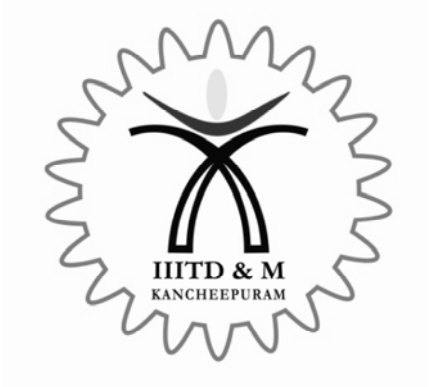
CURRICULUM

B. Tech – Computer Engineering
[2009 Batch onwards]



Indian Institute of Information Technology
Design & Manufacturing (IIITD&M), Kancheepuram

July 2009

B. TECH – COMPUTER ENGINEERING

Semester 1

Course No	*Course Name*	*L*	*T*	*P*	*C*	*Cat*
ELE 101	Basic Electrical & Electronics Engineering	3	0	0	3	BEC
MAT 101	Calculus	3	0	0	3	SMA
COM 102	Computational Engineering	3	0	0	3	BEC
COM 103	Discrete Structures for Computer Science	3	1	0	4	PMC
PHY 105	Mechanics and Wave	3	0	0	3	SPH
COM 102P	Computational Engineering Practice	0	0	3	2	BEC
INT 103	Electronics Engineering Practice	0	0	3	2	BEC
PHY 105P	Mechanics and Wave Practice	0	0	3	2	SPH
	Total	15	1	9	22	

Semester 2

Course No	*Course Name*	*L*	*T*	*P*	*C*	*Cat*
ELE 102	Digital Logic Design	3	0	0	3	PMC
MAT 103	ODE & PDE's	3	0	0	3	SMA
COM 104	Object Oriented Programming	3	0	0	3	PMC
INT 104	English for Communication	2	0	0	2	HSS
PHY 106	Electromag. and Quantum Mech.	3	0	0	3	SPH
ELE 102P	Digital Logic Design Practice	0	0	3	2	PMC
COM 104P	Object Oriented Programming Practice	0	0	3	2	PMC
MEC 105	Engineering Drawing	1	0	3	3	BEC
PHY 106P	Electromag. and Quantum Mech. Practic	0	0	3	2	SPH
	Total	15	0	12	23	

Semester 3

Course No	*Course Name*	*L*	*T*	*P*	*C*	*Cat*
COM 201	Concepts in Computer Engineering	2	0	0	2	PMC
INT 201	Concepts in Engineering Design	3	0	0	3	BEC
MAT 201	Linear Algebra & Optimization	3	0	0	3	SMA
COM 202	Data Structures & Algorithms	3	1	0	4	PMC
ELE 209	Signals and Linear Systems	3	0	0	3	PMC
COM 202P	Data Structures & Algorithms Practice	0	0	6	4	PMC
ELE 209P	Signals and Linear Systems Practice	0	0	3	2	PMC
	Total	14	1	9	21	

Semester 4

Course No	*Course Name*	*L*	*T*	*P*	*C*	*Cat*
COM 203	Introduction to Computer Organization	3	0	0	3	PMC
MAT 203	Probability and Statistics	3	0	0	3	SMA
COM 204	Compiler Design	3	0	0	3	PMC
ELE 215	Electronics Circuits	3	0	0	3	PMC
COM 203P	Introduction to Computer Organization Practice	0	0	6	4	PMC
COM 204P	Compiler Design Practice	0	0	3	2	PMC
ELE 215P	Electronics Circuits Practice	0	0	3	2	PMC
	Total	12	0	12	20	

Semester 5

Course No	*Course Name*	*L*	*T*	*P*	*C*	*Cat*
COM 301	Operating Systems	3	0	0	3	PMC
COM 302	Computer Networks	3	0	0	3	PMC
INT 302	Ecology and Environment	2	0	0	2	HSS
ELE 309	Analog and Digt. Comun. & Signal Proces.	3	0	0	3	PMC
COM 301P	Operating Systems Practice	0	0	3	2	PMC
COM 302P	Computer Networks Practice	0	0	3	2	PMC
COM 303	Scripting Languages - Perl & Python	1	0	3	3	PMC
ELE 309P	Analog and Digt. Comun. & Signal Proces. Practice	0	0	3	2	PMC
	Total	12	0	12	20	

Semester 6

Course No	*Course Name*	*L*	*T*	*P*	*C*	*Cat*
COM 304	Computer Architecture	3	0	0	3	PMC
COM 305	Software Engineering	4	0	0	4	PMC
ELE 311	VLSI Design	3	0	0	3	PMC
INT 303	Product Design Practice	0	0	3	2	PMC
COM 304P	Computer Architecture Practice	0	0	6	4	PMC
COM 305P	Software Engineering Practice	0	0	3	2	PMC
ELE 311P	VLSI Design Practice	0	0	3	2	PMC
	Elective 1	3	0	0	3	ELE
	Total	13	0	15	23	

Semester 7

Course No	*Course Name*	*L*	*T*	*P*	*C*	*Cat*
COM 401	Simulation & Modeling	3	0	0	3	PMC
ELE 401	Embedded Systems	3	0	0	3	PMC
MAN 401	Professional Ethics	2	0	0	2	HSS
COM 401P	Simulation & Modeling Practice	0	0	3	2	PMC
ELE 401P	Embedded Systems Practice	0	0	3	2	PMC
INT 401	Mini Project	0	0	3	2	PMP
	Elective 2	3	0	0	3	ELE
	Elective 3	3	0	0	3	ELE
	Total	14	0	9	20	

Semester 8

Course No	*Course Name*	*L*	*T*	*P*	*C*	*Cat*
COM 402	Human Computer Interaction	3	0	0	3	PMC
MAN 404	Finance Management	3	0	0	3	HSS
COM 402P	Human Computer Interaction Practice	0	0	3	2	PMC
INT 402	Project	0	0	21	14	PMP
	Elective 4	3	0	0	3	ELE
	Total	9	0	24	25	

Compulsory Activities*: Summer Internship (2nd or 3rd year vacation), Industrial Lecture, NSS/NCC/Yoga*

SMA	SPH	BEC	PMC	PMP	ELE	HSS	**Total**
12	10	16	97	19	12	9	**174**

COURSE CONTENTS
B TECH COMPUTER ENGINEERING

(Numbers in the parenthesis indicate L T P C)

ELE 101 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING (3 0 0 3)

DC circuits, Independent and dependent sources, Mesh and nodal analysis
Step response and transients, RC, RL and RLC circuits
Sinusoidal AC sources steady state analysis, Phasor diagram
Power in single and 3–phase AC circuits, star–delta transformation
Magnetic circuit – Magnetic fields, currents, magnetic flux density, inductance, Faraday's Laws– Examples
Semiconductors, P–N Diodes, rectifiers and filters, clipping and clamping circuits
Bipolar and field effect transistors and power devices

Text Books:

1. Hughes Edward, Electrical & Electronic Technology, Pearson Education, 2007.
2. Hayt. W. W, Kemmerly. J.E, and Durbin. S.M, Engineering Circuits Analysis, Tata McGraw Hill, 2008.

References:

1. Hambley. A, Electrical Engineering Principles and Applications: International Version, Pearson Education, 4 Edn, 2007.
2. Alexander.C. K. & Mathew. N. O. Sadiku, Fundamentals of Electrical circuits, Tata McGraw Hill, 2008.

