OFFICE OF THE REGISTRAR : DIBRUGARH UNIVERSITY : DIBRUGARH

Ref. No. DU/DR-A/6-1/17/1491 Dated:16 .08.2017

NOTIFICATION

As recommended by the Board of Studies in Electronics and Telecommunications Engineering of Jorhat Institute of Science and Technology, Jorhat, the Hon'ble Vice-Chancellor is pleased to approve the draft of the Course Structure and Syllabi for the Electronics and Telecommunication Engineering Programme for 3rd and 4th Semester under report to the Under Graduate Board and Academic Council.

The above syllabi shall come into effect from the Academic Session 2016-2017.

Issued with due approval.

(Dr. B. C. Borah)
Deputy Registrar (Academic)
Dibrugarh University

Copy to:

1. The Vice-Chancellor, D.U. for favour of information.
2. The Dean, School of Science and Engineering, Dibrugarh University for favour of information and necessary action.
3. The Registrar, D.U. for favour of information.
4. The Controller of Examinations, DU, for favour of information and necessary action. The copy of the Syllabus is enclosed herewith.
5. The Principal, Jorhat Institute of Science and Technology, Jorhat for favour of information and necessary action.
6. Sri Gunadeep Chetia, Programmer, Dibrugarh University for kind information and with a request to upload the Notification along with the syllabus urgently in the University website.
7. File

(Dr. B. C. Borah)
Deputy Registrar (Academic)
Dibrugarh University

COURSE STRUCTURE OF SEMESTER I

Course structure for Semester-I is same as that of other branches of engineering at Jorhat Institute of Science and Technology, Jorhat and at Jorhat Engineering College, Jorhat under Dibrugarh University which has already been approved and adopted by Dibrugarh University with effective from academic session 2016-17

COURSE STRUCTURE OF SEMESTER II

Course structure for Semester-II is same as that of other branches of engineering at Jorhat Institute of Science and Technology, Jorhat and at Jorhat Engineering College, Jorhat under Dibrugarh University which has already been approved and adopted by Dibrugarh University with effective from academic session 2016-17

COURSE STRUCTURE OF SEMESTER-III:

Sl No	Course Code	Course Title	L	T	P	Contact hrs/wk	Credits
01	BS301	Mathematics-III	3	1	0	4	4
02	ET302	Network Theory	3	1	0	4	4
03	ET303	Digital Circuits & Logic Design	3	1	0	4	4
04	ET304	Electronic Devices and Circuits	3	1	0	4	4
05	ET305	Advanced Computer Programming	3	0	0	3	3
06	PI 306	Electrical Engineering Materials	3	1	0	4	4
07	ME301	Thermodynamics	2	0	0	2	2
Practicals							
08	ET303L	Digital Circuits & Logic Design Laboratory	0	0	2	2	1
09	ET304L	Electronic Devices and Circuits Laboratory	0	0	2	2	1
10	ET305L	Advanced Computer Programming Laboratory	0	0	2	2	1
		Total	20	5	6	31	28

COURSE STRUCTURE OF SEMESTER-IV

Sl No	Course Code	Course Title	L	T	P	Contact hrs/wk	Credits
01	BS 401	Mathematics-IV	3	1	0	4	4
02	ET 402	Analog Electronics	3	1	0	4	4
03	ET 403	Signals and Systems	3	1	0	4	4
04	ET 404	Probability & Random Processes	2	1	0	3	3
05	PI 405	Electrical Machines	3	1	0	4	4
06	ET 406	Computer Architecture and Organization	4	0	0	4	4
Practicals /projects							
07	ET 402L	Analog Electronics Laboratory	0	0	2	2	1
08	ET 403L	Signals and Systems Laboratory	0	0	2	2	1
09	PI 405L	Electrical Machines Laboratory	0	0	2	2	1
10	ET 407L	Mini Project	0	0	2	2	2
		Total	18	5	8	31	28

Chairman **Expert Member** **Convenor**

Member **Member** **Member**

COURSE STRUCTURE OF SEMESTER-V:

Sl No	Course Code	Course Title	L	T	P	Contact hrs/wk	Credits
01	BS 501	Mathematics-V	3	1	0	4	4
02	PI 501	Control Systems	3	1	0	4	4
03	ET 502	Linear ICs and Applications	3	1	0	4	4
04	ET 503	Analog Communication	3	1	0	4	4
05	ET 504	Electromagnetic Field Theory	3	1	0	4	4
06	ET 505	Electronics Measurement and Instrumentation	3	1	0	4	4
Practicals							
07	PI 501L	Control Systems Laboratory	0	0	2	2	1
08	ET 502L	Linear ICs and Applications Laboratory	0	0	2	2	1
09	ET 503L	Analog Communication Laboratory	0	0	2	2	1
10	ET 505L	Electronics Measurement and Instrumentation Laboratory	0	0	2	2	1
		Total	18	6	8	32	28

COURSE STRUCTURE OF SEMESTER-VI:

Sl No	Course Code	Course Title	L	T	P	Contact hrs/wk	Credits
01	HS 601	Introduction to Accountancy & Management	3	1	0	4	4
02	ET 601	Digital Signal Processing	3	1	0	4	4
03	ET 602	Microwave Engineering	3	1	0	4	4
04	ET 603	Digital Communication	3	1	0	4	4
05	ET 604	Microprocessor and Applications	3	1	0	4	4
06	ET 605	Communication Networks	4	0	0	4	4
Practicals							
07	ET 601L	Digital Signal Processing Laboratory	0	0	2	2	1
08	ET 602L	Microwave Engineering Laboratory	0	0	2	2	1
09	ET 603L	Digital Communication Laboratory	0	0	2	2	1
10	ET 604L	Microprocessor and Applications Laboratory	0	0	2	2	1
		Total	19	5	8	32	28

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COURSE STRUCTURE SEMESTER-VII:

