## Programme: Bachelor of Technology in Computer Science & Engineering
### Academic Year 2009-10 (Semester IV)

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## Programme: Bachelor of Technology in Electrical Engineering
### Academic Year 2009-10 (Semester III)

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## Programme: Bachelor of Technology in Mechanical Engineering
### Academic Year 2009-10 (Semester IV)

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Detailed Syllabi for B.Tech. fourth semester 2009-10

B.Tech. in Computer Science and Engineering

CS 204       ALGORITHMS            (3 0 0 6)

Pre-requisites: CS201, CS203

Texts:

References:

CS 222     COMPUTER ORGANIZATION AND ARCHITECTURE                  (3 0 0 6)

Pre-requisites: CS221

Texts:

References:

CS 223        HARDWARE LABORATORY                 ( 0 0 3 3)

Pre-requisites: CS221
Design of synchronous and asynchronous sequential circuits. Digital system design using RTL level functional blocks. Design of various controllers using hardwired and/or microprogrammed techniques. Design of a CPU using SSI/MSI/LSI level components: choice of word size, instruction format, I/O and memory interface, datapath, control unit. Introduction to hardware description languages such as VHDL, Verilog, etc.

References:
1. Analog and digital data manuals.

CS 241       SOFTWARE ENGINEERING        (2 0 3 7)

Pre-requisites: CS201
CS242      SYSTEMS PROGRAMMING LABORATORY          (0 1 3 5)

Pre-requisites: CS201

Linux administration: basic utilities, make, logging, backup, authentication; PERL programming; Unix system calls and shell programming; electronic mail administration; assemblers, linkers and loaders; assembly language programming; introduction to LaTeX.

References:

7. Linux Manuals.

Course common to CSE and EE

MA225   PROBABILITY THEORY AND RANDOM PROCESSES   [3-1-0-8]

Prerequisites: Nil

Axiomatic construction of the theory of probability, independence, conditional probability, and basic formulae, random variables, probability distributions, functions of random variables; Standard univariate discrete and continuous distributions and their properties, mathematical expectations, moments, moment generating function, characteristic functions; Random vectors, multivariate distributions, marginal and conditional distributions, conditional expectations; Modes of convergence of sequences of random variables, laws of large numbers, central limit theorems.

Definition and classification of random processes, discrete-time Markov chains, Poisson process, continuous-time Markov chains, renewal and semi-Markov processes, stationary processes, Gaussian process, Brownian motion, filtrations and martingales, stopping times and optimal stopping.

Texts:

B.Tech. in Electrical Engineering

EE 203 ANALOG INTEGRATED CIRCUITS 3-0-0-6

Frequency response of amplifiers: high frequency device models, frequency response, GBW, methods of short circuit and open circuit time constants, dominant pole approximation; Feedback amplifiers: basic feedback topologies and their properties, analysis of practical feedback amplifiers, stability; Power amplifiers: class A, B, AB, C, D, E stages, output stages, short circuit protection, power transistors and thermal design considerations; Differential amplifiers: DC and small signal analysis, CMRR, current mirrors, active load and cascode configurations, frequency response; case study: 741 op-amp – DC and small signal analysis, frequency response, frequency compensation, GBW, phase margin, slew rate, offsets; CMOS realizations: current source, sink and mirrors, differential amplifiers, multistage amplifiers; Signal generation and waveform shaping: sinusoidal oscillators- RC, LC, and crystal oscillators, Schmitt trigger; Analog subsystems: analog switches, voltage comparator, voltage regulator, switching regulator, bandgap reference voltage source, analog multiplier, filter approximations: Butterworth, Chebyshev and elliptic, first order and second order passive/active filter realizations.

Texts:

References:

EE 204 ANALOG CIRCUITS LABORATORY 0-0-3-3

Experiments using BJTs, FETs, op-amps and other integrated circuits: Multistage amplifiers, automatic gain controlled amplifiers, programmable gain amplifiers; frequency response of amplifiers; voltage regulator with short circuit protection; phase-locked loop; waveform generators; filters.

Text/References:

EE 230 PRINCIPLES OF COMMUNICATION 3-1-0-8

Basic blocks in a communication system: transmitter, channel and receiver; baseband and passband signals and their representations; concept of modulation and demodulation. Continuous wave (CW) modulation: amplitude modulation (AM) - double sideband (DSB), double sideband suppressed carrier (DSBSC), single sideband suppressed carrier (SSBSC) and vestigial sideband (VSB) modulation; angle modulation - phase modulation (PM) & frequency modulation (FM); narrow and wideband FM. Pulse Modulation: sampling process; pulse amplitude modulation (PAM); pulse width modulation (PWM); pulse position modulation (PPM); pulse code modulation (PCM); line coding; differential pulse code modulation; delta modulation; adaptive delta modulation. Noise in CW and pulse modulation systems: Receiver model; signal to noise ratio (SNR); noise figure; noise temperature; noise in DSB-SC, SSB, AM & FM receivers; pre-emphasis and de-emphasis, noise consideration in PAM and PCM systems. Basic digital modulation schemes: Phase shift keying (PSK), amplitude shift keying (ASK), frequency shift keying (FSK) and Quadrature amplitude modulation (QAM); coherent demodulation and detection; probability of error in PSK, ASK, FSK & QAM schemes. Multiplexing schemes: frequency division multiplexing; time division multiplexing.

