as a tradeoff.

Designing Memory and Array structures: Memory Architectures and Building Blocks, Memory Core, Memory Peripheral Circuitry

References:

1. N.H.E. WesteandD.M. Harris, CMOS VLSI design: A Circuits and Systems Perspective,4thEdition,Pearson EducationIndia,latest edition
2. J.Rabaey,DigitalIntegratedCircuits:ADesignPerspective,PrenticeHallIndia,latest edition
3. C.MeadandL.Conway,IntroductiontoVLSISystems,AddisonWesley,latest edition
4. P.Douglas,VHDL:programmingbyexample,McGrawHill,latest edition
5. L.GlaserandD.Dobberpuhl,TheDesignandAnalysis ofVLSICircuits,Addison Wesley,latest edition

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Examine the CMOS circuit's behaviour and its characteristics.
2. Design and realization of combinational & sequential digital circuits.
3. Interpret different Architectures and performance tradeoffs involved in designing and realizing the circuits in CMOS technology.
4. Design the Arithmetic blocks and Memory structures

LC-ECE322G COMPUTER NETWORK LAB

L T P Practical Exam: 25 Marks
- - 4 Lab work : 25 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

List of Experiments

1. Running and using services/commands like ping, trace route, NSLOOKUP, ARP, TELNET, FTP, etc.
2. Network simulation using tools like Cisco Packet Tracer, NetSim, OMNeT++, NS2, NS3, etc.
3. Network Topology – Star, Bus, Ring
4. Simulate the transmission of ping messaged over a network topology and find the number of packets dropped due to congestion.
5. Understanding IP Addressing using the simulation tool.
6. Study of various application protocols using the simulation like FTP, HTTP
7. Understand IP forwarding within a LAN and across a router
8. Understand the working of “Connection Establishment” in TCP using Network simulation using tools
9. Study how the Data Rate of a Wireless LAN (IEEE 802.11b) network varies as the distance between the Access Point and the wireless nodes is varied
10. Study the working and routing table formation of Interior routing protocols, i.e. Routing Information Protocol (RIP) and Open Shortest Path First (OSPF)
11. To determine the optimum persistence of a CSMA / CD network
12. Implementation of distance vector routing algorithm
13. Implementation of Link state routing algorithm
14. Study of Network simulator (NS) and simulation of Congestion Control Algorithms using NS
15. Encryption and decryption.

LC-ECE324G **CONTROL SYSTEM LAB**

L T P
- - 3

Practical Exam: 25 Marks
Lab work : 25 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

Hands-onexperimentsrelatedtothecoursecontentsPCC-ECE307G

LC-ECE326G MINI PROJECT/ELECTRONICDESIGNWORKSHOP

L T P Practical Exam: 25 Marks
- - 4 Lab work : 25 Marks
Total: 50 Marks
Duration of Exam: 3 Hours

Guidelines:

1. The mini- project is a team activity having 3-4 students in a team. This is electronic product design work with a focus on electronic circuit design.
2. The mini project may be a complete hardware or a combination of hardware and software. The software part in mini project should be less than 50% of the total work.
3. Mini Project should cater to a small system required in laboratory or real life.
4. It should encompass components, devices, analog or digital ICs, micro controller with which functional familiarity is introduced.
5. After interactions with course coordinator and based on comprehensive literature survey/ need analysis, the student shall identify the title and define the aim and objectives of mini-project.
6. Student is expected to detail out specifications, methodology, resources required, critical issues involved in design and implementation and submit the proposal within two week of the semester.
7. The student is expected to exert on design, development and testing of the proposed work as per the schedule.
8. Art work and Layout should be made using CAD based PCB simulation software. Due considerations should be given for power requirement of the system, mechanical aspects for enclosure and control panel design.
9. Completed mini project and documentation in the form of mini project report is to be submitted at the end of semester.
10. The tutorial sessions should be used for discussion on standard practices used for electronic circuits/product design, converting the circuit design into a complete electronic product, PCB design using suitable simulation software, estimation of power budget analysis of the product, front panel design and mechanical aspects of the product, and guidelines for documentation /report writing.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Conceive a problem statement either from rigorous literature survey or from the requirements raised from need analysis.
2. Design, implement and test the prototype/algorithm in order to solve the conceived problem.
3. Write comprehensive report on mini project work.