Sl No	Course Code	Course Title	L	T	P	Contact hrs/wk	Credits
01	ET701	Antennas and Wave propagation	3	1	0	4	4
02	ET702	Fiber Optic Communication	2	1	0	3	3
03	PI 703	Power Electronics Devices and Circuits	3	1	0	4	4
04	ET 704	Microcontrollers and Embedded systems	3	1	0	4	4
05	OE….	Elective-I (Open)	4	0	0	4	4
Practical/Projects/Seminar/ Viva							
06	ET702L	Fiber Optic Communication Laboratory	0	0	2	2	1
07	PI 703L	Power Electronics Devices and Circuits Laboratory	0	0	2	2	1
08	ET705	Industrial Summer Training Report/Viva	0	0	2	2	1
09	ET706	General Seminar	0	0	2	2	2
10	ET707	Project work– I	0	0	4	4	4
		Total	15	4	12	31	28

Elective-I (Open):

Sl No	Course Code	Course Title	L	T	P	Contact hrs/wk	Credits
01	OE 01	Engineering Risk–Benefit Analysis	4	0	0	4	4
02	OE 03	Disaster Management	4	0	0	4	4
03	OE 04	Project Management	4	0	0	4	4
04	OE 05	Rural Technology and Community Development	4	0	0	4	4
05	OE 71	Database Management Systems	4	0	0	4	4
06	OE 72	Information Theory and Coding	4	0	0	4	4
07	OE 73	Design and Analysis of Algorithms	4	0	0	4	4
08	OE 74	Optimization Techniques	4	0	0	4	4
09	OE 75	Cloud Computing	4	0	0	4	4
10	OE 76	Software Engineering	4	0	0	4	4
11	OE 77	Engineering System Analysis and Design	4	0	0	4	4
12	OE78	Soft Computing	4	0	0	4	4
13	OE79	Mechatronics	4	0	0	4	4
14	OE80	Industrial Economics	4	0	0	4	4
15	OE81	Any other subject offered from time to time with the approval of the university	4	0	0	4	4

COURSE STRUCTURE SEMESTER-VIII:

Sl No	Course Code	Course Title	L	T	P	Contact hrs/wk	Credits
01	ET 801	VLSI Design	3	1	0	4	4
02	ET 802	Wireless Communication	2	1	0	3	3
03	ETL 2..	Elective-II	4	0	0	4	4
04	ETL 3..	Elective-III	4	0	0	4	4
Practical/Project/Viva-voce							
05	ET 801L	VLSI Design Laboratory	0	0	2	2	1
06	ET 805	Comprehensive Viva Voce	0	0	0	0	2
07	ET 806	Project Work– II	0	0	8	8	8
08	ET 807	Project Viva-voce	0	0	0	0	2
		Total	13	2	10	25	28

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Elective-II:

Sl No	Course Code	Course Title	L	T	P	Contact hrs/wk	Credits
01	ETL21	Communication Switching Systems	4	0	0	4	4
02	ETL22	Robotics and Industrial Automation	4	0	0	4	4
03	ETL23	Pattern Recognition	4	0	0	4	4
04	ETL24	Multimedia Communication Technology	4	0	0	4	4
05	ETL25	Principle of RADAR	4	0	0	4	4
06	ETL26	IC Technology	4	0	0	4	4
07	ETL27	Digital System Design	4	0	0	4	4
08	ETL28	Bio-Medical Electronics	4	0	0	4	4
09	ETL29	Any other subject offered from time to time with the approval of the university	4	0	0	4	4

Elective-III:

Sl No	Course Code	Course Title	L	T	P	Contact hrs/wk	Credits
01	ETL31	MEMS and Microsystems Technology	4	0	0	4	4
02	ETL32	Speech and Audio Processing	4	0	0	4	4
03	ETL33	Digital Image Processing	4	0	0	4	4
04	ETL34	Satellite Communications	4	0	0	4	4
05	ETL35	Mixed Signal Design	4	0	0	4	4
06	ETL36	Fuzzy Logic and Neural Network	4	0	0	4	4
07	ETL37	Adaptive Signal Processing	4	0	0	4	4
08	ETL38	Artificial Intelligence and Robotics	4	0	0	4	4
09	ETL39	Any other subject offered from time to time with the approval of the university	4	0	0	4	4

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COURSE STRUCTURE OF SEMESTER-III:

Sl No	Course Code	Course Title	L	T	P	Contact hrs/wk	Credits
01	BS301	Mathematics-III	3	1	0	4	4
02	ET302	Network Theory	3	1	0	4	4
03	ET303	Digital Circuits & Logic Design	3	1	0	4	4
04	ET304	Electronic Devices and Circuits	3	1	0	4	4
05	ET305	Advanced Computer Programming	3	0	0	3	3
06	PI 306	Electrical Engineering Materials	3	1	0	4	4
07	ME301	Thermodynamics	2	0	0	2	2
Practical							
08	ET303L	Digital Circuits & Logic Design Laboratory	0	0	2	2	1
09	ET304L	Electronic Devices and Circuits Laboratory	0	0	2	2	1
10	ET305L	Advanced Computer Programming Laboratory	0	0	2	2	1
		Total	20	5	6	31	28

MATHEMATICS-III

SEMESTER: THIRD SEMESTER
COURSE CODE : BS301
L:T:P : 3:1:0 Credits:4

VECTOR CALCULUS: Vector functions, variable vectors and preliminaries, differentiation, differential operators, identities, gradient, divergence, curl, their physicals meaning. Line,surface and Volume integrals, Gauss, Green and Strokes Theorem. Simple applications of Engineering problems. PARTIAL DIFFERENTIAL EQUATIONS: First order linear equation, Four standard forms of non – linear equation, linear equation with constant coefficient, Solution by separation of variables, Laplace Equ ation, Wave Equation Heat Equation, Solution of boundary value problems.

STATISTICS:
Measure of central tendency (mean, median, mode) Measures of dispersions, variance, moments, skewnes s and Kurtos' theory of probability-addition law, multiplication law, conditional probability, independent events. Theoretical discrete distribution-binomial, Poisson distribution, Normal distribution, method of least square and curve fitting.