Texts:

References:

EE 280 ELECTRICAL MACHINES 3-0-0-6

Magnetic circuits and transformer including 3-phase transformers; modeling of D.C. machines; phasor diagram of cylindrical rotor and salient pole machines- electromagnetic and reluctance torque, response under short circuit conditions; modeling of induction machines- derivation of equivalent circuits, dynamics under load change, speed reversal and braking, unbalanced and asymmetrical operation; single phase induction motor and applications in domestic appliances; modeling of synchronous machines – equivalent circuit, d-q transformations, short circuit studies in synchronous machines; variable reluctance, permanent magnet, stepper motors and their applications.

Texts:

References:

EE 281 ELECTRICAL MACHINES LABORATORY 0-0-3-3

Open circuit and short circuit tests of single phase transformer, three phase transformer connections, open circuit test and load characteristics of DC generator, speed control and output characteristics of DC motor, no load, blocked rotor and load tests on induction motor, open circuit and short circuit tests of an alternator.

Text/References:
ME202  ENGINEERING MATERIALS  (3 0 0 6)

Pre-requisites: Nil

Crystal systems and lattices. Crystallography, crystals and types, miller indices for directions and planes, voids in crystals, packing density in crystals.


Phase diagrams: Principles and various types of phase diagrams. Iron carbon phase diagrams.


Hot working and cold working of metals: recovery, re-crystallization and grain growth. Fracture, Fatigue and creep phenomenon in metallic materials. General classifications, properties and applications of alloy steels, tool steels, stainless steels, cast irons.

Non ferrous materials like copper base alloys, aluminium base alloys, Nickel base alloys, etc.

Miscellaneous materials viz: composites, ceramics, etc.

Texts and References:

ME-203  ADVANCED SOLID MECHANICS  (2-1-0-6)


Texts/Reference:
ME206                FLUID MECHANICS-II                           (2 1 0 6)

Pre-requisites: ME204 Fluid Mechanics-I

Review: Viscous flow and boundary layer theory, flow separation, turbulence.
Compressible flow:
The speed of sound; Adiabatic and isentropic steady flow - Mach-number relations, Isentropic flow with area changes;
Normal-shock wave - Rankine-Hugoniot relations; Mach waves, oblique shock wave, Prandtl Meyer expansion waves;
Performance of nozzles; Fanno and Rayleigh flow.
Fluid Machinery:
Euler-equation for turbo-machines; Turbines: Impulse turbine- Pelton wheel; Reaction turbine- Francis turbine, propeller
turbine; Pumps: Centrifugal pump; Cavitation; Net positive suction head (NPSH); Role of dimensional analysis and
similitude; Performance parameters and characteristics of pumps and turbines; Positive displacement pumps.

Texts and References

ME210     WORKSHOP II          (0 0 6 6)

Pre-requisites: Nil

Introduction to moulding and foundry practices
Introduction to machine tools and machining processes; types of cutting tools; selection of machining process parameters;
machining operations on lathe, shaping, milling, drilling, grinding machines.
Modern manufacturing trends: CNC and CAM; Introduction to gas and arc welding processes

Texts:

ME-212   MECHANICAL ENGINEERING LABORATORY – I  (0 0 4 4)

Strength of materials: Tensile testing of steel, hardness, torsion, and impact testing;
Fluid Mechanics and hydraulics: Flow through restrictive passages like orifice, venturi, weirs and notches, head losses in piping systems;
Data acquisition: Using data acquisition systems, programming a virtual instrument using standard interfaces.
HSS Electives

B.Tech Elective in Economics

HS 202  INTRODUCTORY MACROECONOMICS  3 0 0 6


Text
1. P. A. Samuelson and W. Nordhaus, Economics, Tata M.Hill, 2005

References
1. A. B. Abel, B.S. Bernanke, Macroeconomics, Addison Wesley, 2000

B. Tech Elective in English

HS211  LITERATURE: VOICES AND CULTURES  3-0-0-6


Text
1. Charlotte Bronte, Jane Eyre, Macmillan India, 2000
6. Phillis Wheatley, On Being Brought From Africa to America. (Phillis Wheatley, Poems on Various Subjects, Religious and Moral (London: by A. Bell, for Cox and Berry, Boston, 1773): 18)
7. A. Ruth, A Black Woman, Nothing Else, Author’s Den, 2002

(The poems mentioned shall be provided in the class)

Reference
1. Meenakshi Mukherjee, Elusive Terrain: Culture and Literary Memory, OUP, New Delhi, 2008
2. Malashri Lai, Signifying the Self – Women and Literature, Macmillan India, New Delhi, 2004
3. Sachchidanand Mohanty, Gender and Cultural Identity, Orient Black Swan, New Delhi, 2008
5. N Krishnaswamy, Contemporary Literary Theory, Macmillan, New Delhi, 2005
B. Tech Elective in Linguistics