MAT 101 CALCULUS (3 0 0 3)

Sequences and series
Definite integral as the limit of sum – Mean value theorem – Fundamental theorem of integral calculus and its applications
Functions of several variables – Geometric representation partial and total increments
Partial derivatives – Derivatives of composite functions
Directional derivatives – Gradient, divergence and curl – Taylor formula – Lagrange multipliers – Optimization problems
Multiple integrals – Evaluation of line and surface integrals
Greens, Gauss, and Stokes theorems

Text Books:

1. Piskunov. N, Differential and Integral Calculus, Vol. I & II, Mir. Publishers, 1981.
2. Kreyszig. E, Advanced Engineering Mathematics, Wiley Eastern 2007.

Reference:

1. Thomas. G.B, and Finney R.L, Calculus, Person Education, 2007.

COM 102 COMPUTATIONAL ENGINEERING (3 0 0 3)

Introduction to computer science – Computer organization basics – Problem solving strategies – Higher level languages – Program design and development – Phases of program development
Basic programming constructs in C – Data types in C – Input output statements – Operators

control structures in C – Types – Sequential, selection and repetition – Variants of selection and repetition – Single/Double and multiple selection structures – Types of repetition structures – for, do–while and while – break and continue

Functions in C – Function declaration, definition – Built and user defined functions – Storage classes and scope – Recursive functions – Arrays in C – Passing arrays to functions multidimensional arrays – String manipulations – Library support – Introduction to pointers in C – Operators – Passing arguments by reference – Pointer expressions and arithmetic – Pointers & arrays relationship –Function pointers

Formatted input output – Aggregated data types – Structures and unions– Definition and member access – File processing in C – Sequential and random access file creation and read – Dynamic memory allocation – Variable length argument lists – Command line arguments – Separating interfaces from implementation

Non linear equations – Regular falsi – Bisection, Newton raphson methods

Text Book:

1. Deitel P.J, and Deitel H.M, C: How to Program, Prentice Hall, 2007.

References:

1. Kernighan, Ritchie D, The C Programming Language, Prentice Hall, 2 Edn, 1988.
2. Chapra S.C and Canale R.P, Numerical Methods for Engineers, McGraw Hill, 2006.

COE 103 DISCRETE STRUCTURES FOR COMPUTER SCIENCE (3 1 0 4)

Mathematical Reasoning – Propositions – Predicates – Logical operators – Logical inferences – Methods of proof

Primitives and paradoxes of set theory – Relations between sets – Operation on sets – Induction – Inductive definition of sets – Recursive procedures – Inductive proofs

Binary relation and digraphs – Special properties of relations – Composition of relations – Closure operations on relations

Basic properties of functions – Inductively defined functions – Special classes of functions – Inverse functions – One sided functions

Basic counting techniques – Decision trees – Asymptotic behavior of functions – Recurrence systems – Analysis of algorithms

Finite and Infinite sets – Countable and uncountable sets – Cardinal numbers

Graph Theory – Graphs – Sub graphs – Isomorphic and Homeomorphic graphs – Paths – Connectivity – Bridges of Konisberg – Labeled and Weighted Graphs – Complete, Regular and Bipartite Graphs – Planar Graphs – Coloring – Representation of graph in computer memory

Text Books:

1. Kenneth H Rosen, Discrete Mathematics and its Applications, McGraw Hill, 6 Edn, 2007.

References:

1. Stanat D.F & McAllister D.F, Discrete Mathematics in Computer Science, Prentice Hall, 1977.
2. Graham R.L , Knuth D.E and Patashnik O, Concrete Mathematics, Addison Wesley, 2 Edn, 1994.
3. Busby, Kolman and Ross, Discrete Mathematical Structures, PHI, 6 Edn, 2008.
4. Seymour Lipschutz, Marc Lipson, Schaum's Outline of Discrete Mathematics, 3 Edn, 2007.

PHY 105 MECHANICS AND WAVES (3 0 0 3)

Vectors - an introduction, use of vectors in practical mechanics, Unit vectors in spherical and cylindrical polar co-ordinates, Concept of vector fields, Gradient of a scalar field, Equipotentials, flux, divergence of a vector, Gauss's theorem

Physical applications of Gauss's law—in gravitation, electrostatics and magnetostatics, Continuity equations and conservation principles for matter, energy and electrical charge, Curl –rotational and irrotational vector fields, Stoke's theorem— physical applications

Oscillatory motion—simple harmonic motion, damped oscillation and forced oscillation, Degrees of freedom, Constraints, Generalized co-ordinate, D'Alambert principle, Lagrangian Lagranges' equation of motion—examples, Hamiltonian—Hamilton's equation of motion — examples

Motion in a central force -- reduction of two-body system to one body system, and conservation of angular momentum, Application to planetary motions (Kepler's law)

Classification of waves -- optical and acoustic wave, Superposition -- phase velocity, group velocity, group index, dispersion, Interference phenomena and Diffraction

Polarization, Acoustooptic effects and devices -- Raman-Nath diffraction, Bragg diffraction, Acoustooptic modulator

Text Books:

1. Kittle. C, Mechanics – Berkley Physics Course, Vol. 1, Tata McGraw Hill, 2008.
2. Hecht. E, Optics, Cambridge University Press, 2002.

References:

1. Crawford. F, Waves – Berkley Physics Course, Vol. 03, Tata McGraw Hill, 2008.
2. Ghatak. A and Thyagarajan. K, Optical Electronics, Cambridge University Press, 2002.
3. Davis. D, Classical Mechanics, Academic Press**,** 1986**.**

COM 102P COMPUTATIONAL ENGINEERING PRACTICE (0 0 3 2)

Learning operating system commands - editors – compilation - Assignments on using the operating system and open office suite - Programs involving output statements, input statements and expression evaluation - Assignments covering If-then-else statement iterative statements - Programs using arrays and functions based approach – Recursion sorting (bubble Sort) on a set of integers and a set of strings and linear search over a set of integers and a set of strings - structures and files in C - Implementation of a grading system computation of e^x, sin(x) and cos(x) - Bisection and Newton Raphson methods in C.

INT 103 ELECTRONICS ENGINEERING PRACTICE (0 0 3 2)

Construction, working and application of workshop tools, Electrical and Electronics Symbols - Wires and Cables, their gauge and their rating - Domestic / Industrial Electrical Accessories - Faults and Remedies in Domestic installation - Electric Shocks and artificial respiration - Indian Electricity rules - Familiarization of electronic components color code, meters, power supplies, function generators and CRO - Bread board assembling of simple circuits - Study of solders, tools, heat sink - Soldering of components and circuits - Estimation and costing of soldering PCB - Domestic wiring practice - Estimation and costing of domestic and industrial wiring - Domestic appliances – Wiring PCB, control, Identification of fault: Electronic Ballast, fan regulator, inverter, UPS etc - Assembling simple electronic products

References:

1. Uppal S. L., Electrical Wiring & Estimating, 5 Edn, Khanna Publishers, 2003.
2. Clyde F. Coombs, Printed circuits handbook, 6 Edn, McGraw Hill,2007.
3. John H. Watt, Terrell Croft: American Electricians' Handbook: A Reference Book for the Practical Electrical Man, Tata McGraw Hill, 2002.

PHY 105P MECHANICS AND WAVES PRACTICE (0 0 3 2)

Practice session include determination of refractive index of the material of the prism, wavelength of a monochromatic light by forming Newton's ring, wavelength of the laser beam using stainless steel scale as diffraction grating, wavelength of the monochromatic light beam by Fresnel's bi-prism method, wavelength of the spectral lines of Mercury spectrum using transmission grating, width of the slit using Fraunhoffer diffraction pattern with the help of laser, numerical aperture and modal field diameter of a single mode fiber, diameter of a thin wire, couple per unit twist of suspension wire using torsional pendulum and value of g using angular pendulum.

ELE 102 DIGITAL LOGIC DESIGN (3 0 0 3)

Representation of Data: Number systems and codes, Representation of unsigned and signed integers, Floating–point representation of real numbers, Representation of characters
Switching Theory: Boolean algebra, Switching functions, Truth Tables and Algebraic forms, Simplification of Boolean Expressions: Algebraic methods, Canonical forms, Minimization of functions using Karnaugh maps and Quine – Mc Clusky method
Logic gates, Realization of functions using logic gates, Combinational Logic Circuits, Arithmetic circuits – Integer adder/subtractor, Integer multiplier; Modular combinational logic elements – Decoders, Encoders, Priority encoders, Multiplexers and Demultiplexers
Sequential Circuits: Latches, Flip–flops, Characteristic table, Characteristic equation and Excitation table, Shift registers, Counters, Random access memories
Analysis and Design of Synchronous Sequential Circuits: Moore machine and Mealy machine; State table and State transition diagram; Top down approach to digital system design, simple design examples
Design of Arithmetic Circuits using Sequential Logic: Integer division circuits, Floating–point adder/subtractor, multiplier; Design of control circuit; Data and Control Flow in a Computer System, Introduction to Microprocessors
ADC, DAC, Monostable and astable multivibrators, Applications of Digital ICs: 555 timers, V to f converters; Introduction to all logic families, Noise in Digital Systems.

Text Books:

1. Mano M., "Digital Design", Prentice Hall, 1979.

Reference :

1. Givone D.D., "Digital Principles and Design", Tata McGraw Hill, 2005.
2. Wakerly J.F., "Digital Design Principles and Practices", Practice Hall, 2007.
3. Tocci R.J., "Digital Systems Principles and Applications", Prentice Hall, India, 2008.

MAT 103 ODEs & PDEs (3 0 0 3)

Linear ordinary differential equations with constant, coefficients, method of variation of parameters – Linear systems of ordinary differential equations
Infinite series, tests for convergence, alternating series, functional series, uniform convergence
Power series solution of ordinary differential equations and Singular points
Bessel and Legendre differential equations; properties of Bessel functions and Legendre polynomials
Fourier series
Laplace transforms elementary properties of Laplace transforms, inversion by partial fractions, convolution theorem and its applications to ordinary differential equations
Introduction to partial differential equations, wave equation, heat equation, diffusion equation, Green functions and its applications

Text Books:

1. Simmons. G.F, Differential Equations, Tata McGraw Hill, 2003.
2. Kreyszig. E, Advanced Engineering Mathematics, Wiley, 2007.

References:

1. William. E. Boyce and R. C. Diprima, Elementary Differential Equations and Boundary Value Problems, John Wiley, 8 Edn, 2004.
2. Sneddon. I, Elements of Partial Differential Equations, Tata McGraw Hill, 1972.
3. Ross. L.S, Differential Equations, Wiley, 2007.

COM 104 OBJECT ORIENTED PROGRAMMING (3 0 0 3)

Object oriented programming – Features – Introduction to classes and objects – Encapsulation scope resolution – Constructors – Destructors
Composition – Friend functions/classes – this pointer – Dynamic memory management – Operator overloading
Reusability – Inheritance – Base & derived classes – Protected members – Constructors – Destructors in derived classes – public/private/protected inheritance – Polymorphism – Virtual functions
Templates – Function templates – Overloading – Class templates – Streams – Stream input output
Stream format states – Manipulators – Exception handling – Re–throwing exceptions – specifications–Stack unwinding – Constructors/destructors and exception handling – Inheritance
Basic data structures – Lists – Stacks – Queues (array based implementation) – Sorting – Insertion/selection sort – Searching – Binary Search

Text Books:

1. Deitel P.J, Deitel H.M, C++ How To Program, 6 Edn, Prentice Hall, 2004.

References:

1. Herbet Schildt, Teach Yourself C++, 3 Edn, Tata McGraw Hill, 2001.
2. Grady Booch, Object Oriented Analysis & Design with Applications, 2 Edn, Addison Wesley, 1993.

INT 104 ENGLISH FOR COMMUNICATION (2 0 0 2)

Structure of english – Remedial grammar
Reading – Comprehension and analysis
Writing – Memos, letters, reports, reviews
Study Skills – Dictionary, thesaurus & reference
Note Taking – Listening comprehension
Presentation Skills – Oral presentation, presentation aid
Presentation of Ideas – Organization, articulation and correctness – writing – Speaking Skills

References:

1. Sharon. J. Gerson and Steven M. Gerson, Technical Writing – Process and Product, Pearson Education Pvt. Ltd., 2004.
2. Wood, A Remedial Grammar of English, Macmillan India, 1969.
3. Thomson and Martinet , Practical English Grammar, Oxford University Press, 1986.
4. Allen and Stannard. W, Living English Structure, Orient Longman, 1997.
5. Leech, Geoffrey & Jan Svartvik, A Communicative Grammar of English,Longman, 2003.

PHY 106 ELECTROMAGNETICS AND QUANTUM MECHANNICS (3 0 0 3)

Electrostatic potential and field due to discrete and continuous charge distributions, Dipole and quadrupole moments, Energy stored in a charge distribution, Energy density in an electric field

Dielectric polarization, Conductors and capacitors, Electric displacement vector, dielectric susceptibility, Biot-Savart's law and Ampere's law in magnetostatics

Magnetic induction due to configurations of current-carrying conductors, Magnetization and surface currents, Energy density in a magnetic field

Magnetic permeability and susceptibility, Time-varying fields, Faradays' law of electromagnetic induction, Self and mutual inductance

Displacement current, Maxwell's equations in free space and in linear media

Scalar and vector potentials, gauges, Plane electromagnetic waves—reflection and refraction, Electromagnetic energy density, Poynting vector

Particles and waves, Dual nature of electromagnetic radiation, Compton scattering, De-Broglie waves, Davisson–Germer experiment, interpretation of wave function, operator, eigenvalue/ eigenfunction, expectation value of observable.

Uncertainty principle, Time dependent and time independent Schrödinger's equation, Bound state problem, formation of energy band in solid. Barrier penetration, Scanning Tunneling Microscope

Text Books:

1. Grifiths. D. J, Introduction to Electrodynamics, Prentice Hall, 2007.
2. Gasiorowicz. S, Quantum Mechanics, John Wiley & Sons, 2003.

References:

1. Purcell. E.M, Electricity and Magnetism – Berkley Physics Course, Vol. 2, Tata McGraw Hill, 2008.
2. Feynman. R.P, Leighton. R.B, Sands. M, The Feynman Lectures on Physics, Narosa Publishing House, Vol. II & III, 2008.
3. Ajoy Ghatak, Basic Quantum Mechanics, Macmilan Publishers India, 2002.

4. Wichmann. E. H, Quantum Physics – Berkley Physics Course, Vol. 04, Tata McGraw Hill, 2008.

ELE 102P DIGITAL LOGIC DESIGN PRACTICE (0 0 3 2)

Design and implementation of logic functions, combinational circuits (code converters, half & full adders, comparator, ripple carry adder, priority multiplexer) – Design of sequential circuits such as master-slave JK flip-flop, bidirectional shift register, bidirectional counter, sequence generator – Design of control circuit for general purpose register having parallel-in, parallel-out, serial-in, serial-out, shift left/right, rotate left/right, clear, increment, decrement facilities.