PROGRAM ELECTIVECOURSES

PEC-ETE303G **INFORMATION THEORY AND CODING**

L T P Theory: 75 Marks
3 1 - Class work : 25 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Probabilityandrandomprocesses:Probability, randomvariables,Probabilitydistribution and density functions,JointStatistics,Conditional Statistics,independence,Functionsof random variables &randomvectors,Expectation,moments,Characteristic Functions,Convergenceof a sequenceofrandomvariables,CentralLimitTheorem,RandomProcesses, meanandAuto Correlation,Stationaryergodicity,PowerSpectraldensity,Responseofmemory-lessand linear systems,GaussianPoisson,Markovprocesses..

Unit-II

Elementsofinformation theoryandsourcecoding: Introduction,informationasameasureof uncertainty, Entropy, itsproperties, discretememory less channels, Mutualinformation, its properties,BSC,BEC.Channelcapacity,Shanon'stheoremon coding formemory lessnoisy channels.Separable binarycodes,Shanon–Fanoencoding,Noiselesscoding,Theoremof decodability, Averagelength of encoded message, Shanon's binary encoding, Fundamental theoremofdiscretenoiselesscoding,Huffman'sminimumredundancycodes.

Unit-III

Linearblockcodes:Introductiontoerrorcontrolcoding,Typesofcodes,MaximumLikelihood decoding,Types oferrorsanderrorcontrol strategies,Galoisfields,Linearblockcodes,Error detectingandcorrectingcapabilitiesofablockcode,Hammingcode,cycliccode,B.C.H.codes.

Unit-IV

ConvolutionalcodesandARQ:Transferfunctionof convolutionalcode,Syndromdecoding, Majoritylogicdecodablecodes,Viterbidecoding,distance propertiesofbinaryconvolutional codes,Bursterrorcorrectingconvolutionalcodes,generaldescription ofbasicARQstrategies, HybridARQschemes.

References:

1.Papoulis,A.Probability,RandomVariablesandStochastic Processes,MGH.
2.Gray, R.M.Davission,L.D,IntroductiontoStatisticalSignalProcessing-WebEdition-1999.
3.F. M. Reza,InformationTheory,McGrawHill.
4.Das,MullickandChatterjee,DigitalCommunication,WileyEasternLtd.
5.ShuLinandJ.Costello,ErrorControlCoding,PrenticeHall.

6.B. R.Bhat,ModernProbabilityTheory,NewAgeInternationalLtd.

CourseOutcomes:

Attheendofthis coursestudentswilldemonstratetheability to

1. Describe the concepts of information theory and digital communication.
2. Construct efficient codes for data on imperfect communication channels.
3. Explain the concepts of coding schemes.

PEC-ECE311G **NANO ELECTRONICS**

L T P Theory: 75 Marks

3 1 - Class work : 25 Marks

Total: 100 Marks

Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit -I

Introduction to nanotechnology, Basics ofQuantumMechanics: Wave nature of particles and wave-particle duality, Pauli Exclusion Principle, wave functions and Schrodinger's equations,Densityof States, BandTheory of Solids,ParticleinaboxConcepts

Unit -II

Shrink-down approaches: CMOS scaling: advantages and limitations. Nanoscale MOSFETs, FINFETs, Vertical MOSFETs, system integration limits (interconnect issues etc.)

Unit -III

Nanostructure materials, classifications of nanostructure materials, zero dimensional, one dimensional, two dimensional and three dimensional, properties and applications Characterization techniques for nanostructured materials: SEM, TEM and AFM

Unit -1V

Nano electronis devices : ResonantTunnelingDiode,Coulombdots, Quantum blockade,Singleelectron transistors, Carbonnanotubeelectronics,Band structureand transport,devices, applications,2D semiconductorsandelectronicdevices,Graphene,atomisticsimulation

References:

1. G.W.Hanson,FundamentalsofNanoelectronics,Pearson,latest edition
2. W. Ranier, Nanoelectronics and Information Technology (Advanced Electronic MaterialandNovelDevices),Wiley-VCH,latest edition
3. K.E.Drexler,Nanosystems,Wiley,latest edition
4. J.H.Davies,ThePhysicsofLow-DimensionalSemiconductors,Cambridge University Press,latest edition
5. C.P.Poole,F.J.Owens,IntroductiontoNanotechnology,Wiley,latest edition

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand various aspects of nano-technology and the processes involved in making nano components and material.
2. Leverage advantages of the nano-materials and appropriate use in solving practical problems.
3. Understand various aspects of nano-technology and the processes involved in making nano components and material.