HS 222 LANGUAGE, HUMAN MIND, AND INDIAN SOCIETY 3-0-0-6

Language: Form and function (Competence vs. Performance), Language as a rule-governed system, Language constitutive of being human; Languages of India: Language families (Genealogical classification of languages), India as a linguistic Area; Human mind: Cognitive language faculty, Biological foundations of language, Language acquisition, Human and non-human systems of communication, Construction of knowledge, Language processing, comprehension and production, Bilingualism and cognitive growth; Indian Society: Multilingualism vs. Bilingualism, India as a multilingual nation, Identities and language, Implications for pedagogy (Multilingual approaches to education), Language and dialect, Politics of language in India

Texts

N. Chomsky, Language and Mind, Cambridge University Press, 2006
V. Evans and M.C. Green, Cognitive linguistics: an introduction, Edinburgh University Press, 2006

References:

N. Chomsky, New horizons in the study of language and mind Cambridge University Press, 2000
W. Croft and D. Alan Cruse, Cognitive linguistics Cambridge University Press, 2004

B. Tech Elective in Linguistics

HS 223 COGNITION: LANGUAGE AND COMPUTATION 3-0-0-3


Texts

N. Chomsky, Knowledge of language: its nature, origin, and use Convergence Greenwood Publishing Group, 1986
W. Croft and D.A. Cruse, Cognitive linguistics, Cambridge University Press, 2004

References

J. Friedenberg and G. Silverman, Cognitive Science: An Introduction to the Study of Mind, SAGE, 2005
Science Elective

MA-251  OPTIMIZATION TECHNIQUES  (3-0-0-6)


Texts

References

MA214  INTRODUCTION TO COMPUTATIONAL TOPOLOGY  3-0-0- 6

1. Introduction and general notions of point set topology: Open and Closed Sets, Neighbourhoods, Connectedness and Compactness, Separation, Continuity.
3. Combinatorial Techniques: Simplicial complexes, and simplicial maps, triangulations, Euler characteristics, Maps on surfaces.
6. Topics in Geometry: Delauny triangulations, Voronoi diagrams, Morse functions

Textbooks:

Reference Books:
5. R. Messer and P. Straffin, Topology Now, MAA, 2006

Text:

Reference:
INTRODUCTION TO NUMERICAL METHODS (3 - 0 - 0 - 6)

Number Representation and Errors: Numerical Errors; Floating Point Representation; Finite Single and Double Precision Differences; Machine Epsilon; Significant Digits.


Numerical Methods for Solving System of Linear Equations: Norms; Condition Numbers, Forward Gaussian Elimination and Backward Substitution; Gauss-Jordan Elimination; FGE with Partial Pivoting and Row Scaling; LU Decomposition; Iterative Methods: Jacobi, Gauss Siedal; Power method and QR method for Eigen Value and Eigen vector.

Interpolation and Curve Fitting: Introduction to Interpolation; Calculus of Finite Differences; Finite Difference and Divided Difference Tables; Newton-Gregory Polynomial Form; Lagrange Polynomial Interpolation; Theoretical Errors in Interpolation; Spline Interpolation; Approximation by Least Square Method.


Exposure to software package MATLAB.

Texts


References


MA212    Algebra and Number Theory        (3-0-0-6)

Algebra: Semigroups, groups, subgroups, normal subgroups, homomorphisms, quotient groups, isomorphisms. Examples: group of integers modulo m, permutation groups, cyclic groups, dihedral groups, matrix groups. Sylow's theorems and applications. Basic properties of rings, units, ideals, homomorphisms, quotient rings, prime and maximal ideals, fields of fractions, Euclidean domains, principal ideal domains and unique factorization domains, polynomial rings. Finite field extensions and roots of polynomials, finite fields.

Number Theory: Divisibility, primes, fundamental theorem of arithmetic. Congruences, solution of congruences, Euler's Theorem, Fermat's Little Theorem, Wilson's Theorem, Chinese remainder theorem, primitive roots and power residues. Quadratic residues, quadratic reciprocity. Diophantine equations, equations \( ax + by = c, x^2 + y^2 = z^2 \). Simple continued fractions: finite, infinite and periodic, approximation to irrational numbers, Hurwitz's theorem, Pell's equation. Partition functions: Formal power series, generating functions and Euler's identity, Euler's theorem, Jacoby's theorem, congruence properties of \( p(n) \). Arithmetical functions: \( \phi(n), \mu(n), d(n), \sigma(n) \). A particular Dirichlet series for Riemann Zeta Function.

Texts:

References:

PH201       Optics & Lasers      (3-0-0-6)

Pre-requisites: Nil


Texts:

PH203    Vacuum Science and Techniques    (3-0-0-6)

Pre-requisites: Nil


Introduction to Deposition, Anti Reflection (AR) Coatings, Mono-dimensionally modulated (MDM) Filters, Vacuum Coatings, High reflectors, e-Beam deposition systems, Film Stoichiometry, Sputtering, Itching and Lithography, Chemical Vapour deposition and Pulse Laser deposition, Mass Flow control, Reactive sputtering, Film growth control.

Text Book:

References: