

B. TECH  
CURRICULUM  
AND  
SYLLABUS



**Semester I**

<b>Code</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
HSS101	English for technical communication I	2	0	0	2
MAT101	Mathematics I	3	0	0	3
PHY101	Physics I	3	0	0	3
CHY105	Chemistry	3	0	0	3
MEC101	Engineering Drawing	1	0	3	2
CIV101	Basic Civil and Mechanical Engineering	4	0	0	4
MEC181	Workshop	0	0	3	1
CHY181	Chemistry Laboratory	0	0	3	1
	<b>Total</b>	<b>16</b>	<b>0</b>	<b>9</b>	<b>19</b>

**Semester II**

<b>Code</b>	<b>Subject</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
HSS102	English for technical communication II	2	0	0	2
MAT102	Mathematics II	3	0	0	3
PHY102	Physics II	3	0	0	3
EEE101	Basic Electrical and Electronics Engineering	4	0	0	4
CHY101	Environmental Sciences	2	0	0	2
CSE102	Programming Languages	2	0	0	2
MEC103	Engineering Mechanics	3	0	0	3
PHY181	Physics Laboratory	0	0	3	1
CSE181	Programming Language Laboratory	0	0	3	1
	<b>Total</b>	<b>19</b>	<b>0</b>	<b>6</b>	<b>21</b>

**Semester III**

<b>CODE</b>	<b>SUBJECT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
MAT205	Mathematics III	3	0	0	3
ECE201	Electron Devices	3	1	0	4
ECE202	Digital Electronics	3	1	0	4
ECE203	Network Analysis	3	1	0	4
ECE204	Electromagnetic Fields	3	1	0	4
CSE255	Data Structures	3	0	0	3
ECE281	Electron Devices Laboratory	0	0	3	2
CSE295	Data Structures Laboratory	0	0	3	2
	Total	18	4	6	26

**Semester IV**

<b>CODE</b>	<b>SUBJECT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
MAT215	Mathematics IV	3	0	0	3
HSSxxx	Humanities Elective I	3	0	0	3
ECE205	Electronic Circuits	3	1	0	4
ECE206	Signals and Systems	3	0	0	3
ECE207	Integrated Electronics	3	1	0	4
ECE208	Control System Engineering	3	1	0	4
ECE282	Electronic circuits Laboratory	0	0	3	2
ECE283	Integrated Electronics Laboratory	0	0	3	2
	Total	18	3	6	25

**Semester V**

<b>CODE</b>	<b>SUBJECT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
ECExxx	Major Elective I	4	0	0	4
	Minor Elective I	3	0	0	3
ECE301	Digital Signal Processing	3	1	0	4
ECE302	Analog Communication	3	0	0	3
ECE303	Transmission lines and Waveguides	3	1	0	4
ECE304	Microprocessors and Microcontrollers	3	0	0	3
ECE381	Digital Signal Processing Laboratory	0	0	3	2
ECE382	Microprocessor Laboratory	0	0	3	2
	<b>Total</b>	<b>19</b>	<b>2</b>	<b>6</b>	<b>25</b>

**Semester VI**

<b>CODE</b>	<b>SUBJECT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
HSSxxx	Humanities Elective II	3	0	0	3
ECE305	Digital Communication	3	1	0	4
	Free Elective I	3	0	0	3
ECExxx	Major Elective II	3	0	0	3
	Minor Elective II	3	0	0	3
ECE306	Computer Communication Networks	3	1	0	4
ECE383	Communication Systems Laboratory	0	0	3	2
ECE384	Communication Networks Laboratory	0	0	3	2
	<b>Total</b>	<b>18</b>	<b>2</b>	<b>6</b>	<b>24</b>

**Semester VII**

<b>CODE</b>	<b>SUBJECT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
HSSxxx	Humanities Elective III	3	0	0	3
ECE401	Optical Communication	3	1	0	4
ECE402	Modeling of digital circuits using HDL	3	1	0	4
	Free Elective II	3	0	0	3
ECExxx	Major Elective III	3	0	0	3
ECExxx	Major Elective IV	3	0	0	3
ECE481	Microwave and Optical Communication Laboratory	0	0	3	2
ECE482	VLSI Design Laboratory	0	0	3	2
	Total	18	2	6	24

**Semester VIII**

<b>CODE</b>	<b>SUBJECT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
ECExxx	Self Study Elective	3	0	0	3
ECE499	Project Work	-	-	24	10
	Total	3	0	24	13

**MAJOR ELECTIVES**

<b>CODE</b>	<b>SUBJECT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
ECE316	Antenna and Wave Propagation	4	0	0	4
ECE317	Measurements and Instrumentation	4	0	0	4
ECE318	Information Theory and Coding	3	1	0	4
ECE319	Radio and Satellite Communication	4	0	0	4

ECE341	Television Engineering	3	0	0	3
ECE342	Advanced Digital Signal Processing	3	0	0	3
ECE343	Advanced Digital System Design	3	0	0	3
ECE344	Multimedia Compression Techniques	3	0	0	3
ECE425	Network Management	3	0	0	3
ECE426	Spread Spectrum Techniques	3	0	0	3
ECE427	Microwave Devices	3	0	0	3
ECE428	VLSI Signal Processing	3	1	0	3
ECE429	Digital Image Processing	3	0	0	3
ECE430	Microwave Integrated Circuits	3	0	0	3
ECE431	Wireless Communication	3	0	0	3
ECE432	DSP Integrated Circuits	3	0	0	3

### HUMANITIES ELECTIVES

Code	Subject	L	T	P	C
HSS001	Total Quality Management	3	0	0	3
HSS002	Engineering Management	3	0	0	3
HSS003	Indian Economic Development	3	0	0	3
HSS004	Industrial Psychology	3	0	0	3
HSS005	Consumer Psychology	3	0	0	3
HSS006	Professional Ethics	3	0	0	3
HSS007	Operations Management	3	0	0	3
HSS008	Basics of Economics	3	0	0	3
HSS010	International Trade and Finance	3	0	0	3
HSS011	Information Systems for Managerial Decision Making	3	0	0	3
HSS012	Advertising and Media Services	3	0	0	3
HSS013	Cost Analysis and Control	3	0	0	3
HSS014	Marketing Management	3	0	0	3
HSS015	Management Concepts and Techniques	3	0	0	3

HSS017	International Economics	3	0	0	3
HSS018	Communication Skills	3	0	0	3
HSS019	Operations Research	3	0	0	3
HSS020	Human Resource Management	3	0	0	3
HSS021	Public Finance Theory	3	0	0	3
HSS022	Banking Theory	3	0	0	3
HSS023	Entrepreneurship Development	3	0	0	3

### MINOR ELECTIVES

CODE	SUBJECT	L	T	P	C
ECE321	Digital MOS circuits	3	1	0	3
EEE355	Soft Computing	3	0	0	3
EEE365	Electrical Machines	3	0	0	3
INT355	Internet and Web Technology	3	0	0	3
EIE355	Advanced Control Systems	3	0	0	3
CSE355	Artificial Intelligence	3	0	0	3
EIE365	Medical Electronics	3	0	0	3
CSE365	Advanced Computer Architecture	3	0	0	3

**Total Credit (from 1<sup>st</sup> semester to 8<sup>th</sup> semester) = 177**

**SEMESTER I**

<b>HSS101</b>	<b>ENGLISH FOR TECHNICAL COMMUNICATION I</b> (common to all branches)	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**FOCUS ON LANGUAGE**

Parts of speech - Nominal compounds, noun phrases - Relative pronoun - Adjective - numerical, comparison and contrast, collocation and word combinations - Verb - Preposition and relative - Conjunction- connectives, expressions of purpose and function, cause and effect - Articles - adjectives - Sentence pattern - Tenses - Voice - Rewriting the sentences in impersonal/abbreviated passive grammatical structures - Concord - sentence level verb noun agreement - Gerund - rewriting infinitive into gerund - Imperative - rewriting imperative into recommendation using should - Word formation - varied grammatical function of the same word - Affixes - prefix and suffix, number prefix, negative prefix - Reported speech - Editing strategies - Conditional structures - real, unreal, no possibility, zero condition - Writing formal definition - Abbreviation and acronym - Idioms and phrases - Varieties of English - British versus American

**LISTENING SKILLS**

Comprehension practice - Vocabulary development - Familiarity to varied types of spoken English and accents - Developing ability to understand audio and video media - Aiming at overcoming barriers to listening - Listening to documentaries, radio news broadcasts, TV

news telecasts - Active listening in discussions and to lectures -  
Taking notes while listening - Extracting information from listening

### **SPEAKING SKILLS**

Oral practice - Role play - Interplay - Seminar - Transcoding visual into oral - Participating in short and longer conversation - Voice record, replay, correction of intonation, pronunciation and flow of speech - Phonemes - vowels, consonants, stress, rhythm, intonation - Group discussion - Participative learning - Acquiring proficiency, fluency, accuracy in oral communication - Speaking practice - Developing confidence - Extempore speech - Learning professional/conversational etiquette

### **READING SKILLS**

Vocabulary Extension - Improving vocabulary - Intensive reading - Reading Strategies - identifying topic sentence - guessing meaning from content - picking out specific information - professional reading - Reading practice - Predicting the content, critical and analytical reading - Reading articles in English newspapers, sports magazines, encyclopedias - Reading aloud, use of stress and intonation - Reading and comprehending technical materials - cloze reading

### **WRITING SKILLS**

Discourse Cohesion - Improving writing skills, avoiding common grammatical errors in academic writing - Extending the hints - Writing shorter sentences - Punctuation - Dialogue writing - Paragraph writing, problems and solutions, achieving coherence, transition words, sequence words - Essays of descriptive and argumentative - Writing instructions, use of imperatives - Jumbled sentences into sequential paragraph using linguistic clues - Report writing - technical reports, industry visit reports, events reports - Writing recommendations - Letter writing - formal and informal letters - job application and resume, permission for in-plant training, business correspondence letters, calling for quotation, placing order,

lodging complaint, persuasive letters - Assignment writing - Mini-project - Transcoding - transferring of information from text to pictorial/graphical representation and vice versa

**TEXT BOOK**

1. Rizvi M Ashraf, Effective Technical Communication, Tata McGraw-Hill, 2005.

**REFERENCES**

1. Daniel Jones, English Pronouncing Dictionary, Universal Book Stall, New Delhi, 17<sup>th</sup> Edition, 2000.
2. Geoffrey Leech, Fan Svartvik, A Communicative Grammar of English, Pearson Education Asia, 1994.
3. Hornby, AS, Oxford Advanced Learner’s Dictionary of Current English, OUP, 7<sup>th</sup> Edition, 2005.
4. Manivannan G, English for Engineers - A Book on Scientific and Technical Writing, Govi Publications, 2005.
5. Martin Cutts, Plain English Guide - How to Write Clearly and Communicate Better, Oxford University Press, 1999.

<b>MAT101</b>	<b>MATHEMATICS I</b> (Common to all Branches)	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**MATRICES**

Review of Linear algebra-Matrix operations - Addition, Scalar Multiplication, Multiplication, Transpose, Adjoint and their properties- Special types of matrices - Null, Identity, Diagonal, Triangular, Symmetric, Skew-symmetric, Hermitian, Skew-Hermitian, Orthogonal, Unitary, Normal- Rank- consistency of a system of linear equations- Solution of the matrix Equation  $Ax = b$  – row-reduced Echelon form