GRAPH THEORY: Definition, Directed and undirected graphs, basic terminologies, finite and infinite graph, incidence and degree of vertex, isolated and pendent vertices, null graph, Handshaking the orem, types of graphs, sub graphs, graphs isomorphism,operations of graphs, connected graph, disconnect ed graphs and components. Walk, path and circuits, Eulerian graphs, Hamiltonian graphs, Dirac's theorem, Ore's, theorem, Konigsberg's Bridge problem, Representation of graphs, matrix representation of graph, adjacency matrix, Incidence matrix, Linked representation of graphs. Trees, Spanning trees, Minimal spanning tree

Text Books/ Reference books:

[1] A Text book of Engineering Mathematics by N.P. Bali & Dr. Manish Goyal.
[2] Graph Theory with application to Engineering and computer Science; Narasingh Deo, Prentice Hall of India, New Delhi, 2006. Page 29 of 31
[3] Graph Theory with Application; C. Vasudev, New Age International Publishers.
[4] Fundamentals of Mathematical Statistics; V.K. Kapoor, S.C.Gupta, Sultan Chand & Sons.
[5] Fundamentals of Applied Statistics;V.K. Kapoor, S. C. Gupta, Sultan Chand & Sons TMGH.
[6] Advance Differential Equation; M D Raisinghania, S Chand Company.
[7] Introduction to Partial Differential Equation; K. Sankara Rao, Prentice-Hall of India.
[8] Advance Engineering Mathematics: Erwin Kreysig(Willey)
[9] A text book of vector calculus; Shanti Narayan, J. N. Kapur, S. Chand and Company, N. Delhi.
[10\ Theory and Problems of Vector !nalysis, MurrayR.Spiegel, Schaum's outline series, Mc Graw Hill Book Company.

NETWORK THEORY

SEMESTER: THIRD SEMESTER
COURSE CODE : ET 302
L:T:P : 3:1:0 Credits:4

Module 1: Sinusoidal Steady state Analysis : Phasor representation of sinusoidal functions; Frequency domain diagram; phasor diagram, Node and loop analysis; steady state response using network theorem Superposition, reciprocity, Thevenin's, Nortons, Maximum power Transfer, compensation and Tallegen's theorem; Magnetically coupled circuits; duality of Network

Module2:Resonance and locus diagrams: Series and parallel resonance - Selectivity - Bandwidth - Q factors –Times circuits. Locus diagrams for RL and RC circuits with AC excitation for parametric and frequency variations under steady state conditions.

Module 3: Circuit Transients: Concept of Circuit Transients: Transient response and steady state response; Laplace transforms of various signals of excitation -Waveform synthesis, Laplace transformed networks - Determination and representation of initial conditions-Response for impulse function only and its relation to network admittance - convolution integral and applications.

Network Synthesis: Hurwitz polynomial, positive real functions, reactive networks, separation property of reactive networks, The fur –reactance function form, specification of reactance function. Foster form of reactive networks Cauer form of reactance networks. Synthesis of R-L and R-C networks in Foster and Cauer forms

Module 4: Two-port network parameters, Interconnection of two port networks, condition of reciprocity and symmetry; Relation between the parameter sets; equivalent T &II section represantation. Barlett's bisection theorem. Image and Iterative parameters. Design of attenuators.

Module 5:Two port Reactive network(filter):Classification of filters, Characteristic impedance, Constant K-filter-derived filter. Composite filters. Band pass and Band elimination filters. Problem of termination, Lattice filters, Introduction to active filters.

Module 6 :Non sinusoidal periodic waves: Periodic waves; Fourier analysis of non- sinusoidal periodic waves; Waveform symmetry Frequency spectrum; average value; Root mean square value Average power of non sinusoidal periodic functions.

Module 7:Graph Theory: Graph of a network and it parts:; Oriented graph; Tree; Co-tree Loop; Tie-sets; Cut set matrix; Incidence matrices; Network equilibrium equations

Reference Book:

1. Valkenberg V., "Network Analysis", 3rd Ed., Prentice Hall International Edition.,2007.
2. Valkenberg V., "Network Synthesis,
3. Kuo F. F., "Network Analysis and Synthesis", 2nd Ed., Wiley India.,2008.
4. Chakraborty A,"Circuit Theory"
5.Roy Chudhury D, "Network and System"

DIGITAL CIRCUITS & LOGIC DESIGN

SEMESTER:THIRD SEMESTER
COURSE CODE : ET303
L:T:P : 3:1:0 Credits:4

Module 1: INTRODUCTION, NUMBER SYSTEMS AND CODES.
Digital Systems; Number Systems: Positional number system- Decimal, binary, octal and hexadecimal number systems and their base conversions; Binary arithmetic- Addition, subtraction, multiplication and division; 1's and 2's complement; Representation of signed numbers; Fixed and floating point numbers; Codes: Binary coded decimal codes, Gray codes, Error detection and correction codes - parity check codes and Hamming code.

Module 2: BOOLEAN ALGEBRA AND LOGIC GATES.
Boolean Algebra: Definition, basic postulates and fundamental theorems of Boolean Algebra; De-Morgan's theorem; Logic Gates: Types, symbols, logic operations and their truth tables; Sum of product(SOP) and product of sum(POS) forms; Canonical forms; minterm and maxterm; Simplification of switching functions – Algebraic and Karnaugh map(K-map) methods; Realization of simplified switching functions using logic gates; Don't-care condition;

Module 3: COMBINATIONAL LOGIC CIRCUITS.
Design of combinational logic circuits; Adders -Half and Full adder, parallel binary adder(ripple carry adder), carry look-ahead adder; Subtractors- Half and Full subtractor; Combined adder/subtractor; ALU; comparators; Parity circuits- Generator and checker; Decoders, encoders, multiplexers, demultiplexers and their applications; Code converters; Design examples.

Module 4: SEQUENTIAL LOGIC CIRCUITS.
Latches; Flip-flops- SR, D, JK, T and Master Slave JK, EDGE Triggered; Registers, Shift-registers- SISO, SIPO, PIPO, PISO, Bidirectional; Counters- Ring counter, Johnson(Twisted ring) counter, ripple(Asynchronous) counter, synchronous counters, up-down counters, timing diagrams and specifications; Clocked sequential circuit: Synchronous circuit analysis and design- Mealy and Moore circuits, transition(excitation) table, state diagram, state table, state reduction, state assignment, Lockout condition; design and analysis of synchronous and asynchronous state machine, concept of race, critical race and hazards,

Module 5: LOGIC FAMILIES
Introduction to different logic families; TTL inverter; CMOS inverter Structure and operations of TTL and CMOS gates; Electrical characteristics of logic gates – logic levels and noise margins, fan-out, propagation delay, transition time, power consumption and power-delay product.

Module 6: MEMORIES.
ROM,PROM,EPROM; RAM- S(Static) RAM and D(Dynamic) RAM; Programmable Logic Devices- PLAs, PALs and their applications; FPGA.

Text/Reference Books:

1. Anand Kumar: Fundamentals of Digital Logic, PHI
2. G.K. Kharate: Digital Electronics, Oxford University Press
3. M. Morris Mano: Digital Logic and Computer Design, PHI
4. J. F. Wakerly: Digital Design, Principles and Practices, Pearson Education
5. Charles H Roth: Digital Systems Design using VHDL, Thomson Learning

ELECTRONIC DEVICES AND CIRCUITS

SEMESTER:THIRD SEMESTER
COURSE CODE : ET304
L:T:P : 3:1:0 Credits:4

Module 1: Semiconductors: Review of Band Theory of solids, intrinsic semiconductors, Generation and Recombination of electrons and holes. Thermal equilibrium, Doped semiconductors n and p types, Fermi level and carrier concentrations of n and p type semiconductors. Carrier mobility and conductivity, diffusion, Mass-action law, continuity equation.

Module 2: P-N Junction Diodes: The open circuited junction, space charge region, the biased p-n junction, the Volt-Ampere characteristics, effect of temperature on V-I characteristics, Breakdown of junctions on reverse bias, Transition and diffusion capacitance of p-n junction diodes, junction diode switching times

Module 3: Diode Circuits: Half wave and Full wave single phase rectifiers and their analysis, peak inverse voltage, various types of filters and their analysis and applications, voltage multiplier circuits, Clipping and Clamping circuit

Module 4: Special purpose diodes: Zener diode, Light Emitting diodes, Photo diodes, Solar cells, Varactor diodes and their applications

Module 5: Bipolar Junction Transistors (BJT): PNP and NPN junction transistors, different configurations of BJT and their input & output characteristics, different modes of operation, the Ebers-Moll representation of BJT, (Early effect), Avalanche breakdown & Punch through, . BJT biasing: The operating Point , DC & AC load lines, different biasing circuits analysis and problems, Stabilization, various stabilization circuits, Thermal runaway and thermal stability, BJT as a switch and amplifier,

Module 6: The Field Effect Transistor (FET): Differences between BJT and FET, the construction and operation of the Junction Field Effect Transistor, the drain and transfer characteristics, MOSFET: construction and operation of Depletion and Enhancement MOSFET, the drain and transfer characteristics, Biasing of FETs, CMOS devices

Module 7: Small Signal low frequency Transistor Amplifier circuits: Transistor hybrid model, Analysis of transistor amplifier circuits using 'h' parameters, Effect of bypass and coupling capacitors on the low frequency response of the amplifier, Emitter follower, FET amplifiers - low frequency and high frequency models, Amplifier configurations, Low and high frequency response of amplifier circuits, Analysis of single stage FET amplifier circuits. Cascaded BJT amplifier, Darlington pair.

Text/Reference Books:

1. *D. A. Neamen, Semiconductor Physics and Devices (IRWIN), Times Mirror High Education Group*
2. *B.G. Streetman, Solid State Electronic Devices, Prentice Hall of India, New Delhi, 1995.*
3. *J. Millman and Halkias, Integrated Electronics, TMH*
4. *R. Boylested and Nashlsky, Electronic Device and Circuits, Pearson*
5. *David Bell, Electronic Devices and Circuits, Oxford University Press*
6. *J. Millman and A. Grabel, Microelectronics, McGraw Hill, International.*
7. *A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, 1991.*

ELECTRICAL ENGINEERING MATERIALS

SEMESTER:THIRD SEMESTER
COURSE CODE: PI 306
L:T:P : 3:1:0 Credits:4

Module1: Crystal Structure of Materials
Atomic bonding, Crystallinity, Miller Indices, X-ray crystallography, Structural imperfections, Crystal growth.
Module2: Conductivity of Metals:
Free electron theory of metals, factors affecting electric conductivity of metals, thermal conductivity of metals, heat developed in current carrying conductors, thermoelectric effect, Superconductivity.
Module3: Dielectric Properties of Materials:
Polarization mechanism and dielectric constant, behaviour of polarization under impulse and frequency switching, dielectric loss, spontaneous polarization, Piezoelectric.
Module4: Magnetic Properties of Materials
Origin of permanent magnetic dipoles in materials, classification, diamagnetism, paramagnetic, ferrimagnetism, antiferromagnetic, and ferrimagnetism, magnetostriction.
Module5: Mechanism of conduction in Semiconductor:
Energy band theory, classification of materials using energy band theory, Hall effect, drift and diffusion current, continuity equation, P-N diode, Volt-Ampere equation and its temperature dependence, display units LED, LCD and monitors, effect of environment on components
Module6: Electrical Engineering Materials:
Properties and applications of electrical conducting, semiconducting, insulting and magnetic materials, cables, calculation of capacity of cables, charging currents, stress grading and heading of cables, construction and characteristics of HV and EHV cables
Module7: Processes:
Basic processes used in the manufacturing of integrated circuits such as epitaxy, masking, photolithography, diffusion, oxidation, etching, metallization, scribing wire bounding and encapsulation, induction and dielectric heating, Electron beam welding and cutting

Text/Reference Books:

1. Decker "Electrical Engineering Materials" PHI
2. S. O. Kasap"Principle of Electrical Engineering Materials" MGH.
3. Mahajan. "Principle of Growth and Procesing of Semiconductors"MGH
4. Dhir"Electronic components and Materials and Maintenance"TMH
5. S.P. Seth "Electrical Engineering Materials"Dhanpat Rai Publication
6. C. S. Indulkar"Electrical Engineering Materials" S. Chand

ADVANCED COMPUTER PROGRAMMING

SEMESTER:THIRD SEMESTER
COURSE CODE : ET305
L:T:P : 3:0:0 Credits:3

Module1: – INTRODUCTION TO OOP

Evolution of object oriented languages, need of Objects, definition of Object-Oriented Language, Programming methodologies, Comparison, Object Oriented concepts, basics of C++ environment.