COM 104P OBJECT ORIENTED PROGRAMMING PRACTICE (0 0 3 2)

Complex number arithmetic – addition, subtraction and multiplication operations – Data encapsulation - Rational numbers arithmetic using encapsulation – fractions to be output in reduced form- Employee payroll generation – Encapsulation – Composition – Employee – Date class - Operator overloading – Complex number & rational number class – Overload +,– and * operators - Polynomial arithmetic using operator overloading - University community hierarchy – Inheritance - Virtual functions – Shape hierarchy – Volume and area – Polymorphic behavior - Exception handling – Divide by 0, arrays out of bounds, memory exhaustion exception - Insertion and selection sort on (i) integer array (ii) strings - binary search over (i) integer array (ii) strings - array based implementation of list, stack and queue and operations - function and class templates based linear ADT and operations

INT 105 ENGINEERING DRAWING (1 0 3 3)

Introduction to engineering drawing and Computer Aided Drafting (CAD) – Dimensioning principles and conventional representations
Construction of plane curves
Coordinate systems – Projection of points, lines and planes
Projection of right regular solids – Section of solids
Systems of projections – Principles, conventions and applications of orthographic projection
Principles, conventions and applications of isometric projection
Intersection of solids – Development of surfaces

Text Books:

1. Narayana. K.L, and Kannaiah. P, Engineering Drawing, Charaotar Publ House, 1998.
2. Bhatt. N.D, Engineering Drawing, New Age International, 2007.

References:

1. Gopalakrishnan. K.R, Engineering Drawing, Subash Stores, 2002.
2. Natarajan. K.V, A text book of Engineering Drawing, Classic Prints, 2000.

PHY 106P ELECTROMAGNETICS AND QUANTUM MECHANNICS PRACTICE (0 0 3 2)

Practice session includes determination of the dielectric constant of a liquid and a solid from capacitance measurement using digital LCR, characteristics of PN Junction Diode, Plotting the graph showing the variation of magnetic field with distance along the axis of a circular coil carrying current, determination of the energy band gap of the material of the

thermistor, value of Planck's constant by photovoltaic effect, characteristics of a PNP junction transistor in common emitter configuration, Young's modulus of a half meter wooden scale using a strain gauge, thermal conductivity of a good conductor by Forbes' method, verification of the Stefan's Law, use the CRO for voltage and frequency measurements and study the waveshapes/Lissajous figures.

COM 201 CONCEPTS IN COMPUTER ENGINEERING (2 0 0 2)

Illustrations – Developments in computer engineering – hardware and software systems
Brief introduction to embedded systems – Human computer interaction–
Introduction to systems involving computer communications and safety critical systems, sensitive nature systems– Issues involved in electronics, software, human computer interface systems– Use of tools, systems, and the engineering dimension– Case studies from field situations and real time products will be used to illustrate the concepts

References:

1. Arnold S. Berger, Berger, Embedded Systems Design, Elsevier Science & Technology Books, 2001.
2. David E Simmons, An Embedded Software Primer, Addison Wesley, 1999.
3. Neil Storey, Safety Critical Computer Systems, Addison Wesley, 1996.
4. Irv Englander, The Architecture of Computer Hardware and Systems Software: An Information Technology Approach, 3 Edn, Wiley, 2003.

INT 201 CONCEPTS IN ENGINEERING DESIGN (3 0 0 3)

The purpose of this course is to introduce to the undergraduate student the fundamental principles of Engineering Design which is very important and relevant in the context of to-days engineering professionals. The course will be generic to all engineering disciplines and will not require specialized preparation or pre-requisites in any of the individual engineering disciplines. Case studies from field situations and real products will be used to illustrate these principles. Software support will be provided for self-learning by students.

This course introduces the students to the following aspects of design.
Philosophy of engineering design,
Engineering design process
Identification and analysis of needs
Organization of design concept and design methods
Considerations in engineering design
Design decisions and development of design
Case studies

Text Books:

1. Otto. K and Wood, K, Product Design, Pearson Education, 2001.
2. Pahl. G and Beitz. G, Engineering Design, Springer, 1996.

Reference:

1. Ullman. D. G, The Mechanical Design Process, Tata McGraw Hill, 1997.

MAT 201 LINEAR ALGEBRA AND OPTIMIZATION (3 0 0 3)

Vector spaces, subspaces, basis and dimension
Linear transformation and their representation by matrices
Rank of matrix – Eigenvalues, eigenvectors and diagonlization
Systems of linear equations – Quadratic surfaces – Inner product spaces
Orthonormal sets, Gram Schmidt orthogonalization process and its applications to the method of least squares and QR algorithm
Introduction to optimization problems: nature of its solutions and algorithms

Text Books:

1. Strang. G, Introduction to Linear Algebra. Wellesley, MA: Wellesley-Cambridge Press, 1993.
2. Curtis. C. G, Linear Algebra: An Introductory Approach, Springer, 1994.

References:

1. Krishnamurthy. V, Mainara. V. P and Arora. J. I, An Introduction to Linear Algebra, Affiliated East-west Press, 1976.
2. Luenberger. D. G, Linear and Nonlinear Programming, Addison Wesley, 2003.
3. Belegundu. A. D and Chandrupatla. T. R, Optimization Concepts and Applications in Engineering, Pearson Education Asia, 2002.

COM 202 DATA STRUCTURES AND ALGORITHMS (3 1 0 4)

Need for data structures – Algorithms – Complexity analysis – Best, average and worst case complexities – Linear ADT's – Cursor, pointer based lists, stack, queues – Applications of lists, stacks and queues
Trees – Need – Terminologies – Binary trees – Implementation – Expression trees – Binary search trees – AVL trees – Splay trees – Tree traversals
Hashing – Hash function – Separate chaining – Open addressing – Priority queues – Binary heaps – Application of priority queues – Sorting – Heap – Shell – Merge – Quick sort – Bucket – External sorting
Graph algorithms – Representation – Topological sort – Shortest path algorithms – Unweighted – Dijskstra's Algorithm – Minimum spanning tree – Prims and Kruskal's algorithm
Algorithm design techniques – Divide & conquer – Dynamic programming – Backtracking – Applications

Text Books:

1. Mark Allen Weiss, Data Structures and Algorithm Analysis in C, 2 Edn, Pearson Education, 2002.

References:

1. Cormen T.H, Leiserson C.E and Rivest R.L, Introduction to Algorithms, 2 Edn, Prentice Hall India, 2001.
2. Aho, Hopcroft and Ullmann, Data Structures & Algorithms, Addison Wesley, 1983.

