CURRICULUM

B Tech – Electronics Engineering (Design & Manufacturing)
[2008 Batch Onwards]

INDIAN INSTITUTE OF INFORMATION TECHNOLOGY, DESIGN & MANUFACTURING, KANCHEEPURAM

B. TECH – ELECTRONICS ENGINEERING (DESIGN & MANUFACTURING)
[2008Batchonwards]

Semester 1

Course No	Course Name	L	T	P	C	Cat	NEW CAT
ELE 101	Basic Electrical & Electronics Engineering	3	0	0	3	BEC	BEC
MAT 101	Calculus	3	0	0	3	SMA	BSC
COM 102	Computational Engineering	3	0	0	3	BEC	AEC
PHY 105	Mechanics and Wave	3	0	0	3	SPH	BSC
MEC 107	Thermal Science for Electronics Engineering	3	0	0	3	BEC	BEC
INT 101	Graphic Art Practice	0	0	3	2	BEC	DES
COM 102P	Computational Engineering Practice	0	0	3	2	BEC	AEC
INT 103	Electronics Engineering Practice	0	0	3	2	BEC	BEC
PHY 105P	Mechanics and Wave Practice	0	0	3	2	SPH	BSC
	Total	**15**	**0**	**12**	**23**		

Semester 2

Course No	Course Name	L	T	P	C	Cat	NEW CAT
ELE 102	Digital Logic Design	3	0	0	3	PMC	PEC
MAT 103	ODEs & PDEs	3	0	0	3	SMA	BSC
INT 104	English for Communication	2	0	0	2	HSS	HMC
PHY 106	Electromagnetics and Quantum Mechanics	3	0	0	3	SPH	BSC
MEC 109	Statics & Strength of Materials	3	1	0	4	BEC	AEC
ELE 102P	Digital Logic Design Practice	0	0	3	2	PMC	PEC
INT 102	Basic Engineering Practice	0	0	3	2	BEC	BEC
INT 105	Engineering Drawing	1	0	3	3	BEC	AEC
PHY 106P	Electromagnetics and Quantum Mechanics Practice	0	0	3	2	SPH	BSC
	Total	**15**	**1**	**12**	**24**		

Semester 3

Course No	Course Name	L	T	P	C	Cat	NEW CAT
INT 201	Concepts in Engineering Design	3	0	0	3	BEC	DES
MAT 201	Linear Algebra & Optimization	3	0	0	3	SMA	BSC
ELE 206	Networks and Systems	3	0	0	3	PMC	PEC
ELE 207	Solid State Devices	3	0	0	3	PMC	PEC
ELE 208	Electromechanical Energy Conversion	3	0	0	3	PMC	PEC
ELE 206P	Networks and Systems Practice	0	0	3	2	PMC	PEC
ELE 207P	Solid State Devices Practice	0	0	3	2	PMC	PEC
ELE 208P	Electromechanical Energy Conversion Practice	0	0	3	2	PMC	PEC
	Total	**15**	**0**	**9**	**21**		

Semester 4

Course No	Course Name	L	T	P	C	Cat	NEW CAT
MAT 203	Probability & Statistics	3	0	0	3	SMA	BSC
ELE 211	Control Engineering	3	0	0	3	PMC	AEC
ELE 212	Principles of Measurements	3	0	0	3	PMC	AEC
ELE 213	Analog Circuits	3	0	0	3	PMC	PEC
ELE 214	Power Electronics and Industrial Drives	3	0	0	3	PMC	AEC
ELE 211P	Control Engineering Practice	0	0	3	2	PMC	AEC
ELE 212P	Principles of Measurements Practice	0	0	3	2	PMC	AEC
ELE 213P	Analog Circuits Practice	0	0	3	2	PMC	PEC
ELE 214P	Power Electronics and Industrial Drives Practice	0	0	3	2	PMC	AEC
	Total	**15**	**0**	**12**	**23**		