Module2: – OBJECT AND CLASSES

Core object concepts: (Encapsulation, Abstraction, Polymorphism, Classes, Messages Association, Interfaces) , data members, member functions, access specifiers, C++ object as data types constructor, object as function arguments, Constructors: multiple constructors, parameterized constructors, copy constructors , constructors with default arguments, Destructors, Static members , This pointer, pointer to derived class, Constant members, Free store operators.

Module3: – INHERITANCE AND POLYMORPHISM

Introduction to Inheritance, defining derived classes, single inheritance, multilevel inheritance, multiple inheritance, hierarchical inheritance, hybrid inheritance, virtual base classes, abstract classes, friend functions and classes, Polymorphism: Runtime and Compile time polymorphism, overloading functions and operators, virtual function, pure virtual function, virtual base classes.

Module 4: – TEMPLATES AND EXCEPTION HANDLING

Class templates, class templates with multiple parameters, function templates, function templates with multiple parameters, Exception handling: throwing and catching mechanism.

Module5: – JAVA FUNDAMENTALS

Introduction to programming languages, the evolution of java, object-oriented programming concepts and java, differences between c++ and java, the primary characteristics of java, the architecture,

Module6: – PROGRAMMING WITH JAVA

Tokens, expressions, data types, declarations, control statements, classes, working with objects, methods, packages, inheritance, interfaces, Exception handling, threads, multithreading, streams and I/O, applets.

Text and References:

1. *Herbert Schildt, "The Complete Reference to C++", Tata McGraw Hill Education.*
2. *E. Balaguruswamy, "Object oriented Programming with C++", Tata McGraw Hill Education.*
3. *Lippman S. B., Josee Lajoie, Barbara E. Moo, "C++ Primer", Pearson Education.*
4. *Bjarne Stroustrup, "The C++ Programming Language", Addison Wesley.*
5. *R. Lafore , Object Oriented Programming using C++, Galgotia Publications..*
6. *Herbert Schildt, "**Java: A Beginner's Guide"**, Tata McGraw Hill Education.*
7. *E. Balaguruswamy, "Programming in JAVA a Primer", Tata McGraw Hill Education.*
8. *Herbert Schildt, "The complete reference to JAVA", Tata McGraw Hill Education.*
9. *Robert Sedgewick and Kevin Wayne, "Introduction to Programming in Java: An Interdisciplinary Approach", Pearson Education.*

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THERMODYNAMICS

SEMESTER: THIRD SEMESTER
COURSE CODE: ME 301
L:T:P : 2:0:0 , Credits:2

Module1: Basic Concepts- Basic concepts - concept of continuum, macroscopic approach, Thermodynamic systems - closed, open and isolated. Property, state, path and process, quasi-static process, work, modes of work. Zeroth law of thermodynamics, concept of temperature and heat. Concept of ideal and real gases.

Module2: First Law of Thermodynamics- Concepts of Internal Energy, Specific Heat Capacities, Enthalpy. Energy Balance for Closed and Open Systems, Energy Balance for Steady-Flow Systems. Steady- Flow Engineering Devices. Energy Balance for Unsteady-Flow

Module3: Second Law of Thermodynamics- Thermal energy reservoirs, heat engines energy conversion, Kelvin's and Clausius statements of second law, the Carnot cycle, the Carnot Theorem, the thermodynamic temperature scale, the Carnot heat engine, efficiency, the Carnot refrigerator and heat pump, COP. Clausius inequality, concept of entropy, principle of increase of entropy – availability, the increase of entropy principle, perpetual-motion machines, reversible and irreversible processes, Entropy change of pure substances, isentropic processes, property diagrams involving entropy, entropy change of liquids and solids, the entropy change of ideal gases, reversible steady-flow work, minimizing the compressor work, isentropic efficiencies of steady- flow devices, and entropy balance. Energy - a measure of work potential, including work potential of energy, reversible work and irreversibility, second-law efficiency, energy change of a system, energy transfer by heat, work, and mass, the decrease of energy principle and energy destruction, energy balance: closed systems and control volumes energy balance.

Module 4: Ideal and Real Gases and Thermodynamic Relations- Gas mixtures – properties ideal and real gases. Equation of state, Avogadro's Law, Vander Waal's equation of state, Compressibility factor, compressibility chart. Dalton's law of partial pressure. Exact differentials, T-D relations, Maxwell's relations. Clausius Clapeyron equations, Joule –Thomson coefficient.

Text/ Reference Books:

1. Nag.P.K., "Engineering Thermodynamics", Tata McGraw-Hill, New Delhi.
2. Cengel, „Thermodynamics – An Engineering Approach" Tata McGraw Hill, New Delhi.
3. Sonntag, R. E., Borgnakke, C., &Wylen, G. J. V. Fundamentals of thermodynamics: Wiley.
4. Moran, M. J., Shapiro, H. N., Boettner, D. D., & Bailey, M. Fundamentals of Engineering Thermodynamics:John Wiley & Sons.
5. Jones, J. B., & Dugan, R. E. Engineering thermodynamics: Prentice Hall.
6. *Potter, M. C., & Somerton, C. W. Schaum's Outline of Thermodynamics for Engineers, McGraw-Hill.*

DIGITAL CIRCUITS & LOGIC DESIGN LABORATORY

SEMESTER:THIRD SEMESTER
COURSE CODE : ET303L
L:T:P : 0:0:2 Credits:1

Objectives: The main objectives of this course are:

- To give Introduction to Digital Laboratory Equipments & IC's
- To study basic logic gates and verify their truth tables.
- To study sop and pos forms of Boolean function and implement it using logic gates .
- To study and construct basic flip-flops
- To study and implement encoder and decoder
- To study and implement multiplexer
- To study and implement demultiplexer
- To study adder, subtractor circuit using a 4-bit adder IC
- To study and construct of Synchronous Counter
- To study and construct Asynchronous counter
- To realize basic gates (AND,OR,NOT) from Universal Gates(NAND & NOR).
- To study about full adder & verify its truth table.