PEC-ECE313G **LINEAR IC APPLICATIONS**

L T P Theory: 75 Marks
3 1 - Class work : 25 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Differential and cascade amplifiers:Balanced, unbalanced outputdifferential amplifiers,FETdifferential amplifier,currentmirrors,level Translators,cascade configurationof amplifiers,operational amplifiers,IntroductiontoidealOP-AMP, characteristic parameters,Practical OP-AMP,itsequivalentcircuitandop-amp circuit configurations.

Unit-II

Op-amp with negative feedback and frequency response: Block diagram representation offeedback amplifier,voltageseriesfeedback,voltageshuntfeedback differentialamplifiers,frequencyresponsecompensatingnetwork,frequencyresponse ofinternallycompensativeop-ampandnon compensatingop-amp.Highfrequency op-ampequivalentcircuit,openloopgainV/sfrequency,closedloopfrequency response, circuitstability,slewrate.

Unit-III

Op-ampapplication:DC,AC amplifiers,peakingamplifier,summing,scaling, averagingandinstrumentationamplifier, differentialinputoutputamplifier,voltage to currentconverter, current to voltage converter, very high inputimpedance circuit, integrationanddifferentialcircuit,waveshapingcircuit,activefilters,oscillators.

Unit-IV

Specializedliner ICapplications: 555timerIC(monostable&astableoperation)&its applications,Universalactivefilter,PLL,poweramplifier,8038 IC.

References:

1.R.A.Gayakwaed,OP-ampsandLinearIntegratedcircuits.
2.K.R.Botkar,Integratedcircuit

Course Outcomes:

Attheendofthis coursestudentswilldemonstratetheability to

1. Design linearandnon-linearapplications of op-amps.
2. DesigntheapplicationsusingTimer andPLL.
3. Designtheapplicationsusing Voltageregulator and Functiongenerator ICs.

PEC-ECE315G **SCIENTIFIC COMPUTING**

L T P Theory: 75 Marks

3 1 - Class work : 25 Marks

Total: 100 Marks

Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Introduction: Sources of Approximations, Data Error and Computational, Truncation Error and Rounding Error, Absolute Error and Relative Error, Sensitivity and Conditioning, Backward Error Analysis, Stability and Accuracy

Computer Arithmetic: Floating Point Numbers, Normalization, Properties of Floating Point System, Rounding, Machine Precision, Subnormal and Gradual Underflow, Exceptional Values, Floating-Point Arithmetic, Cancellation

Unit-II

System of liner equations: Linear Systems, Solving Linear Systems, Gaussian elimination,Pivoting, Gauss-Jordan, Norms and Condition Numbers, Symmetric Positive Definite Systems and Indefinite System, Iterative Methods for Linear Systems

Linear least squares: Data Fitting, Linear Least Squares, Normal Equations Method, Orthogonalization Methods, QR factorization, Gram-Schmidt Orthogonalization, Rank Deficiency, and Column Pivoting

Eigenvalues and singular values:Eigenvalues and Eigenvectors, Methods for Computing All Eigenvalues, Jacobi Method, Methods for Computing Selected Eigenvalues, Singular Values Decomposition, Application of SVD

Unit-III

Nonlinear equations: Fixed Point Iteration, Newton's Method, Inverse Interpolation Method

Optimization: One-Dimensional Optimization, Multidimensional Unconstrained Optimization, Nonlinear Least Squares

Interpolation: Purpose for Interpolation, Choice of Interpolating, Function, Polynomial Interpolation, Piecewise Polynomial Interpolation Numerical Integration And Differentiation: Quadrature Rule, Newton-Cotes Rule, Gaussian Quadrature Rule, Finite Difference Approximation

Unit-1V

Initial Value Problems for ODES, Euler's Method, Taylor Series Method, Runga-Kutta Method, Extrapolation Methods, Boundary Value Problems For ODES, Finite Difference Methods, Finite Element Method, Eigen value Problems Partial Differential Equations, Time Dependent Problems, Time Independent Problems, Solution for Sparse Linear Systems, Iterative Methods Fast Fourier Transform, FFT Algorithm, Limitations, DFT, Fast polynomial Multiplication, Wavelets, Random Numbers AndSimulation,Stochastic Simulation, Random Number Generators, Quasi-Random Sequences

References:

1. Heath Michael T., " Scientific Computing: An Introductory Survey" , McGraw-Hill, latest edition
2. Press William H., Saul A. Teukolsky, Vetterling William T and Brian P.