ELE 209 SIGNALS AND LINEAR SYSTEMS (3 0 0 3)

Fundamental concepts: Signals and systems, continuous–time and discrete–time signals,
Sampling: Sample and hold, Interpolation, aliasing, Nyquist criterion

Basic system properties, Linearity, time invariance and causality; systems defined by differential/difference equations with constant coefficients, system modeling, discretization in time of differential equations, systems defined by time–varying or nonlinear equations Properties of Linear time invariant systems, Convolution Representation of Linear Time–Invariant Continuous–Time and Discrete–Time signals and Systems, Numerical Convolution, Linear Time–Varying Systems

Fourier analysis of continuous time and discrete–time signals and systems: Fourier series representation of continuous time and discrete time periodic signals, continuous time and Discrete time Fourier Transform, their properties, System Analysis via the DTFT and DFT Transfer function representation: Laplace Transform, Transfer Function Representation, Block Diagrams

Stability and the Impulse Response, Analysis of the Step Response, Frequency Response Function, Causal Filters, design of continuous time electric filters

Introduction to state variable concepts: State Model, Construction of State Models, Solution of State Equations, State Representations of Discrete–Time Systems, Discretization of State Model

Text Book:

1. Oppenheim A.V, Willsky A.S and Nawab S.H, Signals & Systems, Prentice Hall, 1997.

Reference:

1. Haykin. S and Van Veen. B, Signals and Systems, 2 Edn, Wiley, 2007,

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COM 202P DATA STRUCTURES AND ALGORITHMS PRACTICE (0 0 6 4)

Pointer based implementation of list, stack and queue operations - Application of linked lists – Polynomial manipulations - Application of queues – first come first served scheduling simulation - Representing sets using lists - Expression conversion and evaluation using stacks - Representation of LONG strings using queues - Binary trees (including priority queues) - Arrays, searching, sorting, binary search trees, Hashtables, arrays-stripping punctuation marks from huge collection of text - words must be used to build the dictionary - Graphs – Dijkstra's shortest Path – Heap version - Longest common subsequence using dynamic programming.

ELE 209P SIGNALS AND LINEAR SYSTEMS PRACTICE (0 0 3 2)

Study of sampling and reconstruction, linear convolution, low-pass and high-pass filters - Fourier series of continuous and discrete signals, Continuous time and discrete time Fourier transform - Transfer function: step and impulse response, frequency response function, solution of state equations.

COM 203 INTRODUCTION TO COMPUTER ORGANIZATION (3 0 0 3)

Introduction: function and structure of a computer, functional components of a computer, performance of a computer system

Representation of instructions: machine instructions, operands, addressing modes, instruction formats, instruction sets, instruction set architectures – CISC and RISC architectures

Processing unit: organization of a processor, registers, ALU, control unit, datapath in a CPU, instruction cycle, organization of a control unit – Hardwired control unit and microprogrammed control unit

Memory Unit: memory cells – SRAM cell and DRAM cell, internal organization of a memory chip, organization of a SRAM memory unit, organization of a DRAM based main memory unit, error detection and correction memories, cache memory

Input/Output Unit: access of I/O devices, I/O ports, I/O control mechanisms – Program controlled I/O. Interrupt controlled I/O and DMA controlled I/O; I/O interfaces – Serial port, parallel port, USB port, SCSI bus, PCI bus; I/O peripherals – Keyboard, display, secondary storage devices (Hard disks)

Pipelined processors – Pipelining, hazards – Structural, data and control hazards

Text Book:

1. Hamacher C, Vranesic Z and Zaky S, Computer Organizaton, Tata McGraw Hill, 2002.

References:

1. Stallings W, Computer Organization and Architecture – Designing for Performance, Prentice Hall, 2006.
2. Hayes J.P, Computer Architecture and Organization, Tata McGraw Hill, 1998.

MAT 203 PROBABILITY AND STATISTICS (3 0 0 3)

Introduction to probability – Probability measure and random processes

Conditional probability, independence and Baye's theorem

Discrete and continuous random variables; probability density function, concepts of mean, variance and moment generating function of a few standard discrete and continuous distributions: binomial, Poisson, exponential and normal

Central limit theorem and its implications for the normal distribution

Purpose and the nature of sampling; nature of estimates, point estimates and interval estimates

Maximum likelihood principle approach, least squares approach and confidence intervals

Nature of hypothesis formulation, null and alternate hypotheses, testing hypotheses; criteria for acceptance of hypothesis t-test, chi-squared test

Text Book:

1. J. S. Milton, J. C. Arnold, Introduction to Probability and Statistics, Tata McGraw Hill, 4 Edn, 2002.

Reference:

1. Richard A Johnson, Miller and Freunds, Probability and Statistics for Engineers, Pearson Edu., 6 Edn, 2001.

COM 204 COMPILER DESIGN (3 0 0 3)

Introduction to phases of compiler – Grouping of phases – DFA – Lexical analysis – Token specifications

Parser – Context free grammar – Types of parsing – Top down and bottom up – Recursive descent – Predictive – Shift reduce – Operator precedence – LR, SLR and CLR, LALR parsers

Intermediate code generation – Languages – Declaration – Assignment statements – Boolean expressions – Multiple selection statements – Back patching and procedure calls code generator design issues – Target machine – Runtime storage management – Basic

blocks – Flow graphs – Next use information – Code generator case study – Directed acyclic graph representation of basic blocks – Peephole optimization technique
Introduction to code optimization – Sources – Block optimization – Global data flow analysis –Language issues – Storage optimization & allocation strategies – Parameter Passing

Text Book:

1. Alfred Aho, Ravi Sethi and Jeffrey D Ullman, Compilers Principles, Techniques and Tools, Pearson Education, 2003.

References:

1. Levine J.R, Mason T, Brown D, Lex & Yacc, OReilly Associates, 1992.
2. Allen I. Holub, Compiler Design in C, Prentice Hall, 2003.
3. Kamala Krithivasan and R Rama, Introduction to Formal Languages, Automata Theory and Computation, Pearson Education, 2009.

ELE 215 ELECTRONICS CIRCUITS (3 0 0 3)

Device Models (diode, BJT, MOSFET); Small signal analysis of nonlinear circuits, small signal equivalent of diode, BJT, MOSFET Adding dc bias to ac signals–Concept of ac coupling
Basic transistor Amplifiers, small signal and large signal (low frequency) characteristics, biasing the MOS and BJT amplifiers
Ideal OpAmp circuits, Inverting and non inverting configurations, integrator and differentiator
Practical OpAmp circuits, voltage followers, voltage comparators, Schmitt trigger
Analog to digital and digital to analog conversions
Introduction to digital simulators

Text Books:

1. Boylestad R.L. and Nashelsky L., Electronic Devices and Circuit Theory Ninth Edition, Pearson Edition, 2006.
2. Gayakwad R., Op-amps and Linear intergrated circuits, PHI,2004.

References:

1. Clayton G. and Winder S., Operational Amplifiers, Newnes Publishers, 2003.
2. Schilling D. L. and Belove C., Electronic Circuits: Discrete and Integrated, Tata McGraw Hill, 2002.

COM 203P INTRODUCTION TO COMPUTER ORGANIZATION PRACTICE (0 0 6 4)

The lab course is intended for giving exposure to assembly language programming in 80 x 86 assembly language. The students are expected to learn about the instruction set, addressing modes, assembly language syntax, assembler directives and assemble macros. Lab exercises will mainly involve writing the assembly language programs - Execution of assembly language programs: Single–step, break points, Accessing contents of registers, accessing contents of memory locations - Implementation of higher level language assignment statements with arithmetic expressions and logical expressions - Implementation of control transfer statements: IF..THEN..ELSE and CASE statements - Implementation of loop statements: FOR, WHILE, DO..WHILE - Subroutines/functions: Parameter passing using (a) registers and (b) memory locations - Subroutines/Functions: Parameter passing using stack – Macros - Software interrupts - Operating system function calls - Interrupt service routines - Simple device drivers - Assembly language programming in C language

COM 204P COMPILER DESIGN PRACTICE (0 0 3 2)

Lexical analyzer implementation in C - Lexical analyser implementation using LEX tool - Recursive descent parser implementation in C for an expression grammar - YACC and LEX based implementation for an expressions grammar - YACC implementation of a calculator that takes an expression with digits, + and * and computes and prints its value - Front end implementation of a compiler that generates the three address code for a simple language- Back end implementation of a compiler which takes the three address code (output of previous exercise) and results in assembly language instructions - Implementation of peephole optimization in C.