ELECTRONIC DEVICES AND CIRCUITS LABORATORY

SEMESTER:THIRD SEMESTER
COURSE CODE : ET304L
L:T:P : 0:0:2 , Credit:1

Course objectives:

The main objective of this course is to make the students well versed with basic electronic components and circuits. The objective are

- To operate the CRO and Function Generator
- To study and realize the Characteristics of PN junction diode and Zener diode
- To study Applications of PN junction diode like Rectifiers, Clippers etc.
- To study and perform experiments for application of Zener diode as voltage regulator
- To study and realize Characteristics of different configurations of BJT and its usage in applications like amplifiers
- To study and realize Characteristics of FET

ADVANCED COMPUTER PROGRAMMING
LABORATORY

SEMESTER:THIRD SEMESTER
COURSE CODE : ET305L
L:T:P : 0:0:2 , Credit:1

OBJECTIVES:

1. To make the student to learn C++ programming language.

2. To teach the student the implementation of object oriented programming features.

3. To teach the student to write programs to understand
   i) structure and Union,
   ii) Pointer Arithmetic, Inline functions
   iii) Different function call mechanism
   iv) Constructor and Destructors

4. To teach the student to write programs to implement inheritance and function overriding, Friend function and Friend class, Class templates.

5. Developing Applets using core JAVA

COURSE STRUCTURE OF SEMESTER-IV

Sl No	Course Code	Course Title	L	T	P	Contact hrs/wk	Credits
01	BS 401	Mathematics-IV	3	1	0	4	4
02	ET 402	Analog Electronics	3	1	0	4	4
03	ET 403	Signals and Systems	3	1	0	4	4
04	ET 404	Probability & Random Processes	2	1	0	3	3
05	PI 405	Electrical Machines	3	1	0	4	4
06	ET 406	Computer Architecture and Organization	4	0	0	4	4
Practical /projects							
07	ET 402L	Analog Electronics Laboratory	0	0	2	2	1
08	ET 403L	Signals and Systems Laboratory	0	0	2	2	1
09	PI 405L	Electrical Machines Laboratory	0	0	2	2	1
10	ET 407L	Mini Project	0	0	2	2	2
		Total	18	5	8	31	28

MATHEMATICS-IV

SEMESTER: FOURTH SEMESTER
COURSE CODE: BS401
L:T:P : 3:1:0, Credits:4

Module 1: SERIES SOLUTION: Series Solution of ordinary differential equation. Bessel's equation, Bessel's function, Legendre Polynomials.

Module 2: FUZZY MATHEMATICS:
Introduction to fuzzy set theory: Crisp set and Fuzzy set, Types of fuzzy sets, some basic definitions, Uni on and intersection of fuzzy sets. Operations on fuzzy sets: Some important theorems, Decomposition the orems, Fuzzy numbers and arithmetic: Fuzzy numbers, triangular fuzzy numbers, Trapezoidal fuzzy num bers, Fuzzy Arithmetic, Arithmetic operation on fuzzy numbers, Fuzzy Equations. Fuzzy Relations: Fuzz y relation and basic definition, Equivalent fuzzy relations, Composition of fuzzy relation (MAX-MIN operation, MAX PRODUCT composition and MAX AVERAGE composition) Fuzzy systems and Fuzzy controlling:Fuzzy rule based system, Fuzzification and Defuzzification (Centre of Are a Method, Centre of Sums method, Mean of Maxima Method, Centre of maxima method, weighted avera ge Method) Fuzzy Control, Assumption and Design of fuzzy controllers, some examples (Air conditioner controller, Aircraft Landing Control Problem), Fuzzy Neural networks.

Module 3: TENSOR ANALYSIS:
Introduction: Summation convention, Transformation of coordinates.
Tensor of order zero. Kronecker delta, contravariant and covariant vectors, contravariant and covariant te nsors of order two. Symmetric and skew symmetric tensors, addition of tensors, outer product and inner p roduct of tensors. Quotient law, Riemamnnian space, metric tensor, conjugate tensor, Christoffel symbols , Transformation of Christoffel symbols.

Module 4: LINEAR PROGRAMMING PROBLEM:
LP Model Formulation and Graphical method, Feasible solution, Basic solution of a Linear Programming Problem, Theory of Simplex Algorithm and simplex method; Standard form of an L P Problem; Complim entary slackness theorem, Degeneracy; Fundamental theorem of Duality, Cycling, Transportation Proble m, Elements of Dynamic Programming problem.

Text Books/ Reference books:

1. Advance Differential Equation; M D Raisinghania, S Chand Company.
2.Fuzzy Sets and Fuzzy Logic, Theory and Applications. (George J.Klir and Bo Yuan)
3. Fuzzy Set Theory and its application (H. J. Zimarmen, Boston)
4. Fuzzy Sets and Their Application (Dr. Sudhir K. Pundir and Dr. Rimple Pundir)
5.A Text Book of Engg. Math.: By N.P. Bali & Dr. Manish Goyal(Laxmi Publication).
6. Linear Programming and Theory of Game; P. M. Karak, New Central Book Agency(P) Ltd.
7. Linear Programming and Game Theory; Dipak Chatterjee, Prentice Hall of India (P) Ltd.
8. Linear Programming; G. Hadley, Narosa Publishing House.
9. Vector Analysis and an Introduction to Tensor Analysis(Schaum Outline Series) by M. R. Spiegel.

ANALOG ELECTRONICS

SEMESTER: FOURTH SEMESTER
COURSE CODE: ET402
L:T:P : 3:1:0 , Credits:4

Module 1: INTRODUCTION: Scope and applications of analog electronic circuits. Amplifier m odels: Voltage amplifier, current amplifier, trans-conductance amplifier and trans-resistance amplifier. Procedure for particular specifications

Module 2: MULTISTAGE AMPLIFIERS: Classification of amplifiers, Distortion in amplifiers, Frequency response of an Amplifier, Bode plots, Step response of an amplifier, Analysis of Multistage amplifier, Design of two stage amplifier, Common Source and Common Drain amplifier at high frequencies, Frequency response of cascaded stages, Cascode amplifiers (CE-CB),The effect of coupling and bypass capacitors, RC coupled amplifier and its low frequency response Differential amplifiers, Analysis of Differential amplifiers

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Module3: FEEDBACK AMPLIFIERS: Classification and representation of amplifiers, Feedback concept, The transfer gain with feedback, General characteristics of negative feedback amplifiers. Feedback topologies: Voltage series, current series, voltage shunt, current shunt, effect of feedback on gain, bandwidth etc., calculation with practical circuits, concept of stability, gain margin and phase margin.