Flannery, "Numerical Recipes: The Art of Scientific Computing", Cambridge University Press, latest edition

3. Xin-she Yang (Ed.)., "Introduction To Computational Mathematics", World Scientific Publishing Co., latest edition
4. Kiryanov D. and Kiryanova E., "Computational Science", Infinity Science Press, latest edition
5. Quarteroni, Alfio, Saleri, Fausto, Gervasio and Paola, "Scientific Computing With MATLAB And Octave", Springer, latest edition

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Understand the significance of computing methods, their strengths and application areas.
2. Perform the computations on various data using appropriate computation tools.
3. Analyse the various system using Linear and Non Linear methods.
4. Understand application of these methods in various areas.

PEC-ECE310G **BIO-MEDICAL ELECTRONICS**

L T P Theory: 75 Marks
3 1 - Class work : 25 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

UNIT I

Physiology and Transducers

Brief introduction to human physiology: Cell and its structure; Resting and Action Potential; Nervous system: Functional organisation of the nervous system ; Structure of nervous system, neurons; synapse; transmitters and neural communication; Cardiovascular system; respiratory system; Basic components of a biomedical system. Biomedical transducers: Transducers selection criteria; Piezoelectric; ultrasonic; displacement, velocity, force, acceleration, flow, temperature, potential, dissolved ions and gases; Temperature measurements; Fibre optic temperature sensors;

UNIT II

Electro – Physiological Measurements

Bio-electrodes and Biopotential amplifiers for ECG, EMG, EEG, etc.: Limb electrodes; floating electrodes; pregelled disposable electrodes ;Micro, needle and surface electrodes; Preamplifiers, differential amplifiers, chopper amplifiers ;Isolation amplifier. ECG; EEG; EMG; ERG; Lead systems and recording methods

UNIT III

Non-Electrical Parameter Measurements

Measurement of blood temperature, pressure and flow; ; Cardiac output ; Heart rate ; Heart sound ;Pulmonary function measurements ; spirometer ; Impedance plethysmography; Photo Plethysmography, Body Plethysmography

UNIT IV

Medical Imaging

Ultrasonic, X-ray and nuclear imaging: Radio graphic and fluoroscopic techniques; Computer tomography; MRI; Ultrasonography

UNIT V

Assisting And Therapeutic Equipments

Prostheses and aids: pacemakers, defibrillators, heart-lung machine, artificial kidney, aids for the handicapped; Safety aspects: safety parameters of biomedical equipments

References:

1. W.F. Ganong, Review of Medical Physiology, latest edition, Medical Publishers
2. J.G. Websster, ed., Medical Instrumentation, Houghton Mifflin, latest edition
3. A.M. Cook and J.G. Webster, eds., Therapeutic Medical Devices, Prentice-Hall, latest edition
4. R.S.Khander, Handbook of Biomedical Instrumentation‖, TATA Mc Graw-Hill, New Delhi, latest edition

5. Leslie Cromwell, ―Biomedical Instrumentation and Measurement‖, Prentice Hall of India, New Delhi, latest edition

Course outcomes:

At the end of the course, students will demonstrate the ability to:

1. Apply the concept of electronic systems design in Bio- medical applications.
2. Examine the practical limitations on the electronic components while handling bio- substances.
3. Evaluate and analyze the biological processes like other electronic processes.
4. Familiar the various Bio Medical Measuring Instruments and therapeutic equipments.
5. Aware of electrical safety of medical equipments

PEC-ECE312G **VHDL AND DIGITAL DESIGN**

L T P Theory: 75 Marks

3 1 - Class work : 25 Marks

Total: 100 Marks

Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Introduction: Introduction to Computer-aided design tools for digital systems. Hardware description languages; introduction to VHDL data objects, classes and data types, Operators, Overloading, logical operators. Types of delays, Entity and Architecture declaration. Introduction to behavioral dataflow and structural models.