Semester 5

Course No	Course Name	L	T	P	C	Cat	NEW CAT
INT 302	Ecology and Environment	2	0	0	2	HSS	HMC
ELE 305	Electronic Instrumentation	3	0	0	3	PMC	PEC
ELE 306	Analog IC Applications	2	0	0	2	PMC	PEC
ELE 307	Applied DSP	3	0	0	3	PMC	PEC
ELE 308	Computer Organization and Microprocessors	3	0	0	3	PMC	AEC
ELE 305P	Electronic Instrumentation Practice	0	0	3	2	PMC	PEC
ELE 306P	Analog IC Applications Practice	0	0	3	2	PMC	PEC
ELE 307P	Applied DSP Practice	0	0	3	2	PMC	PEC
ELE 308P	Computer Org. and Microprocessors Practice	0	0	3	2	PMC	AEC
	Total	**13**	**0**	**12**	**21**		

Semester 6

Course No	Course Name	L	T	P	C	Cat	NEW CAT
MAN 302	Quality and Reliability Management	3	0	0	3	HSS	HMC
ELE 310	Electronic Manufacturing & Packaging Techniques	3	0	0	3	PMC	PEC
ELE 311	VLSI Design	3	0	0	3	PMC	PEC
ELE 312	PCB/Prototype Design and Development	2	0	0	2	PMC	PEC
INT 303	Product Design and Practice	0	0	3	2	PMC	DES
ELE 311P	VLSI Design Practice	0	0	3	2	PMC	PEC
ELE 312P	PCB/Prototype Design and Development Practice	0	0	3	2	PMC	PEC
	Elective 1	3	0	0	3	ELE	PEC
	Total	**14**	**0**	**9**	**20**		

Semester 7

Course No	Course Name	L	T	P	C	Cat	NEW CAT
ELE 401	Embedded Systems	3	0	0	3	PMC	PEC
MAN 401	Professional Ethics	2	0	0	2	HSS	HMC
ELE 402	Data Networks	3	0	0	3	PMC	PEC
ELE 401P	Embedded Systems Practice	0	0	3	2	PMC	PEC
ELE 402P	Data Networks Practice	0	0	3	2	PMC	PEC
INT 401	Mini Project	0	0	3	2	PMP	PEC
	Elective 2	3	0	0	3	ELE	PEC
	Elective 3	3	0	0	3	ELE	PEC
	Total	**14**	**0**	**9**	**20**		

Semester 8

Course No	Course Name	L	T	P	C	Cat	NEW CAT
MAN 404	Finance Management	3	0	0	3	HSS	HMC
INT 402	Project	0	0	24	16	PMP	PEC
	Elective 4	3	0	0	3	ELE	PEC
	Total	**6**	**0**	**24**	**22**		

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

BSC	BEC	PEC	HMC	AEC	DES	Total
22	10	91	12	32	07	174

COURSE CONTENTS
B TECH ELECTRONICS ENGINEERING (DESIGN AND MANUFACTURING)
(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.

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.

MEC 107 THERMAL SCIENCE FOR ELECTRONICS ENGINEERING (3 0 0 3)

In this course students will learn the fundamentals of Thermodynamics, fluid flow principles and heat transfer concepts and their applications to electronic equipment and digital devices. Course covers the following topics:

Thermodynamics: System & control volume – State & process – Thermodynamic definition of work –other forms of work – Examples – Temperature – Definition of thermal equilibrium – Zeroth law – Definition of temperature and temperature scale – Definition of heat – Examples of heat/work interaction – First law – Cyclic & non-cyclic process – Concept of total energy – Various modes of energy – First law for floe process – Derivation of general energy equation for control volumes – Steady & unsteady flow process – Second law – Definition of thermal efficiency and COP – Definition of reversible process – Available and Unavailable energy – Concept of irreversibility and lost work

Fluid Mechanics: The concept of a fluid – Properties of velocity field – Thermodynamic properties of a fluid – Viscosity and other secondary properties – Basic flow analysis techniques – Flow patterns – Basic physical laws of fluid mechanics – Conservation of mass – The linear momentum equation – The energy equation – Flow past immersed bodies

Heat transfer: Conductive heat transfer – General conduction equation – One dimensional steady state conduction – Fins and extended surfaces – Transient conduction of lumped and distributed systems – Convective heat transfer – Boundary layers – Dimensionless group for convection – Forced convection – Elements of free convection – Elements of radiation heat transfer – Environmental heat transfer

Heat generation in printed-circuit boards – Power transmission mediums – Thermal resistance concepts – Junction temperature – Cooling and heating loads – Air and liquid cooled heat sinks – Thermoelectric power generation and refrigeration – Dielectric heating – Heat pipes and vortex tubes and their applications in electronic cooling

Text Books:

1. Nag. P.K, Engineering Thermodynamics, Tata McGraw Hill, 2005.
2. Jones. J.B and Shapiro. H.N, Fundamentals of Engineering Thermodynamics, John Wiley, 1999.

References:

3. Moran. M.J. and Shapiro. H.N, Fundamentals of Engineering Thermodynamics, John Wiley, 2003.
4. Sonnag. R.E, Borgnakke. C and Van Wyan. G.J, Fundamentals of Thermodynamics, 6 Edn, John Wiley, 2003.
5. Spalding. D. B. and Cole. E.H, Engineering Thermodynamics, Edward Arnold, 1976.

INT 101 GRAPHIC ART PRACTICE (0 0 3 2)

Skilled base course with focuses on drawing as a medium for expression and communication through drawn images. It will enhance the ability to represent images, ideas and concepts as observations and thinking process. Studies will include:
Interrelatedness of visual forms in terms of size, scale and overall proportion
Understanding basics principles of perception including depth and its representation

Introduction to different media, tools and instruments to create surface textures

Assignments includes: Skill enhancing assignments in developing basic drawing of lines – straight, curvilinear, angular, thick, thin, plane, volume etc – Nature drawing – including Human/Animal/Birds – to study shapes and forms – Representation of basic 3-dimensional forms – Cubes, Cylinders, Cones, Spheres etc. in different combinations and sizes to understand principles of perspectives – Some assignments in drawing and quick sketching.

Text Books:

1. Thomas C Wang, Pencil Sketching, John Wiley, 2002.
2. Itten Johannes, Design and Form, John Wiley, 1975.

Reference:

1. Kasprin Ron, Design Media – Techniques for Water Colour, Pen and Ink Pastel and colored markers, John Wiley,1999.

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, 3 Edn, Prentice Hall, 2002.
2. Taub H. and Schilling D, Digital Integrated circuits, Tata McGraw Hill, 1977.

References:

1. Givone D.D, Digital Principles and Design, Tata McGraw Hill, 2005.
2. Wakerly J.F, Digital Design Principles and Practices, 4 Edn, Practice Hall, 2007.
3. Tocci R.J, Digital Systems Principles and Applications, 10 Edn, Prentice Hall, 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.

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.

MEC 109 STATICS AND STRENGTH OF MATERIALS (3 1 0 4)

Review of vector algebra and equivalent force systems – Equilibrium of rigid bodies – Analysis of trusses
Friction forces – Properties of surfaces – virtual work and energy
Analysis of stress and strain – Hooke's law and relation between elastic constants
Euler Beams – Derivation of relations between load, shear force and bending moments
Bending and shear stress distribution – Deflection of beams – Successive integration and moment area method
Transformation of stresses – Principal stresses and strains – Mohr's circle
Torsion of circular cross-section – Thin walled pressure vessels – Elastic stability for Euler columns

Text Books:

1. Beer. F. P and Johnston. E. R, Vector Mechanics for Engineers, Vol I – Statics, 2005.
2. Meriam. J. L and Kraige. L. G, Engineering Mechanics, Vol. I – Statics, 2007.

References:

1. Popov. E. P, Engineering Mechanics of Solids, Prentice Hall, 1998.
2. Shames. I. H, Introduction to Solid Mechanics, 2 Ed, Prentice Hall, 1999.
3. Timoshenko. S. P, Strength of Materials, vols. 1 & 2, CBS Pub., 1986.

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.

INT 102 BASIC ENGINEERING PRACTICE (0 0 3 2)

Students get trained in following common engineering practices:
Basic manufacturing processes – Turning – Drilling – Assembling – Electrical wiring – Computer hardware – Software installations.

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, 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.

ELE 206 NETWORKS AND SYSTEMS (3 0 0 3)

Linearity, time invariance and causality; Convolution, Time-domain representation and analysis of LTI systems
Laplace transforms and Z-transforms, Poles and Zeros, Impulse and Step response
Fourier Series and Fourier Transform, Sampling theorem, Discrete Fourier transform
Network theorems, Tellegen's theorem
Transient and steady state response, Resonance
Coupled circuits, Single and double tuned circuits
Two-port networks, z, y, h and transmission parameters, cascading; Network functions.

Text Books:

1. Valkenburg. V, Network Analysis, Prentice Hall, 2007.
2. Oppenheim. A.V, Willsky A.S. and Nawab S.H, Signals & Systems, 2 Edn, Prentice Hall, 2008.

Reference:

1. Seshu and Balabanian, Linear Network Analysis, John Wiley, 2006.

ELE 207 SOLID STATE DEVICES (3 0 0 3)

Basic mechanism in semiconductors- Valence band and Energy band models of intrinsic and extrinsic semiconductors, Thermal equilibrium, carrier concentration.
Carrier transport by drift, resistivity, Excess carriers, lifetime, carrier transport by diffusion, Continuity equation
p-n junctions- Energy band diagrams, Forward and reverse biasing, Static analysis, Current-Voltage equation, Breakdown processes, Equivalent circuit, Practical p-n diodes; Transient analysis,
Bipolar junction transistors- structures, Current gain, Current-Voltage characteristics, BJT Models, Emitter efficiency, transport factor, transit time, Charge control description, Transient analysis
Metal-Semiconductor junctions - Schottky and Ohmic contacts; JFETs and MESFETs - Simple analysis
MOS capacitors, CV characteristics, Threshold voltage, Flat-band voltage
MOSFETs- I-V relationship, Equivalent circuits, Short-Channel effects; CMOS Other semiconductor devices

Text Books:

1. DasGupta. N. and DasGupta. A, Semiconductor Devices: Modeling and Technology, Prentice Hall, 2007.
2. Achuthan. M.A and Bhat. K.N, Fundamentals of semiconductor devices, Tata McGraw Hill, 2006.

Reference:

1. Sze. S.M, Physics of Semiconductor Devices, 3 Edn, John Wiley, 2008.

ELE 208 ELECTROMECHANICAL ENERGY CONVERSION (3 0 0 3)

Energy conversion principles, DC machines, types, generator and motor characteristics
Armature reaction and commutation, starting, braking and speed control
Single phase transformer, equivalent circuit, phasor diagram, regulation and efficiency
Three phase transformer, connections, parallel operation, autotransformer
3 phase induction motor, equivalent circuit, performance characteristics, starting, braking and speed control, single phase induction motors
Synchronous machines, performance, regulation, parallel operation, starting, characteristics and applications
Switched reluctance, BLDC, servo and stepper motors

Text Book:

1. Stephen. J. Chapmann, Electrical Machinery Fundamentals, 4 Edn, Tata McGraw Hill, 2004.

References:

1. Fitzgerald. A. E, Charles Kingsley Jr. and Stephen D. Umans, Electric Machinery, Tata McGraw Hill, 2007.
2. Nagrath and Kothari, Electrical Machines, Tata McGraw Hill, 2004.

ELE 206P NETWORKS AND SYSTEMS PRACTICE (0 0 3 2)

Verification of network theorems - Study of two port networks - Study of transients and resonance - Simulation Study of different transforms - Power measurement in three phase circuits

ELE 207P SOLID STATE DEVICES PRACTICE (0 0 3 2)

Static and switching characteristics of diodes and transistors - Rectifiers and filters - Clipping and clamping circuits

ELE 208P ELECTROMECHANICAL ENERGY CONVERSION PRACTICE (0 0 3 2)

Open Circuit, Short Circuit and Load Tests and Sumpner's Test on Single Phase Transformer - Swinburnes test/ Speed Control of DC Shunt Motor - Determination of self excited and Separately Excited DC Generator Characteristics - Hopkinsons Test - No-Load Test, Blocked Rotor Test and Load Test on Single Phase/Three phase Induction Motor

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.