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Module4: OSCILLATORS: Sinusoidal oscillators, Barkhausen Criterion, Analysis and design of RC phase shift (FET/ BJT) oscillator, Wien bridge oscillators, Resonant circuit oscillators, General form of oscillator circuit (Hartley & Colpitts), Crystal oscillators, non-sinusoidal oscillators.

Module5: POWER AMPLIFER: Class A, B, AB, and C power amplifiers, push – pull and complementary symmetry push-pull amplifier. Design of heat sinks, power output, efficiency, crossover distortion and harmonic distortion.

Module 6: TUNED AMPLIFIER: Design and analysis of single tuned amplifier circuit with a capacitor coupled load, Double tuned inter-stage design. Stability consideration, Class B and class C tuned power

Text/Reference Books:

1. J. Millman and A. Grabel, Microelectronics, 2nd edition, McGraw Hill, 1988.
2. P. Horowitz and W. Hill, The Art of Electronics, 2nd edition, Cambridge University Press, 1989.
3. A.S. Sedra and K.C. Smith, Microelectronic Circuits, Saunder's College Publishing, Edition IV
4. Paul R.Gray & Robert G.Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley, 3rd Edition McGraw Hill, 1992.

SIGNALS AND SYSTEMS

SEMESTER: FOURTH SEMESTER
COURSE CODE : ET403
L:T:P : 3:1:0, Credits:4

Module 1: Signals: Signals and their Examples; Signal classifications: continuous time and discrete time signals- Deterministic and non deterministic, periodic and non periodic, even and odd, energy and power signals; Elementary signals: unit step, unit impulse, unit ramp, the sinusoid, the complex exponential; Basic operations: Time shifting, time scaling, time reversal, amplitude scaling, signal addition, signal multiplication.

Module 2: Systems: Systems and their Examples; System classifications: continuous time and discrete time systems- static and dynamic, causal and non causal, linear and non linear, time invariant and time variant, stable and unstable, invertible and non invertible systems; Linear Time Invariant (LTI) systems and their properties.

Module 3: Fourier Series Representation Of Periodic Signals: Fourier series representation of periodic signals- Trigonometric Form, cosine form and exponential form; Fourier spectrum- amplitude and phase spectra; Properties of Fourier Series.

Module 4: LTI - Continuous Time Systems: Fourier transforms; magnitude and phase representation of CTFT; existence of Fourier transforms; CTFT of standard signals; Properties of CTFT; CTFT of signals; Inverse CTFT; system representation by differential equation; system analysis with CTFT.
Laplace transforms- unilateral and bilateral; Region of Convergence (ROC); existence of LT; unilateral LT of some commonly used signals; Properties and theorems of LT; Inverse LT; system representation by differential equation; System analysis with LT.

Module 5: Sampling: Sampling theorem; Nyquist rate; Effect of under sampling- Aliasing; Anti-Aliasing filter; Sampling techniques- Impulse sampling, Natural sampling, Flat Top sampling; Data reconstruction- Ideal reconstruction filter, Zero order hold, Transfer function of a zero order hold

Module 6: LTI - Discrete Time Systems: Z-Transformation; ZT of some commonly used sequences; ZT and ROC of finite duration sequences; Properties of ROC; Properties and theorems of ZT; Inverse ZT; system representation by difference equation; System analysis with ZT.

Text/ Reference:

1. A.V. Oppenheim, A.S. Willsky and I.T. Young: Signals and Systems, PHI
2. A.Anand Kumar: Signals and Systems, EEE
3. B. P. Lathi: Signal Processing and Linear Systems, Oxford University Press
4. Douglas K. Lindner: Introduction to Signals and Systems, McGraw-Hill International Edition
5. Simon Haykin, Barry van Veen: Signals and Systems, John Wiley and Sons (Asia) Private Limited

PROBABILITY AND RANDOM PROCESSES

SEMESTER: FOURTH SEMESTER
COURSE CODE : ET404
L:T:P : 2:1:0 , Credit:3

Module 1: Sets and set operations; Probability space; Conditional probability and Bayes theorem ; Combinatorial probability and sampling models;

Module 2: Discrete random variables, probability mass function, probability distribution functio n ; Continuous random variables, probability density function,probability distribution function: Bionomial, Poission, Geometric, Exponential, Gamma and Normal distribution and their moment generating functions.

Module 3:Joint distributions, functions of one and two random variables, moments of random variables;Conditional distribution, densities and moments; Characteristic functions of a random v ariable; Markov, Chebyshev and Chernoff bounds;

Module 4: Random sequences and modes of convergence (everywhere, almost everywhere, probability, distribution and mean square); Limit theorems; Strong and weak laws of large numb ers, central limit theorem.

Module 5: Random process. Stationary processes. Auto correlation and cross correlation functions of input and output, Ergodicity,Transmission of random process through LTI, Noises in communication system, Power spectral density.

Text/Reference Books:

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,'' Fo urth 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.

COMPUTER ARCHITECTURE AND ORGANIZATION

SEMESTER: FOURTH SEMESTER
COURSE CODE : ET406
L:T:P : 4:0:0, Credit:4

Module1 : The Computer System: Computer interconnection structure - Computer components Functions, interconnection structures. Performance of a computer, Memory organization- Internal and external memory - Overview of computer memory Systems, Semiconductor main memory, virtual memory concept, cache memory, Improving cache performance ,magnetic disc, magnetic tape, large storage memories. Operating System - Operating Systems Overview, Scheduling and memory management.