**EIGEN VALUE PROBLEMS**

Eigen value and eigen vector of real matrix – properties of eigen values and eigen vectors – Cayley- Hamilton theorem – Orthogonal

transformation of a real symmetric matrix to diagonal form – reduction of quadratic form to canonical form by orthogonal transformation – index, signature and nature of quadratic form

### **DIFFERENTIAL CALCULUS**

Review of limits - continuity and differentiability - Curvature – Cartesian and Parametric Co-ordinates – Centre and radius of curvature – Circle of curvature-evolutes - involutes - envelopes - partial differentiation –Euler’s theorem for homogeneous functions-total differential – Taylor’s expansion (two variables) - Maxima / Minima for functions of two variables – Method of Lagrangian multiplier – Jacobian multiplier

### **THREE DIMENSIONAL ANALYTICAL GEOMETRY**

Direction cosines and ratios – Angle between two lines – Equations of a plane – Equations of straight line – coplanar lines – shortest distance between two skew lines – sphere – tangent plane – plane section of a sphere – orthogonal spheres

### **ORDINARY DIFFERENTIAL EQUATIONS**

Solutions of second and higher order linear ODE with constant coefficients – Cauchy’s and Legendre’s linear equations - Simultaneous first order linear equations with constant coefficients - Method of variation of parameters

### **TEXT BOOKS**

1. Kreyszig, E, Advanced Engineering Mathematics, John Wiley and Sons (Asia) Limited, Singapore , 8<sup>th</sup> Edition, 2001.
2. Arumugam, S., et al, Engineering Mathematics Volume I, Scitech Publications (India) Pvt. Ltd., Chennai, 2<sup>nd</sup> Edn., Reprint 2000, 1999.

### **REFERENCES**

1. Grewal , B.S., Grewal, J.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 37<sup>th</sup> Edition., 5<sup>th</sup> Reprint 2004.

2. Venkataraman, M. K., Engineering Mathematics First Year, The National Publishing Company, Chennai, 2<sup>nd</sup> Edition., Reprint 2001.

<b>PHY101</b>	<b>PHYSICS I</b> (common to all branches)	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **ACOUSTICS AND STRUCTURE OF SOLIDS**

Classification of sound- Reverberation, Sabine's formula , Common acoustical defects and remedies – Classification of solids – Crystal structures, X-ray diffraction, crystal growth, Crystal defects

### **LASER AND FIBRE OPTICS**

Interaction of radiation with matter –quantum mechanical view, three and four level laser system, engineering and medical applications -Introduction of fibre optics- classification of optical fibre – engineering and medical applications

### **QUANTUM PHYSICS**

Inadequacy of classical mechanics –Black body radiation, Plancks law, Photoelectric effect, Compton effect ,Einstein's photoelectric equation, Schrödinger wave equation, Particle in one dimensional and three dimensional box

### **NDT, NEW ENGINEERING MATERIALS**

Ultrasonics – Ultrasonic flaw detectors, X-ray photography, Fluoroscopy, Thermography, Gamma ray spectroscopy , Characterization technique – Nanophase materials, Biomaterials, Non linear materials, Polymer materials

**DIGITAL ELECTRONICS**

Introduction – Analog to Digital conversion – Conversion of numbers – one's complement, 2's complement – Logic gates – Boolean algebra – DeMorgan's theorem – Karnaugh's maps.

**TEXT BOOK**

1. Gaur R. K. and Gupta S. L., Engineering Physics, Dhanpat Rai Publishers, New Delhi, 2001.

**REFERENCES**

1. Murthy V.S.R., et al, Structures and Properties of Engineering Materials, Tata McGrawHill, New Delhi, 2003.
2. Ali Omar. M., Elementary Solid State Physics, Pearson Education (Singapore), IndianBranch, New Delhi, 2006.
3. William F. Smith., Foundations of materials science and Engineering, McGraw Hill, New York, 3<sup>rd</sup> Edition , 2003.
4. Mathews. P.M., Venkatesan. K., Text Book of Quantum Mechanics, Tata McGraw Hill company, Delhi, 2003.
5. Gupta S.L., Kumar.V., Hand book of Electronics, Pragati Prakashan, Meerut, 28<sup>th</sup> Edition, 2001.