Unit-II

VHDL Statements: Assignment statements, sequential statements and process, conditional statements, case statement Array and loops, resolution functions, Packages and Libraries, concurrent statements. Subprograms: Application of Functions and Procedures, Structural Modelling, component declaration, structural layout and generics.

Unit-III

Combinational & Sequential Circuit Design: VHDL Models and Simulation of combinational circuits such as Multiplexers, Demultiplexers, encoders, decoders , code converters, comparators, implementation of Boolean functions etc. VHDL Models and Simulation of Sequential Circuits Shift Registers, Counters etc.

Unit-IV

Design of Microcomputer & Programmable Device: Basic components of a computer, specifications, architecture of a simple microcomputer system, implementation of a simple microcomputer system using VHDL Programmable logic devices: ROM, PLAs, PALs, GAL, PEEL, CPLDs and FPGA. Design implementation using CPLDs and FPGAs

References:

1. Ashenden - Digital design,Elsevier
2. IEEE Standard VHDL Language Reference Manual latest edition
3. Digital Design and Modelling with VHDL and Synthesis : KC Chang; IEEE Computer Society Press.
4. "A VHDL Primmer" : Bhasker; Prentice Hall latest edition
5. “Digital System Design using VHDL” : Charles. H.Roth ; PWS latest edition
6. "VHDL-Analysis & Modelling of Digital Systems” : Navabi Z; McGraw Hill.
7. VHDL-IV Edition: Perry; TMH latest edition
8. “Introduction to Digital Systems” : Ercegovac. Lang & Moreno; John Wiley latest edition
9. Fundamentals of Digital Logic with VHDL Design : Brown and Vranesic; TMH latest edition
10. Modern Digital Electronics- III Edition: R.P Jain; TMH latest edition
11. Grout - Digital system Design using FPGA & CPLD 'S,Elsevier

Course Outcome

At the end of the course, students will demonstrate the ability to:

1. Understand the need & application of hardware description language.
2. Modelling & simulations of various basic & advanced digital systems using VHDL.
3. Implementation of various basic & advanced digital systems using FPGAs.
4. Apply knowledge to design & implement combinational circuits & sequential circuits related to research & industry applications.

PEC-ECE314G **INTRODUCTION TO MEMS**

L T P Theory: 75 Marks

3 1 - Class work : 25 Marks

Total: 100 Marks

Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit -I

Overview of MEMS and Microsystems: Introduction Microsystems vs. MEMS, Microsystems and Microelectronics, the Multidisciplinary Nature of Microsystems design and manufacture, Application of MEMS in various industries. MEMS and Miniaturization: Scaling laws in miniaturization: Introduction to Scaling, Scaling in Geometry, Rigid Body dynamics, Electrostatic forces, Electromagnetic forces, Electricity, Fluid Mechanics, Heat Transfer, Overview of Micro/Nano Sensors, Actuators and Systems.

Unit -II

Review of Basic MEMS fabrication modules: Oxidation, Deposition Techniques, Lithography (LIGA), and Etching. Micromachining: Surface Micromachining, sacrificial layer processes, Stiction; Bulk Micromachining, Isotropic Etching and Anisotropic Etching, Wafer Bonding.

Unit -III

Mechanics of solids in MEMS/NEMS: Stresses, Strain, Hookes's law, Poisson effect, Linear

Thermal Expansion, Bending; Energy methods

Unit -IV

Overview of Finite Element Method, Modeling of Coupled Electromechanical Systems: electrostatics, coupled electro mechanics.

References:

1. G. K. Ananthasuresh, K. J. Vinoy, S. Gopalkrishnan K. N. Bhat, V. K. Aatre, Micro and Smart Systems, Wiley India, latest edition
2. S. E.Lyshevski, Nano-and Micro-Electromechanical systems: Fundamentals of Nano- and Microengineering (Vol. 8). CRC press, latest edition
3. S. D. Senturia, Microsystem Design, Kluwer Academic Publishers, latest edition
4. M. Madou, Fundamentals of Microfabrication, CRC Press, latest edition
5. G. Kovacs, Micromachined Transducers Sourcebook, McGraw-Hill, Boston, latest edition
6. M.H. Bao, Micromechanical Transducers: Pressure sensors, accelerometers, and Gyroscopes, Elsevier, New York, latest edition

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Interpret the basics of micro/nano electromechanical systems including their applications and advantages
2. Recognize the use of materials in micro fabrication and describe the fabrication processes including surface micromachining, bulk micromachining and LIGA.
3. Analyze the key performance aspects of electromechanical transducers including sensors and actuators
4. Comprehend the theoretical foundations of quantum mechanics and Nano systems

PEC-ECE316G SPEECH AND AUDIO PROCESSING

L T P Theory: 75 Marks
3 1 - Class work : 25 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Introduction- Speech production and modeling - Human Auditory System; General structure of speech coders; Classification of speech coding techniques – parametric, waveform and hybrid ; Requirements of speech codecs –quality, coding delays, robustness.

Unit-II

Speech Signal Processing- Pitch-period estimation, all-pole and all-zero filters, convolution; Power spectral density, periodogram, autoregressive model, autocorrelation estimation.

Linear Prediction of Speech- Basic concepts of linear prediction; Linear Prediction Analysis of non-stationary signals –prediction gain, examples; Levinson-Durbin algorithm; Long term and short-term linear prediction models; Moving average prediction.

Speech Quantization- Scalar quantization–uniform quantizer, optimum quantizer, logarithmic quantizer, adaptive quantizer, differential quantizers; Vector quantization – distortion measures, codebook design, codebook types.

Unit-III

Scalar Quantization of LPC- Spectral distortion measures, Quantization based on reflection coefficient and log area ratio, bit allocation; Line spectral frequency – LPC to LSF conversions, quantization based on LSF.
Linear Prediction Coding- LPC model of speech production; Structures of LPC encoders and decoders; Voicing detection; Limitations of the LPC model.

Unit-IV

Code Excited Linear Prediction-CELP speech production model; Analysis-by-synthesis; Generic CELP encoders and decoders; Excitation codebook search – state-save method, zero-input zero- state method; CELP based on adaptive codebook, Adaptive Codebook search; Low Delay CELP and algebraic CELP.
Speech Coding Standards-An overview of ITU-T G.726, G.728 and G.729standards

References:

1. "Digital Speech" by A.M.Kondoz, Second Edition (Wiley Students *Edition)* latest edition
2. "Speech Coding Algorithms: Foundation and Evolution of Standardized Coders", W.C.Chu, WileyInter science, latest edition

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Mathematically model the speech signal
2. Analyze the quality and properties of speech signal.
3. Modify and enhance the speech and audio signals.

OPEN ELECTIVE COURSE

OEC-ECE317G **OBJECT ORIENTED PROGRAMMING WITH C++**

L T P	Theory: 75 Marks
3 - -	Class work : 25 Marks
	Total: 100 Marks
	Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit – I

Object-Oriented Programming Concepts: Introduction, comparison between procedural programming paradigm and object-oriented programming paradigm, basic concepts of object-oriented programming — concepts of an object and a class, data abstraction, encapsulation, inheritance, polymorphism.

Basic Concepts of C++: Structure of C++ Program, Basic Data Types, Expressions and Control Structures, Functions in C++: Call by Value, Call by Reference, Recursion, Function Overloading.

Unit - II

Classes and Objects: Specifying a class, creating class objects, accessing class members, access specifiers, static data members, use of const keyword, friends of a class, empty classes, nested classes, local classes, abstract classes, container classes.

Constructors and Destructors: Need for constructors and destructors, copy constructor, dynamic constructors, destructors.

Unit - III

Inheritance: Introduction, defining derived classes, forms of inheritance, virtual base classes.

Operator Overloading and Type Conversion: Overloading operators, rules for overloading operators, overloading of various operators, type conversion - basic type to class type, class type to basic type, class type to another class type.

Unit - IV

Virtual functions & Polymorphism: Concept of binding - early binding and late binding, virtual functions, pure virtual functions, abstract classes, virtual destructors.

Exception Handling: Review of traditional error handling, basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, rethrowing an exception, specifying exceptions.

References:

1. E. Balagurusamy,"Object Oriented Programming with C++", 7th edition, Mc Graw Hill Education(2018)
2. Bjrane Stroustrup, "C++ Programming language",3rd edition, Pearson education Asia(1997)
3. Lafore R."Object oriented Programming in C++",4th Ed. Techmedia,New Delhi(2002).
4. Yashwant Kenetkar,"Let us C++",1stEd.,Oxford University Press(2006)
5. B.A. Forouzan and R.F. Gilberg,CompilerScience,"A structured approach using C++" Cengage Learning, New Delhi.