ELE 211 CONTROL ENGINEERING **(3 0 0 3)**

The Control Problem – Models of physical systems – Differential Equations, transfer functions and state variable models – Block diagram
Signal flow graph and Mason's fain formula – Time and frequency response of first and second order systems – Control system characteristics
Stability, sensitivity and disturbance rejection and steady state accuracy
Stability analysis – Routh hurwitz test – Root locus analysis – Frequency response plots and Nyquist criterion
Design of control systems – Classical design – Root locus and frequency response based design for phase lead, phase lag and PID controllers
Modern design – Pole placement, controllability and observability
Introduction to digital control systems – Applications, sampled data systems, stability analysis in Z plane, case studies

Text Book:

1. Norman S. Nise, Control Systems Engineering, Wiley, 2007.

References:

1. Ogata. K, Modern Control Engineering, Prentice Hall, 2006.
2. Nagrath. I.J and Gopal. M, Control Systems Engineering, New Age International, 2008.

ELE 212 PRINCIPLES OF MEASUREMENTS **(3 0 0 3)**

Introduction to electronic measurements, Digital multimeter and voltmeters
Chopper stabilised DC voltmeter; True RMS voltmeter, Vector voltmeter, RF power and voltage measurement
Q-meter; Errors in measurement, Systematic and Random errors, error analysis
Different types of instruments; Galvanometers; CRO, Storage, Sampling Oscilloscopes
Function Generator, Signal Generator; Distortion Analyzer; Spectrum Analyzer
Frequency Counter; Digital IC tester, Logic State Analyzer; PROM Programmer

Text Books:

1. Golding EW, Electrical Measurements & Measuring Instruments, Ah Wheeler & Co, 2001.
2. A.K. Sawhney, Course In Electrical & Electronics Measurement & Instrumentation Dhanpat Rai Publ, 2007.

References:

1. Helfric A.D., Modern Electronic Instrument Measure, Dorling Kindersley, 2008.
2. Alan S. Morris, Measurement and instrumentation principles, Elsevier, 2001.

ELE 213 ANALOG 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
Amplifiers with tuned load-narrow band amplifier, high frequency effects
Ideal OpAmp circuits
Differential pair-differential amplifiers
Oscillator Circuits

Text Books:

1. Boylestad R.L and Louis Nashelsky. L, Electronic Devices and Circuit Theory, 9 Edn, Prentice Hall, 2006.
2. Millman. J, Electronic Devices & Circuits, 2 Edn, Tata McGraw Hill, 1998.

Reference:

1. Sedra and Smith, Microelectronic Circuits, Oxford University Press, 1997.

ELE 214 POWER ELECTRONICS AND INDUSTRIAL DRIVES **(3 0 0 3)**

Static characteristics and principle of operation of Power diodes, transistors, thyristors, triacs, GTOs, MOSFETs and IGBTs
Triggering methods and commutation methods
Single phase and 3 phase half controlled and fully controlled rectifiers, dual converter
Voltage and current source inverters, resonant, Series inverter, PWM inverter, 3-phase full bridge inverters
AC and DC choppers, AC voltage controllers, Cycloconverters
DC motor drives, Induction and synchronous motor drives, switched reluctance and brushless motor drives
Battery charger, SMPS, UPS–induction and dielectric heating

Text Books:

1. Ned Mohan, Tore M. Undeland, Undeland and Robbins, William P. Robbins, Power Electronics: Converters, Applications and Design, John Wiley, 2007.
2. Bimal K. Bose, Power Electronics and Motor Drives: Advances and Trends, Academic Press, 2006.

References:

1. I. Boldea, S. A. Nasar, Electric Drives, CRC Press, 2006.
2. Ned Mohan, Electric Drives: An Integrative Approach, MNPERE, 2003.

ELE 211P CONTROL ENGINEERING PRACTICE (0 0 3 2)

Lead Lag Network – P, PI and PID Controllers – Closed loop controller – DC and AC Servo motor Controller – Bode Plot, Root Locus and Nyquist Plot – MIMO – Impulse and Step Response – Synchro.

ELE 212P PRINCIPLES OF MEASUREMENTS PRACTICE (0 0 3 2)

Errors in measurement systems - Calibration experiments - Analog indicating instruments measurement of voltage, current, power and reactive power Potentiometric and Bridge methods - Digital Instruments

ELE 213P ANALOG CIRCUITS PRACTICE (0 0 3 2)

RC coupling - Frequency response of narrow/wide band and power Amplifiers - Differential amplifier/ CMRR, Oscillators - Biasing of BJTs and FETs, Op Amp circuits - Simulation using SPICE

ELE 214P POWER ELECTRONICS AND INDUSTRIAL DRIVES PRACTICE (0 0 3 2)

Static characteristics of power devices - Triggering and commutation circuits - Study of controlled rectifiers, inverters, choppers - DC and AC Drives

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 305 ELECTRONIC INSTRUMENTATION (3 0 0 3)

Transducers, Passive and active, Resistance, inductance and capacitance types
Generator, thermoelectric and piezo - electric types
Measurement of non electrical quantities such as displacement, pressure, force, flow and temperature
Thermo electric measurements and systems
Data Acquisition Systems, Tele-metering, Data recording and display
PC-based Instrumentation Systems
Digital instrumentation – ADC and DAC

Text Books:

1. Alan S. Morris, Measurement and Instrumentation Principles, Elsevier, 2001.
2. A.K. Sawhney, Course In Electrical & Electronics Measurement & Instrumentation Dhanpat Rai Publ, 2007.

References:

1. Helfric A.D., Modern Electronic Instrument Measure, Dorling Kindersley, 2008.
2. Golding EW, Electrical Measurements & Measuring Instruments, Ah Wheeler & Co Ltd, 2001.

ELE 306 ANALOG IC APPLICATIONS (2 0 0 2)

Amplifier Circuits using OpAmps, Stability frequency compensation
Filters using OpAmps, oscillators using OpAmps
Oscillators on ICs- ring oscillator, LC oscillator
IC building blocks-current mirror, differential pair
OpAmp internal circuitry- 2-stage+ buffer example, Miller compensation of a 2-stage OpAmp
ADC architectures and their comparison, DAC architectures and their comparison
Switched capacitor filters using OpAmps

Text Books:

1. Gayakwad, Linear Integrated Circuits, Prentice Hall, 2004.
2. Razavi. B, Design of Analog CMOS Integrated Circuits, McGraw Hill, 2003.

Reference:

1. Clayton G. and Winder S., Operational Amplifiers, 5 Edn, Elsevier, 2004.

ELE 307 APPLIED DSP (3 0 0 3)

Review of Signals and Systems – Nyquist's Sampling Theorem, aliasing, interpolation, LTI and discrete time systems, Impulse and step responses, system functions
Discrete time Fourier Series, Fourier Transform, z-transform and its inverse, region of convergence, properties
Frequency selective filters, pole-zero locations and frequency response, stability
Discrete Fourier transform and FFT algorithms
High speed convolution and its application to digital filtering
Design of digital filters, IIR and FIR filters, linear phase filters; Parametric and non-parametric spectral estimation

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, Prentice Hall, 2009.
2. Oppenheim, Willsky and Nawab, Signals and Systems, Prentice Hall, 2008.

Reference:

1. Proakis J.G. and Manolakis D.G., Digital Signal Processing: Principles, Algorithms, and Applications, Pearson, 2007.

ELE 308 COMPUTER ORGANIZATION AND MICROPROCESSORS (3 0 0 3)

Organization of a Computer: Von Neumann and Harvard architecture; Instruction Set, Architecture: RISC and CISC processors
Computer Arithmetic: fixed point and floating point arithmetic; Design of ALU
Hardware algorithms for addition, multiplication and division of fixed point and floating point numbers
Processor design: Data Path and Control Design, Microprogramming, Exception Processing, Pipelining
Memory Organization: memory hierarchy, cache organization, virtual memory
System Design: bus structure, bus transactions
Input-output Systems: programmed I/O, DMA and interrupt driven I/O. Illustrations with examples of CISC processors from Intel and RISC processors like MIPS and ARM.

Text Books:

1. Stallings. W, Computer Architecture and Organization, 6 Edn, Prentice Hall, 2003.
2. Mano. M.M, Computer System Architecture, 3 Edn, Prentice Hall, 2007.