<b>CHY105</b>	<b>CHEMISTRY</b> (Common to ECE, EEE and EIE)	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**WATER**

Water Quality Parameter (Industry and Drinking Water) – Hardness, Definition, Classifications, Expressions, Units of Hardness of Water with respect to CaCO<sub>3</sub>, Problems -Estimation of Hardness by EDTA Method (Theory Only) - Definition of Alkalinity (Theory Only) – Boiler feed water - Requirements, Disadvantages of using hard water in boilers, Removal of boiler scales, sludges - Water Softening - Zeolite Process, Demineralization – Ion – Exchange Process, Desalination

**CORROSION SCIENCE AND CONTROL ENGINEERING**

Corrosion – definitions – Electrode potential - Principles of Dry and Wet Corrosion, Factors Influencing rate of corrosion, Types of Corrosion - Corrosion Control – Impressed Current Cathodic Protection and Sacrificial Anodic Protection Method - Corrosion Inhibitors – Protective Coatings, Surface conversion coatings, organic coatings, paints

**POLYMERS**

Introduction – Classification – Difference Between Thermoplastic and Thermosetting Plastics – Properties of Plastic - Degree of Polymerization – Types of Polymerization (Mechanism) - Phenol Formaldehyde Resin, Epoxy Resin, polyurethanes, Teflon -Amino Resins (Urea Formaldehyde, Nylon-11, Nylon-66 & Nylon-6), PET, PVC – Composites - Definition, characteristics, Constituent – Types – Fibre reinforced plastics (FRP), Metal Matrix Composites (MMC), Ceramic Matrix Composites – Properties and Applications

**INSTRUMENTAL METHODS OF ANALYSIS**

Electro Magnetic Radiation - Absorption of Radiation , Beer - Lambert's Law – UV-VIS. Spectroscopy – IR Spectroscopy - Principle and Instrumentation, Block Diagram – Estimation of Iron by Calorimetry – Flame Photometry, Principle and Estimation of Sodium by Flame Photometry - Atomic Absorption Spectroscopy, Principle and Instrumentation , Quantitative Estimation of Nickel by Atomic Absorption Spectroscopy

**ENERGY STORAGE DEVICES AND NANOTECHNOLOGY**

Batteries - Introduction, Primary and Secondary Batteries - Dry Cell - Alkaline Batteries, Lead Acid Storage Cell, NICAD Battery, Lithium Batteries – Fuel Cell ( Hydrogen - Oxygen Fuel Cell) – Photo Galvanic Cell - Chemical Structure and Electronic Behavior of Conduction Polymer, Semi Conducting Properties of Organic Polymers containing Metal Group Such as Polyferrocenes - Optical

Fibre Principle and Structure, Characteristic of Optical Fibre, Photoresist Optical Fibre, Advantages of Optical Fibres - Nanotechnology – Introduction, Preparation, Characterization and Application

**TEXT BOOKS**

1. Jain,P.C, Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing company (Pvt) Ltd.,New Delhi, 14<sup>th</sup> Edition 2002.
2. Sharma, B.K., Industrial Chemistry, Goel Publishing House, Meerut, 12<sup>th</sup> edition 2001.

**REFERENCES**

1. Puri B.R.and Sharma L.R. Principles of Physical Chemistry, Shoban Lal Nagin Chand & Co., Jalandhar, 40<sup>th</sup> edition 2003.
2. Vogel A.I., A text book of Quantitative Inorganic Analysis, ELBS, London, 3<sup>rd</sup> edition, 2000.
3. Mick Wilson, Kamali Kannangara, Nanotechnology: Basic science and emerging technology, Overseas India Pvt. Ltd. Press, New Delhi, 2005.
4. Bandyopadhyay, A.K., Nano materials, New Age International Publishers, New Delhi, 2007.