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Students will able to understand and implement real-world entities like inheritance, data hiding, polymorphism, etc in programming.
2. Students will aware about C++ Programming concepts.
3. Students will implement the function overloading and operator overloading concepts.
4. Students will understand the concept of Exception handling.

OEC-ECE319G ADDITIVE MANUFACTURING

L T P
3 - -

Theory: 75 Marks
Class work : 25 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Introduction and basic principles: Definition , Generic Additive Manufacturing (AM) Process, Terms related to AM, Benefits of AM, Distinction between AM and CNC machining, Additive manufacturing process chain: Variation between different AM machines, Metal systems, Maintenance of Equipment, Material Handling Issues.

Unit-II

Introduction to rapid prototyping (RP), Need of RP in context of batch production, Basic principles of RP, Steps in RP, Process chain in RP in integrated CAD- CAM environment, Advantages of RP, Medical applications.

Unit-III

Classification of different RP techniques – based on raw materials, layering technique (2-D or 3-D) and energy sources: Process technology, Stereo-lithography (SL), photo polymerization, liquid thermal polymerization, Solid foil polymerization

Unit-IV

Selective laser sintering, Selective powder binding, ballistic particle manufacturing – both 2-D and 3-D, Fused deposition modeling, Shape melting, Laminated object manufacturing, Solid ground curing, 3 D printing

Unit-V

Introduction to reverse engineering Meaning, Use, RE-The generic process, Phase of RE–scanning, Contact Scanners, Noncontact Scanners, Point Processing, Application Geometric Model, Development. Learning Resources

References:

1. Ian Gibson, David W. Rosen, Brent Stucker , "Additive Manufacturing Technologies" ,Springer,latest edition

2. Chua C. K., Leong K. F., and Lim C. S., "Rapid Prototyping: Principles and Applications", Second Edition, World Scientific Publishers latest edition

3. Patri K. Venuvinod, Weiyin Ma "Rapid Prototyping: Laser-Based and Other Technologies" Springer ,latest edition

4. Peter D. Hilton, Hilton/Jacobs, Paul F. Jacobs, "Rapid Tooling: Technologies and Industrial Applications", CRC Press,latest edition

5.Burns. M, “Automated fabrication”, Prentice-Hall,latest edition

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Apply the knowledge of Additive Manufacturing and Rapid Prototyping technologies.
2. Understand the applications in various fields, reverse engineering techniques.
3. Understand about mechanical properties and geometric issues relating to specific rapid prototyping applications.

OEC-ECE321G MEASUREMENTS AND INSTRUMENTATION

L T P Theory: 75 Marks
3 1 - Class work : 25 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 6 parts of 2.5 marks each from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each unit.

Unit-I

Science of Measurement

Measurement System – Instrumentation – Characteristics of measurement systems – Static and Dynamic – Errors in Measurements – Calibration and Standards

Transducers

Classification of Transducers – Variable Resistive transducers – Strain gauges , Thermistor, RTD-Variable Inductive transducers- LVDT, RVDT,- Variable Capacitive Transducers – Capacitor microphone- Photo electric transducers – Piezo electric transducers – Thermocouple – IC sensors - Fibre optic sensors – Smart/intelligent sensors.

Unit-II

Signal Conditioning and Signal Analyzers

DC and AC bridges – Wheatstone, Kelvin, Maxwell, Hay and Schering. Pre- amplifier – Isolation amplifier – Filters – Data acquisition systems. Spectrum Analyzers – Wave analyzers – Logic analyzers

Unit-III

Digital Instruments

Digital Voltmeters – Millimeters – automation in Voltmeter – Accuracy and Resolution in DVM - Guarding techniques – Frequency counter- Data Loggers – Introduction to IEEE 488/GPIB Buses.

Unit-IV

Data Display Recording and Systems

Dual trace CRO – Digital storage and Analog storage oscilloscope. Analog and Digital Recorders and printers. Virtual Instrumentation - Block diagram and architecture – Applications in various fields. Measurement systems applied to Micro and Nanotechnology

References:

1. Albert D.Helfrick and William D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, latest edition
2. Ernest o Doebelin and Dhanesh N Manik, "Measurement Systems", McGraw-Hill, latest edition
3. A course in Electrical & Electronics Measurements & Instrumentation : A.K.Sawhney; Dhanpat Rai & Sons.
4 Albert D.Helfrick and William D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, latest edition

Course Outcomes:

At the end of the course, students will demonstrate the ability to:

1. Discuss about the principles of various measurement techniques.
2. Analyze the transducers and its impact.
3. Explain about the signal conditioning system and signal analyzers.
4. Illustrate the digital measurement equipments.
5. Emphasize the need for data acquisition, recording and display systems.

OEC-ECE318G **PYTHON PROGRAMMING**

L T P
3 - -

Theory: 75 Marks
Class work : 25 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 1.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT I

Introduction: Fundamental ideas in computer science; modern computer systems, installing Python; basic syntax, interactive shell, editing, saving, and running a script; The concept of data types; variables, assignments; numerical types; arithmetic operators and expressions; comments in the program; understanding error messages; Control statements: if-else, loops (for, while)

UNIT II

Strings, text files: String manipulations: subscript operator, indexing, slicing a string; strings and number system: converting strings to numbers and vice versa. Text files: reading/writing text and numbers from/to a file; creating and reading a formatted file (csv or tab-separated).

UNIT III

Lists, dictionary and Design with functions: Basic list operators, replacing, inserting, removing an element; searching and sorting lists; dictionary literals, adding, and removing keys, accessing and replacing values; traversing dictionaries, arguments and return values. Recursive functions.

UNIT IV

Object Oriented concepts: Classes and OOP: classes, objects, attributes and methods; defining classes; design with classes, data modelling; persistent storage of objects, Inheritance, polymorphism, operator overloading; abstract classes.

References:

1. "Fundamentals of Python: First Programs" Kenneth Lambert, Course Technology, Cengage Learning, latest edition

2. "Introduction to Computer Science Using Python: A Computational Problem-Solving Focus", By Charles Dierbach, John Wiley & Sons, latest edition

Course outcomes

At the end of the course, students will demonstrate the ability to:

1. For a given conceptual problem student will able to analyze the problem and write a program in python with basic concepts.
2. For a given problem of Strings and texts, student will able to analyze the problem and write a program in python with basic concepts involving strings and texts.
3. The knowledge of list and dictionary will enable student to implement in python language and analyze the same.
4. Student will able to write a program using functions to implement the basic concepts of object oriented programming language

OEC-ECE320G PROBABILITY AND STOCHASTIC PROCESSES

L T P — Theory: 75 Marks
3 - - — Class work : 25 Marks
Total: 100 Marks
Duration of Exam: 3 Hours

Note: Examiner will set nine questions in total. Question one will be compulsory. Question one will have 10 parts of 1.5 marks from all units and remaining eight questions of 15 marks each to be set by taking two questions from each unit. The students have to attempt five questions in total, first being compulsory and selecting one from each Unit.

UNIT I

Sets and set operations; Probability space; Conditional probability and Bayes theorem; Combinatorial probability and sampling models. Discrete random variables, probability mass function, probability distribution function, example random variables and distributions; Continuous random variables, probability density function, probability distribution function, example distributions;

UNIT II

Joint distributions, functions of one and two random variables, moments of randomvariables; Conditional distribution, densities and moments; Characteristic functions of a random variable; Markov, Chebyshev and Chernoff bounds;

UNIT III

Random sequences and modes of convergence (everywhere, almost everywhere, probability, distribution and mean square); Limit theorems; Strong and weak laws of large numbers, central limit theorem.

UNIT IV

Random process. Stationary processes. Mean and covariance functions. Ergodicity. Transmission of random process through LTI. Power spectral density.

References:

1. H. Stark and J. Woods, ``Probability and Random Processes with Applications to Signal Processing," Third Edition, Pearson Education
2. A.Papoulis and S. Unnikrishnan Pillai, ``Probability, Random Variables and Stochastic Processes," Fourth Edition, McGraw Hill.
3. K. L. Chung, Introduction to Probability Theory with Stochastic Processes, Springer International
4. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability, UBS Publishers,
5. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Stochastic Processes, UBS Publishers
6. S. Ross, Introduction to Stochastic Models, Harcourt Asia, Academic Press.

Course Outcomes:

At the end of this course students will demonstrate the ability to

1. Understand representation of random signals

2. Investigate characteristics of random processes
3. Make use of theorems related to random signals
4. To understand propagation of random signals in LTI systems.