ELE 215P ELECTRONICS CIRCUITS PRACTICE (0 0 3 2)

Static characteristics of diodes, BJTs and FETs, rectifiers and filters, clipping and clamping circuits - Biasing of BJTs and FETs, OpAmp circuits (inverting amplifier, voltage followers) - Simulation examples using SPICE

COM 301 OPERATING SYSTEMS (3 0 0 3)

Introduction – Computer systems organization – OS structure – Operations – Process, memory, storage management – Distributed systems – System calls – System programs – Virtual machines – OS generation

Process management – Process concept – Scheduling – Inter process communication – Client

Server systems – Threads – Multithreads – Thread libraries – CPU scheduling – Process synchronization – Deadlocks

Memory management – Main memory – Swapping – Paging – Segmentation – Virtual Memory demand paging – Copy on write – Page replacement – Allocation of frames – Thrashing kernel memory

Storage management – File system interface – Directory structure – Mounting – Sharing – Protection

Mass storage – Disk structure – Attachment – Scheduling – Management – RAID – Stable storage

I/O Systems – Protection – Security – Distributed systems – File systems – Coordination

Text Book:

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, Operating System Concepts, 6 Edn, John Wiley, 2002.

References:

1. Andrew S Tanenbaum, Modern Operating Systems, Prentice Hall, 2001.
2. Stallings. W, Operating System: Internals and Design Principles, Prentice Hall, 2000.
3. Gary Nut, Operating Systems: A Modern Perspective, Addison Wesley, 2003.

COM 302 COMPUTER NETWORKS (3 0 0 3)

Network – Requirements – Network architecture – Implementing network software – Performance

Direct link networks – Encoding – Framing – Error detection – Reliable transmission – Ethernet – Token rings – Wireless

Packet switching – Forwarding – Bridges – Cell switching – Internetworking – Datagram forwarding – ARP – DHCP – Routing – Multicast
Protocols – UDP – TCP – Remote procedure call – Congestion control – Congestion avoidance – QoS
Presentation formatting – Data compression – Cryptographic algorithms – Security mechanisms – Firewalls – Name service and other applications

Text Book:

1. Larry L Peterson & B S Davie, Computer Networks A Systems Approach, 3 Edn, Morgan Kauffman Publishers, 2003.

References:

1. William Stallings, Data and Computer Communications, Pearson Education, 1999.
2. Tanenbaum. A. S, Computer Networks, 4 Edn, Prentice Hall, 1993.
3. Keshav , An Engineering Approach to Computer Networks, Addison Wesley,1998.

INT 302 ECOLOGY AND ENVIRONMENT (2 0 0 2)

Introduction to environment and ecology – Ecosystems – Principles concepts, components and function
Atmospheric, aquatic and terrestrial ecosystems – Biogeochemical cycles and limiting factor concepts –Impacts of natural and human activities on ecosystems
Environmental policies, acts and standards – Sustainable development and environmental impact assessment – Institutional frame work and procedures for EIA
Methods for impact identification-matrices – Networks and Check lists – Environmental settings, indices and indicators
Prediction and assessment of the impacts on air, water, land, noise and biological environments – Assessment of impacts of the cultural, socioeconomic and ecosensitive environments
Mitigation measures, economic evaluation – Public participation and design making – Preparation of Environmental statement

References:

1. Rubin. E. S, Introduction to Engineering and the Environment, McGraw Hill, 2000.
2. Masters. G. M., Introduction to Environmental Engineering & Science, Prentice Hall, 1997.
3. Henry. J. G, and Heike, G. W, Environmental Science & Engineering, Prentice Hall International, 1996.
4. Dhameja. S. K, Environmental Engineering and Management, S. K. Kataria and Sons, 1999.
5. Shyam Divan and Armin Rosancranz, Environmental Law and Policy in India, Cases, Materials and Statutes, Oxford University Press, 2001.

ELE 309 ANALOG AND DIGITAL COMMUNICATION & SIGNAL PROCESSING (3 0 3 5)

Analog communication systems: amplitude and angle modulation and demodulation systems, spectral analysis of these operations, superheterodyne receivers – elements of hardware, realizations of analog communication systems
Pulse Modulation: Transition from Analog to Digital Communications, Baseband Data Transmission, Digital Band–Pass Modulation Techniques

Digital modulation schemes– amplitude, phase and frequency shift keying schemes (ASK, PSK, FSK)
Random Signals and Noise, Noise in Analog and digital Communications, Inter signal Interference, band with consideration and probability of error calculations
Information theory entropy, data compression, channel capacity, Gaussian channel
Coding theory, coding schemes, error correction codes
Application of DSP to speech, radar and image signal processing, Introduction to DSP architecture.

Text Books:

1. Oppenheim. A, Schafer R. and Buck J., Discrete-Time Signal Processing, Pearson Education, 2007.
2. Proakis. J.G and Salehi. M, Communications System Engineering, Prentice Hall, 1994.

References:

1. Moher. M, An Introduction to Analog and Digital Communications, 2 Edn, Wiley, 2001.
2. Cover. T and Thomas. J, Elements of Information Theory, John Wiley & Sons, 2006.
3. Lathi B. P, Modern Digital and Analog Communication Systems, Oxford Press, 2008.

COM 301P OPERATING SYSTEMS PRACTICE (0 0 3 2)

Implementation of scheduling algorithms – SRT, SJF, RR and priority in C -file allocation algorithms – Best, worst and first fit - Bankers algorithm - System calls in linux – System, memory and file information - Processes and threads in linux. - Readers writers problem - Dining philosophers problem

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COM 302P COMPUTER NETWORKS PRACTICE (0 0 3 2)

Unix programming – Unix system calls – Network basics – Configuring a LAN, gateway - Socket programming – Unix sockets – Ports, TCP/UDP – Basic echo and File server - Performance evaluation - Simulation of MAC protocols – stop and wait – go back n routing – IP address configuration – sub netting – Packet tracking and network intrusion detection - Firewalls – IP tables – Configuration – Setup - Computer network project

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COM 303P SCRIPTING LANGUAGES – PERL AND PYTHON PRACTICE (1 0 3 3)

Introduction to PERL – Scalar data – Numbers – Strings – Output with print – Control structures – User input – Chomp operator – Lists – Arrays – Indices – List literals – Interpolation subroutines
Input output – Standard input – Diamond operator – Standard output – Formatted output File handles – Hashes – Regular expressions – Matching
text processing with regular expressions – Control structures – Modules – File tests – Directory operations – Strings & sorting
Introduction to PYTHON – Object types – Strings – Lists – Dictionary – Tuples – Files – Numbers – Expressions operators
String literals – Lists & dictionary operations – Expressions – Control structures – Functions scopes & arguments – Modules – Class coding
Designing with classes – Exception handling – try – raise – assert statements – exception objects – Designing with exceptions

This is a practice only course and lectures will be covered as a part of the laboratory sessions.