<b>MEC101</b>	<b>ENGINEERING DRAWING</b> (common to all branches)	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>1</b>	<b>0</b>	<b>3</b>	<b>2</b>

**INTRODUCTION**

Importance of graphics – use of drafting instruments – BIS conventions and specifications – size, layout and folding of drawing sheets – lettering dimensioning and scales - Orthographic principles - free hand sketching in first angle projection from pictorial views.

**PROJECTION OF POINTS, STRAIGHT LINES AND PLANES**

Projection of points, located in all quadrants - projection of straight lines located in the first quadrant, determination of true lengths and true inclinations, location of traces - projection of polygonal surface and circular lamina located in first quadrant inclined to one or both reference planes.

### **PROJECTION AND SECTION OF SOLIDS**

Projection of solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method. Section of above solids in simple vertical position by cutting planes inclined to any one of the reference planes, obtaining true shape of section.

### **DEVELOPMENT OF SURFACES**

Development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders and cones - development of lateral surfaces of combined solids – prism and cylinder, cylinder and cylinder with axes at right angles with no offset.

### **ISOMETRIC AND PERSPECTIVE PROJECTION**

Principles of isometric projection – isometric view and projections of simple solids, truncated prisms, pyramids, cylinders and cones. Perspective projection of prisms, pyramids and cylinders by visual ray and vanishing point methods.

### **TEXT BOOK**

1. Bhatt, N.D., Engineering Drawing, Charotar publishing House, New Delhi, 46<sup>th</sup> Edition, 2003.

### **REFERENCES**

1. Natarajan, K.V., A text book of Engineering Graphics, Dhanalakshmi Publishers, Chennai, 2006.
2. Shah, M.B., and Rana, B.C., Engineering Drawing, Pearson Education, New Delhi, 2005.

3. Gopalakrishnana, K.R., Engineering Drawing (Vol. I and II), Subhas Publications, 1998.
4. Luzadder and Duff, Fundamentals of Engineering Drawing, Prentice Hall of India Pvt Ltd, New Delhi, XI Edition, 2001

<b>CIV 101</b>	<b>BASIC CIVIL AND MECHANICAL ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	(common to all branches)	<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

### **CIVIL ENGINEERING**

#### **BUILDINGS**

Characteristics of good building materials such as stones, bricks, plywood and ceramic tiles, timber, cement, aggregates and concrete - Basic functions of buildings – Major components of buildings – Foundations - Purpose of a foundation – Bearing capacity of soils – types of foundations. Proper methods of construction of Brick masonry – Stone masonry – Hollow Block masonry. Beams – Lintels – Columns – Flooring – Damp proof course – surface finishes – Doors and windows – Roofing.

#### **TRANSPORTATION ENGINEERING**

Principles and Classification of surveying, Chain surveying, Compass surveying and leveling - Importance of roads – Classification of Highways –water bound macadam, bituminous and cement concrete roads –. Railways - Importance of railways – Gauges – Components of a permanent way. Bridges - Components of Culverts – Causeways, Slab Bridge, T-beam and slab bridge, Suspension bridge

#### **MECHANICAL ENGINEERING**

##### **BOILERS AND TURBINES**

Boilers - boiler mountings and accessories – Cochran boiler, Locomotive boiler, Babcock and Wilcox boiler, fire and water tube boilers - Steam turbine - single stage impulse turbine, Parson's reaction turbine, difference between impulse and reaction turbines.

**POWER PLANTS AND INTERNAL COMBUSTION (IC) ENGINE**

Classification of power plants – steam, nuclear, diesel and hydro power plants - Alternate sources of energy - solar, wind, tidal, geothermal, ocean thermal energy conversion. – IC engine - components, working of four and two stroke petrol and diesel engines.