References:

1. Hamacher. V. Carl, Vranesic. Z, and Zakay. S., Computer Organization, 5 Edn, Tata McGraw Hill, 2001.
2. Hayes. J. P, Computer Architecture and Organization, 3 Edn, Tata McGraw Hill, 1999.
3. Tanenbaum. A. S, Structured Computer Organization, 4 Edn, Pearson, 1998.

ELE 305P ELECTRONIC INSTRUMENTATION PRACTICE (0 0 3 2)

Study of different sensors and transducers - Data acquisition systems - PC based instrumentation system

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ELE 306P ANALOG IC APPLICATIONS PRACTICE (0 0 3 2)

Ideal and practical op-amp circuits - Study and compensation of offset parameters - Amplifiers, oscillators, VCO, PLL and Filters using OP Amp - ADC, DACs

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ELE 307P APPLIED DSP PRACTICE (0 0 3 2)

Sampling, Quantization, and DSP Data Formats - FIR Filtering and Convolution, Filtering of Noisy Signals - Delays and FIR Filters, Reverb Filters and Multi-delay effects - Spectral Analysis by DFT/FFT

ELE 308P COMPUTER ORGANIZATION AND MICROPROCESSORS PRACTICE (0 0 3 2)

Use of ALU - Design and implementation of special purpose hardware for application specific computation, like HCF - Design and implementation of interfacing hardware, eg,. Serial I/O - Assembly Language programming and interfacing experiment with microprocessor/microcontroller kit

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MAN 302 QUALITY AND RELIABILITY MANAGEMENT (3 0 0 3)

Definition of Quality – Dimensions of quality – Quality control
Seven statistical tools of quality
Control charts for variables and attributes
New seven management tools – Process capability concepts – Concept of six sigma – Concept of Product Life cycle
Basic concept of ISO 9000 and other quality systems
Reliability – Introduction – Definitions – Reliability evaluation
Failure data analysis – Mean Time to Failure, Maintainability & Availability concepts – Reliability improvement techniques – Design for reliability

Text Books:

1. Montgomery, D. C., Introduction to Statistical Quality Control, 5 Edn, John Wiley, 2004.
2. Srinath. L. S, Reliability Engineering, 3 Edn , East-West Press, 1991.

References:

1. Burr. J. T, Elementary Statistical Quality Control, CRC Press, 2004.
2. Bromley. R, *et al.*, Practical Reliability engineering, 4 Edn, John Wiley, 2002.

ELE 310 ELECTRONIC MANUFACTURING & PACKAGING TECHNIQUES (3 0 0 3)

Discrete electronic components manufacturing: materials terminology, devices and circuits for displays, sensors, MEMS, and flexible electronics
Introduction to IC manufacturing and realization of passive components in ICs and VLSI; Electromagnetic interference, Yield and reliability, thermal budget and Current trends.
Design and noise issues in Electronic packaging, Packaging of power devices;
Printed wiring boards, interconnects, hybrids, surface-mount technology,
Physical integration of circuits, packages, boards and full electronic systems.
Package modeling and simulations: SPICE simulations of signals and noise

Text Books:

1. Lau J. H., Wataru, Nakayama, Prince J. L., Christine P. W. Wong, Electronic Packaging: Design, Materials, Process and Reliability, McGraw-Hill.
2. Ghosh A., Basavaraj V. H. and Shigekazu S., Manufacturing of electronic materials and components, American Ceramic Society, 1998

Reference:

1. Shina Sancy G., Six sigma electronics design and manufacturing, McGraw Hill.

ELE 311 VLSI DESIGN **(3 0 0 3)**

Review of MOS device operation; fabrication and layout;
Combinational and sequential logic design; verification and testing;
Arithmetic blocks, memory; architecture design;
Floor planning; design methodologies;
Example of a chip design;
Analysis and synthesis algorithms including circuit, switch and logic simulation, logic synthesis
Layout synthesis and test generation

Text Books:

1. Muroga. S, VLSI System Design, Wiley, 1982.
2. Geiger. R. L, Allen. P. E and Strader. N. R, VLSI Design Techniques for Analog and Digital Circuits, Tata McGraw-Hill, 1990.
3. Mark Zwolinski, Digital System Design with VHDL, Prentice Hall, 2003.