Program to display a string with format options - Area and circumference of a circle given radius input - String display as per user specified number of times - Display a given input list of strings in (i) reverse (ii) alphabetical order - Simulate working of CAT command in Linux in reverse order - Generate frequency of words in a given list of strings - Print each line that has a word capitalized in it but not all (in a collection of strings) - Display any line that ends with whitespace, those that end with a 'a' that is captured in memory and match three consecutive occurrences of contents of a variable - Switch to a user specified directory and list hidden files in a directory in alphabetical order - Simulate the working of rm and mv command in Linux - Report multiple occurrences of a given sub string in a given input string. Generate count, average, highest and lowest given a set of numbers as input - Compute roots of a quadratic equation - Compute mean, median and mode given a collection of numbers using functions - Simulate the working of directory listing with options such as l, a, etc - Exception handling

Text Books:

1. Randal L Schwartz, Learning PERL, 3 Edn, Oreilly, 2001.
2. Mark Lutz, Learning PYTHON, 3 Edn, Oreilly, 2007.

References:

1. Deitel P.J and Deitel H.M, PERL How To Program , Prentice Hall,2001.
2. Deitel P.J and Deitel H.M, PYHON How To Program, Prentice Hall, 2002.

ELE 309P ANALOG AND DIGITAL COMMUNICATION & SIGNAL PROCESSING PRACTICE (0 0 3 2)

Sampling a given sinusoid a different sampling rates (lower, equal, greater than Nyquist rate) and observing the spectra. Study of noisy sinusoids and their spectra - Convolution and correlation - Quantization of sum/convolution of damped sinusoids using PCM/mu–law or A–law for a given number of bits - DPCM, Delta Modulation - Correlation of two image, Computing 2–D Fourier transform of images, Median, mean filter images using a running mean, median filter.

COM 304 COMPUTER ARCHITECTURE (3 0 0 3)

Fundamentals of computer design: Classes of computers, trends in technology, measurement of performance of a computer system, current issues in design of functional components of a computer system – Processor unit, memory unit, and secondary storage unit; Hardware/software tradeoff in computer design

Fundamentals of processor design: Instruction set processor design, exploitation of instruction level parallelism, processor micro architecture, performance of a processor

Pipelined processor architecture: Fundamentals of pipelining, arithmetic pipeline design – Carry look ahead adder, Wallace tree multiplier, Floating–point adder/subtractor; Instruction pipeline design; Balancing pipeline stages; Stalls in a pipeline; Methods for reductions of stalls in a pipelined processor

Superscalar processor architecture: Limitations of scalar pipelines, superscalar pipelines, dynamic exploitation of instruction–Level parallelism, register dataflow techniques, memory dataflow techniques, Instruction flow techniques, case studies of superscalar processors

Advanced processor architectures: Multithreaded processors, multi core processors, reconfigurable instruction set processors

Storage system architectures: RAID architecture, storage area networks, Network attached storage
Large computer system architectures: Symmetric multiprocessor systems – Shared memory systems and shared bus architectures; cache coherency protocols – MESI protocol and coherence in multi–level cache systems; Internetwork architectures – Directory protocol for cache coherence

Text Books:

1. Shen J.P and Lipasti M.H, Modern Processor Design – Fundamentals of Superscalar Processors, Tata McGraw Hill, 2003.
2. Hennessy J.H and Patterson D.A, Computer Architecture – A Quantitative Approach, Morgan Kaufmann, 2003.

COE 305 SOFTWARE ENGINEERING (3 0 0 3)

History and overview – Software processes – Software requirements & specifications
Software design – Software testing & validation – Software evaluation
Software tools & environments – Language translation
Software project management & fault tolerance
Database management systems – History & overview – Data modeling – Relational databases design – Database query languages – Physical database design
Relational algebra – Relational calculus – Relational operations – Tuple relational calculus Domain relational calculus
Transaction processing concepts – Serializability and recoverability – Concurrency control techniques – Locking techniques – Timestamp

Text Books:

1. Ramez Elamsri and Shamkant B Navathe, Fundamentals of Database Systems, 4 Edn, Addison Wesley, 2003.
2. Roger S Pressman, Software Engineering A practitioners Approach, Tata McGraw Hill, 2005.

References:

1. Pankaj Jalote, An Integrated Approach to Software Engineering, 3 Edn, Narosa Publishers, 2005
2. Jeff Ullmann and Jennifer Widom, A First Course in Database Systems, 3 Edn, Prentice Hall, 1997

ELE 311 VLSI DESIGN (3 0 0 3)

NMOS, PMOS Enhancement transistor, Threshold voltage, Body effect, MOS DC equations, channel length modulation, Mobility variation, MOS models, small signal AC characteristics. Complementary CMOS inverter DC characteristics, Noise Margin, Rise time, fall time, power dissipation, transmission gate, tristate inverter.
Restoring and non restoring logic design and optimization of basic gates. NMOS and CMOS logic design of adders. Transmission gates, latches, Muxes.
Static and dynamic logic , design with overlapping and non overlapping clock.
Layout design rules, physical design: basic concepts, CAD tool sets, physical design of logic gates: Inverter, NAND, NOR, Design Hierarchies.

Basic Concepts of VLSI Design flow, identifiers, gate primitives, value set, ports, gate delays, structural gate level and switch level modeling, Field Programmable Gate Array structure. Design hierarchies, Behavioral and Data flow modeling; Structural gate level description of different digital entities.
CMOS chip design options: Full custom ASICs, Std. Cell based ASICs, Gate Array based ASICs Channelled, Channelless and structured GA, Programmable logic structures;

Text Books:

1. Weste & Eshraghian: Principles of CMOS VLSI design, 2 Edn, Addison Wesley, 1993.
2. Zwolinski Mark, Digital System Design with VHDL, PHI, 2003.

References:

1. Samir Palnitkar; Verilog HDL - Guide to Digital design and synthesis, 3 Edn, Pearson Education, 2003.
2. Geiger R. L., Allen, P. E. and Strader, N. R., VLSI Design Techniques for Analog and Digital Circuits, McGraw-Hill, 1990.
3. Wolf W., Modern VLSI Design, Pearson Education, 1997.

INT 303 PRODUCT DESIGN AND PRACTICE (0 0 3 3)

This is an interdisciplinary team-based product design course. The concept of the course is to provide a broad hands-on learning experience in interdisciplinary fields of Engineering and exposure to the context of a "real" product design problems. In this course students will design a product by following the systematic product design process.

A team consist of students from different discipline will choose their own product and while designing, students will consider many issues like market opportunities, formal requirements and constraints, the environment in which the product will be used, product look and feel; technical legitimacy, and manufacturing considerations for the products.

During the course student will learn and put into practice Teaming, Project Management, Product Realization, Ethical and other skills practiced by product developers in industry. Throughout the semester, the student teams have several opportunities to present their progress to their fellow students and faculty.

COM 304P COMPUTER ARCHITECTURE PRACTICE (0 0 6 4)

The lab course is intended to give exposure to the design of different functional components of a computer system using verilog and development kits such as simple scalar
Introduction to digital design with verilog - verilog: Gate–level modeling and dataflow modeling - verilog: Behavioral modeling - Logic synthesis with verilog - Design of a 16–bit carry look ahead adder - Design of 8–bit signed integer multiplier using Wallace tree multiplier - Design of single precision floating–point adder/subtractor - Design of a register file with 2 read ports and 1 write port - Design of direct mapped cache - Design of 2–way set–associative cache - Study of superscalar processor architecture using Simple Scalar - Reconfiguring the processor architecture using simple scalar

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COE 305P SOFTWARE ENGINEERING PRACTICE (0 0 3 2)

Software life cycle analysis and evaluation for the application of library information system Use case diagrams – Activity diagrams – Sequence diagrams - Test plan, validation testing, coverage analysis, test case hierarchy development - Data Definition – Manipulation – Control language commands in RDBMS - Cursors and triggers - Procedures and functions – Embedded SQL - Database design – ER model and normalization - Design and implementation of library information system - Software engineering project

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ELE 311P VLSI DESIGN PRACTICE (0 0 3 2)

Analog and digital circuit simulation using SPICE - Design of static and dynamic digital circuits and timing simulation with IRSIM/ Modelsim - Use of the layout tool MAGIC for analog and digital integrated circuits - Design of simple digital systems using HDL/ FPGA- Design of pipelined and super scalar processor.