**PRODUCTION TECHNOLOGY**

Metal casting and forming process –patterns, moulding, melting of cast iron, casting – forging – rolling – extrusion – drawing - Metal joining process - welding – arc welding, gas welding, brazing and soldering - Metal machining – lathe, drilling machine, milling machine, shaping machine, planing machine, introduction to Computer Numerical Control machining.

**TEXT BOOK**

1. Shanmugam, G., and Palanichamy, M.S., Basic Civil and Mechanical Engineering, Tata McGraw Hill Publishing Co., New Delhi, 1996.

**REFERENCES**

1. Khanna, K., Justo C E G, Highway Engineering, Khanna Publishers, Roorkee, 2001
2. Arora S.P. and Bindra S.P., Building Construction, Planning Techniques and Method of Construction, Dhanpat Rai and Sons, New Delhi, 1997.
3. Venugopal K., Basic Mechanical Engineering, Anuradha Publications, Kumbakonam, 2000.
4. Shanmugam G., Basic Mechanical Engineering, Tata McGraw Hill Publishing Co.,New Delhi, 2001.

<b>MEC181</b>	<b>WORK SHOP</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
---------------	------------------	----------	----------	----------	----------

		<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>
--	--	----------	----------	----------	----------

**CARPENTRY**

Carpentry tools - practice in marking, sawing, planing and chiseling – making simple joints: lap joint, T-joint, dovetail joint, mortise and tenon joint.

**FITTING**

Fitting tools - practice in marking, filing, punching, hacksawing - fitting to size and drilling - making of simple mating profiles: V, square, dovetail, half round joints.

**SHEET METAL**

Study of press, die and tools - sheet metal layout - development of lateral surfaces -simple exercises: blanking, forming, bending and flanging.

**DRILLING**

Drilling and tapping in drilling machines

**DEMONSTRATION ON**

- i) Welding operations like butt joint and lap joints in Arc welding
- ii) Foundry operations like mould preparation for split pattern
- iii) Smithy operations like the production of hexagonal bolt
- iv) Preparation of plumbing line sketches – basic pipe connections involving the fittings like valves, taps, couplings, unions, reducers, elbows and other components used in household fittings.

<b>CHY 181</b>	<b>CHEMISTRY LABORATORY</b> (Common to all branches)	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>

1. Preparation of standard and buffer solutions.
2. Estimation of hardness of water sample by EDTA method
3. Determination of dissolved oxygen in a sample of water

4. Estimation of chloride and fluoride ions in water sample
5. Determination of alkalinity of water sample
6. Estimation of hydrochloric acid by pH titration
7. Estimation of ferrous ion by potentiometric titration
8. Estimation of mixture of acid by conductometric titration
9. Estimation of iron by spectrophotometric method.
10. Flame photometry – Determination of Na & K

**SEMESTER II**

<b>HSS102</b>	<b>ENGLISH FOR TECHNICAL COMMUNICATION II</b> (Common to all branches)	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**GRAMMAR AND VOCABULARY**

Grammar and Vocabulary - Introduction to grammatical models - Proper use of tenses, concord, voice, articles, punctuation, modal auxiliaries

**RECEPTION SKILLS**

Listening and Language Development - Improving listening skills - comprehension practice - classroom lectures, simple technically oriented passages - Listening to news bulletins, pre-recorded talks, different speech styles – comprehending the essential meaning - Physical and psychological barriers to listening - Steps to overcome the barriers - Practice in note-taking while listening

**SPEAKING TECHNIQUES**

Speaking practice - Improving conversing skills - Improving self-expression - Developing confidence and fluency in oral communication - Physical and psychological barriers to speaking - Steps to overcome the barriers - Formal and public speaking practice - Extemporaneous talk practice - Speech process - fluency and accuracy in speech - Developing persuasive speaking skills - Conversation in a given milieu, social and cultural surroundings - Practice in giving small talks on local topics for a minute or two - Goal oriented group discussion - Participating in seminars - Independent and effective communication