Module 2: The Central Processing Unit: Computer arithmetic, ALU, integer and floating point numbers representations and arithmetic. Instruction Sets - Machine instruction characteristics - types of operands and Operations, addressing modes – Instruction set architectures, CISC and RISC architectures, Super scalar Architectures.

Module 3: The Control Unit: Control Unit Operation - Micro Operations, Control of the CPU, hardware implementation. Micro programmed control - Sequencing and execution of Micro instructions, bit slice architecture, applications. Recent Trends in Computer Systems: Parallel organization - Multiprocessing, Vector Computation, Faulty tolerant Systems.

Module 4: I/O Organization: Accessing I/O devices, Input/output programming, Interrupts, Exception Handling, DMA, Buses, I/O interfaces-Serial port, Parallel port, PCI bus, SCSI bus, USB bus, Firewall and Infini band, I/O peripherals.

Text Books/ Reference:

1. Computer Organization and Design, by David A. Patterson and John L. Hennessy, Morgan 1997, Kauffmann.
2. Computer Architecture and Organization, 3rd Ed., by John P. Hayes, TMH.
1. Operating Systems Internals and Design Principles by William Stalling, Prentice Hall.
2. Computer Organization 5th Ed., by Carl Hamacher, Zvonko Vranesic, 2002, Safwat Zaky.
3. Mano M.M., Computer System Architecture, PHI (EEE).
4. Structured Computer Organization by A.S. Tanenbaum, 4th Ed., PHI. .

ELECTRICAL MACHINES

SEMESTER: FOURTH SEMESTER
COURSE CODE: PI 405
L:T:P : 3:1:0 , Credit:4

Module 1: **DC Generator**: Construction and principle of operation, armature winding, armature reaction and commutation, interpoles and compensating winding, E.M.F. equation, classification, characteristics and uses, losses and efficiencies, condition of maximum efficiency.

Module 2: D.C. motor: Principle of operation, classification, characteristics and uses, losses and efficiency, condition for maximum power output, starting and speed control.

Module 3: Transformer: Construction and core type, shell type and berry type transformers, classification, working principle, e.m.f. equation, phasor diagram, leakage reactance, equivalent circuits, voltage regulation, losses and efficiency, open circuit and short circuit tests, all day efficiency.

Module 4: Polly phase induction motor: Construction ,type of induction motor, principle of operation, equivalent circuit, torque equation, slip-toque curves, losses and efficiency, condition of maximum torque, no load and blocked rotor tests, methods of starting and speed control.

Module 5: Synchronous Machines: Construction, classification, working principle, armature winding and winding factors, e.m.f. equation, armature reaction, synchronous reaction and impedance, phasor diagram, open circuit and short circuit tests, voltage regulation by synchronous impedance method,
Synchronous motor- principle of operation-curve, vector diagram, starting methods, Hunting, Application of Synchronous converter.

Module 6: Single phase induction motor: Construction, Principle of operation on the basis of double revolving field theory, characteristics, types of starting methods

Module 7: Special Machines : Shades pole motor, universal motor, repulsion type motor, Hysteresis type motor, Stepper motor.

Texts

1. Stephen Chapman, Electric Machinery Fundamentals, McGraw-Hill, 4/e, 2003.
2. R. K. Rajput, Electrical Machines, 3/e, Laxmi Publications (P) Ltd., 2003.
3. Cotton,H., "Advanced Electrical Technology", CBS Publishers and Distributors, New Delhi, 1984.
4. Nagrath I.J. and Kothari, D.P., "Electrical Machines", TMH, New Delhi, 2001.
5. Yamayee,Z.A and Bala, JL, Electromechanical Energy Devices an Power Systems, John Wiley & Sons Inc., 1994

References

1. I. L. Kosow, Electrical Machinery and Transformers, 2/e, Prentice- Hall of India Pvt. Ltd., 2003.
2. B. S. Guru and H. R. Hiziroglu, Electrical Machinery and Transformers, 3/e, Oxford University Press, 2003

ANALOG ELECTRONICS LABORATORY

SEMESTER: FOURTH SEMESTER
COURSE CODE : ET402L
L:T:P : 0:0:2 ,Credit:1

Objectives:

The main objective of this course are:

- To learn Voltage gain and frequency response of RC coupled amplifier
- To learn Oscillators(e g. Hartly, Colpits, wein bridge oscillators)
- To learn power amplifiers(Class A,B, C)
- T0 learn differential amplifier

SIGNALS AND SYSTEMS LABORATORY

SEMESTER: FOURTH SEMESTER
COURSE CODE : ET403L
L:T:P : 0:0:2, Credit:1

Objectives: The main objectives of this course are:

- To Introduce students to MATLAB
- To study the continuous and discrete time signals using MATLAB
- To study the continuous and discrete time systems using MATLAB
- To study the Fourier series using MATLAB
- To study the Fourier transforms using MATLAB
- To study the Convolution of signals using MATLAB
- To study the Laplace transforms using MATLAB
- To study the Z-transforms using MATLAB
- To study the sampling using MATLAB

ELECTRICAL MACHINES LABORATORY

SEMESTER: FOURTH SEMESTER
COURSE CODE : PI405L
L:T:P : 0:0:2, Credit:1

Objectives: The main objectives of this course are:

To learn open circuit and Load characteristics of D.C shunt generator, Load characteristic of the D.C shunt / compound motor and speed reversal, Regenerative braking of D.C series motor, Methods of startin g and speed control of the 3-Phase induction motor, Parallel operation of 3phas e transformer, Synchronous motor V curves.

MINI PROJECT

SEMESTER: FOURTH SEMESTER
COURSE CODE : ET407L
L:T:P : 0:0:2 , Credits:2

The object of miniproject is to enable the student to take up preliminary study in the field of Ele ctronics & Telecommunication Engineering,either fully theoretical/practical or involving both th eoretical and practical work to be assigned by the Department on students in a group, under the guidance of a Supervisor.

The assignment to normally include:

- Working out a preliminary Approach to the Problem relating to the assigned topic;
- Conducting preliminary Analysis/Modelling/Simulation/Experiment/Design/Feasibility
- Preparing a Written Report in format on the project
- Final Presentation/viva before a Departmental Committee.