COM 401 SIMULATION AND MODELING (3 0 0 3)

Introduction to modeling and simulation – System analysis – Classification of systems – System theory basics & its relation to simulation – Model classification: conceptual, abstract, and simulation models – Heterogeneous models – Methodology of model building simulation systems and languages, means for model and experiment description – Principles of simulation system design – Parallel process modeling – Using petri nets and finite automata in simulation

Models of queuing systems – Discrete simulation models – Model time, simulation experiment control – Continuous systems modeling – Overview of numerical methods used for continuous simulation – System Dymola / Modelica – Combined simulation – The role of simulation in digital systems design
Special model classes, models of heterogeneous systems – Cellular automata and simulation checking model validity, verification of models – Analysis of simulation results – Simulation results visualization – Interactive simulation – Design and control of simulation experiments – Model optimization
Generating, transformation, and testing of pseudorandom numbers – Stochastic models – Monte Carlo method – Overview of commonly used simulation systems

Text Books:

1. Fishwick. P, Simulation Model Design and Execution, PrenticeHall, 1995.
2. Law. A and Kelton.D, Simulation Modelling and Analysis, Tata McGraw Hill, 1991.

References:

1. Ross. S, Simulation, Academic Press, 2002.

ELE 401 EMBEDDED SYSTEMS (3 0 0 3)

Introduction to Embedded Systems: standalone vs specialized – Elements of embedded controllers such as A/D converters, PWM circuits and timers.
Implementation of embedded controllers: computer architecture, logic, timing, loading, protocols, and software.

Design of embedded digital systems: microcontrollers, embedded programs, real–time operating systems.
Design methodologies, hardware–software codesign, hardware modeling and computer–aided design, prototyping with FPGAs.

Text Books:

1. Vahid. F and Givargis. T, Embedded System Design – A unified hardware/ software introduction, John Wiley, 2002.
2. Valvano Jonathan W., Embedded Microcomputer Systems – A real time interfacing, Cengage Learning, 2007.

References:

1. Heath. S, Embedded Systems Design, Ed.2, Elsevier India, 2007.
2. Labrosse Jean. J, Embedded System Building Blocks : Complete and Ready to use modules in C, 2 Edn, Complete and Ready to use Modules in C, Elsevier, 1999.

MAN 401 PROFESSIONAL ETHICS (2 0 0 2)

Concepts of profession and highlights its difference from occupation or job
The vital role of ethics in professional
The importance of ethical codes in professional and the prerequisites of an ethical professional
The nature of engineering ethics
The value of ethical practices in engineering and the virtues of an ethical engineer

References:

1. Velasquez. M. G, Business Ethics and Cases, 5 Edn, Prentice Hall, 2002.
2. Harris. *et al.,* Engineering Ethics: Concepts and Cases, Belmont Wadsworth, 1995.
3. Sekha. R.C, Ethical Choices in Business Response, Sage Publication, 2002.
4. Mike Martin and Roland Schinzinger, Ethics in Engineering, McGraw Hill, 1996.
5. Fleddermann. C. D, Engineering Ethics, Prentice Hall, 1999.

COM 401P SIMULATION AND MODELING PRACTICE (0 0 3 2)

Curve fitting – Solving non linear equations using graphical method - Continuous system modeling - Solving differential equations and system of differential equations - Discrete system modeling – Implementation of finite state automata in C – Design DFA to recognize identifier, valid integer and float representations in C - Parallel process modeling – Implementation of petrinets in C – Application of petrinets - Implementation of cellular automata in C and its application - Pseudo random number generation - Continuous simulation using Dymola system - Case studies of discrete and continuous simulation using SIMULINK/MATLAB

ELE 401P EMBEDDED SYSTEMS PRACTICE (0 0 3 2)

Programming with ATMEL AVR series microcontrollers, Embedding RTOS in ATMega32 - Analog and digital sensor interfacing, serial communication interface, DC/ stepper motor control - Preparation of embedded Linux system, Use of RT–Linux, measurement of interrupt latency in RTOS - Waveform generation with integrated timers, Digital–to–

analog/analog–to–digital conversion - Building an embedded Linux system, Boot embedded Linux on remote system

COE 402 HUMAN COMPUTER INTERACTION (3 0 0 3)

The human – Input output channels – Human memory – Reasoning and problem solving emotions – Individual differences – Psychology and design of interactive systems
The computer – Text entry devices – Positioning, pointing and drawing – display devices – Devices for virtual reality and 3D interaction – Physical controls and Sensors for special devices – Printing and Scanning – Memory – Processing and networks
The Interaction – Models of interaction – Frameworks and HCI – Ergonomics – Interaction styles – Elements of the WIMP interface – Interactivity – The context of interaction
Paradigms for interaction – Interaction design basics – The process of design – User focus – Scenarios – Navigation design – Screen design and Layout – Interaction and Prototyping
HCI in the software process – The software life cycle – Usability engineering – Interactive design and prototyping – Design rationale – Design rules – Principles to support usability standards – Guidelines – Golden rules and heuristics – HCI patterns
Implementation support – Elements of windowing systems – Programming the applications using tool kits – Evaluation techniques – Evaluation through expert analysis – through user participation
Universal Design – principles – multi model interaction – designing for diversity

Text Books:

1. Alan Dix, Janet Finlay, Abowd. G and Beale. R, Human Computer Interaction, Prentice Hall, 2004.

References:

1. David Benyon, Preece. J, Rogers. Y and Sharp. H, Human Computer Interaction, Addison Wesley, 1994.

MAN 404 FINANCE MANAGEMENT (3 0 0 3)

Engineering and uncertainty –Engineering processes – Strategies, Proposals, Decision making
Economic concepts – Utility, value, cost, consumers – Supply and demand
Costs: Initial, maintenance, fixed, variable, and marginal costs
Interest rates: Simple and compound interest
Money value – Past, present, and future values
Cash flow – Present and future worth – Payback periods

Text Books:

1. Shim. J. K and Siegel. J. G, Financial Management, Schaum's Outline Series, 2009.
2. Barathwal. R. R, Engineering Economics, McGraw Hill, 1997.

References:

1. Crabaugh. R. J, International Economics, South Western College Pub., 2004.
2. Pepall, Richards and Norman, Industrial Organization: Contemporary Theory and Practice, Thomson South Western, 2005.
3. Martin. S, Advanced Industrial Economics, Blackwell Pub., 2002.

COE 402P HUMAN COMPUTER INTERACTION PRACTICE (0 0 3 2)

Process of developing interactive systems: (i) Design and evaluation (ii) Considering work Contexts in Design (iii) Development tools - Interacting with computers – (i) Vision, graphic design and visual display (ii) Touch, gesture and marking (iii) Speech, language and audition - Psychology and human factors – Human information processing - Designing to fit human capabilities - Context and intelligent agents

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