References:

1. Palnitkar. S. Verilog, HDL: A Guide to Digital Design and Synthesis, Prentice Hall, 2003.
2. Douglas J Smith, HDL Chip Design: A Practical Guide for Designing, Synthesizing and Simulating ASICs and FPGAs using VHDL or Verilog, Doone Publications, 1998.

ELE 312 PCB/PROTOTYPE DESIGN AND DEVELOPMENT **(2 0 0 2)**

Modern CAD tools for schematic formulation and verification: basics of netlist description SPICE circuit simulator, Design and implementation of circuits with PCB, assembly, schematic drawing, component layouts and artworks
Schematics, Finishing design, Explanation of board level annotation, netlisting, and reports
Introduction to Surface mounts vs. through-hole components, Hole sizes, drills, and mounting holes, different layers. Annular rings, clearance, and thermal relieve.
PCB design: Basics, board outline, grid setup, clearances setup, nets setup, the ratnest, part placement
Routing: manual routing – noise issues. Automatic routing, Finishing Error checking, manufacturing details
Coupling between lines, termination, ground plane, and good routing practices;
Documentation, Testing and debugging PCB's

Text Books:

1. Axelson. J., Making Printed Circuit Boards, Tata McGraw Hill, 1993.
2. Ronald. A. Reis, Electronic project design and fabrication, 6 Edn, Prentice Hall, 2005.

References:

1. Varteresian. J., Fabricating Printed Circuit Boards, 2002.
2. Complete PCB Design Using OrCad Capture and Layout, Elsevier, 2007.

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.

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 parity generator circuit using verilog HDL - Design of 2:1 and 4:1 multiplexer using Verilog HDL - Design a circuit in Verilog that takes a 4 bit number and which counts the number of one's in the input - Design a binary comparator that compares two 5-bit unsigned numbers a and b and generates the following code: 00 if both are equal, 01 if a < b and 10 if a > b - Design a counter that counts the following sequence 0,0,1,1,2,2,3,3,..,15,15,0,0,.. - Design of Fully pipelined Carry Look ahead Adder (CLA) - 32 bit - Design of Fully pipelined Wallace Tree Multiplier (WTM) - 32 bit - Design of Fully pipelined Load - Store Unit (LSU) - Design of ALU for integer operations - Design of pipelined processor - Design and implementation of super scalar processor

ELE 312P PCB/PROTOTYPE DESIGN AND DEVELOPMENT PRACTICE **(0 0 3 2)**

Design and development of PCBs using different simulator tools

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. Heath. S, Embedded Systems Design, 2 Edn, Newnes Publishers, 2007.
2. Valvano Jonathan W, Embedded Microcomputer Systems, CI Engineering, 2009.

Reference:

1. Labrosse Jean J., Embedded System Building Blocks, Complete and Ready to use Modules in C, 2 Edn, Cmp Books, 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.

ELE 402 DATA NETWORKS **(3 0 0 3)**

Importance and model of data communication systems, Discrete Information Source, Encoders, Modern Design Issues – Communication Channel-Characterization and Degrading Effects
Information Theoretic Concepts – Entropy, Information content of a message, Effect of communication noise – PAM system design, Spectrum shaping techniques
Error control coding, Syndrome computation – Introduction to Fiber-Optic Communication Technology
Evolution of Data networks – Network Standards and their relations
OSI: Network Design & Topology
Routing and flow control – Network Protocols and implementation, LAN, MAN & WAN Network Architecture
Queuing theory and performance evaluation, Network operating system, Multimedia System, High speed communication, Case study of different networks

Text Books:

1. Bertsekas. D. P, Data Networks, 2 Edn, Prentice Hall, 2006.
2. Stallings W., Data and Computer Communications, 8 Edn, William Stallings, 2007.

References:

1. Kurose. J. F and Ross. K. W, Computer Networking: A Top-Down Approach, 4 Edn, Pearson, 2007.
2. Tanenbaum. A. S, Computer Networks, 3rd Ed, Prentice Hall, 2004

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.