**READING STRATEGIES**

Reading comprehension - Vocabulary extension methods - Speed reading practice - technical and non-technical materials - Practice in various reading techniques - skimming, scanning, eye reading - Looking for specific information - Comprehending the given passages, technical information

**WRITTEN COMMUNICATION**

Basic grammatical structures - Alphabet of other languages - Paragraph writing - Expressing the idea in writing - Avoiding and correcting common errors - Effective writing techniques - brevity, clarity, objectivity and simplicity - Discourse writing - definition, description, instruction - Note-making - Proof reading - Mechanics of writing - Writing formal, informal letters, Technical reports - Reference skills - using dictionary

**TEXT BOOKS**

1. Rizvi M. Ashraf, Effective Technical Communication, Tata McGraw-Hill, 2005.
2. Rutherford Andrea J., Basic Communication Skills for technology, Pearson Education, 2002.

**REFERENCES**

1. Deborah C Andrews, Margaret D Bickle, Technical Writing - Principles and Forms, Macmillan, 1978.
2. Manivannan G, English for Engineers - A Book on Scientific and Technical Writing, Govi Publications, 2005.
3. Sarah Freeman, Written Communication in English, Orient Longman, 2000.
4. Thomson A J, AV Martinet, A Practical English Grammar, Oxford University Press, 4<sup>th</sup> Edition, 1986.
5. Tom Hutchinson, Alan Waters, English for Specific Purpose, Cambridge University Press, 1987.

<b>MAT102</b>	<b>MATHEMATICS II</b> (Common to all Branches)	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**SEQUENCES AND SERIES**

Convergence and divergence of infinite series – series of positive terms – comparison, D’Alembert’s ratio, Raabe’s and Cauchy’s root tests – Convergence of alternating series – Leibnitz’s test ( proof of theorems and tests not included) – elementary notions of absolute and conditional convergence - Power series – Taylor’s theorem(one variable)

**ANALYTIC FUNCTION AND CONFORMAL MAPPING**

Function of a complex variable – Analytic function – Necessary conditions – Cauchy – Riemann equations – Sufficient conditions (excluding proof) – Properties of analytic function – Harmonic conjugate – Construction of Analytic functions - Conformal mapping -  $w = z+a$ ,  $az$ ,  $1/z$ ,  $e^z$ ,  $\sin z$ ,  $\cos z$  and bilinear transformation – fixed points – cross ratio

**COMPLEX INTEGRATION**

Statement and application of Cauchy’s integral theorem and integral formula – Taylor and Laurent expansions – Isolated singularities – Residues - Cauchy’s residue theorem - Contour integration over unit

circle and semicircular contours (excluding poles on boundaries)-  
evaluation of real integrals using contour integration

**MULTIPLE INTEGRALS**

Review of Riemann integrals - Double integration – Cartesian and polar coordinates – change of order of integration – change of variable between Cartesian and polar – area as double integral – Triple integration in Cartesian, cylindrical and spherical polar coordinates – volume as triple integral

**VECTOR CALCULUS**

Gradient, Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stoke’s theorem (excluding proof) – Simple applications

**TEXT BOOKS**

1. Kreyszig, E, Advanced Engineering Mathematics, John Wiley and Sons (Asia) Limited, Singapore , 8<sup>th</sup> Edition., 2001.
2. Arumugam, et al, A., Engineering Mathematics Volume II, Scitech Publications (Pvt) Ltd., Chennai, 2000

**REFERENCES**

1. Grewal , B.S., Grewal, J.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi, 37<sup>th</sup> Edition., 2004.
2. Venkataraman, M. K., Engineering Mathematics First Year, The National Publishing Company, Chennai, 2<sup>nd</sup> Edition 2001.
3. Venkataraman, M. K., Engineering Mathematics –III A, The National Publishing Company, Chennai, 11<sup>th</sup> Edition., 2002.

<b>PHY102</b>	<b>PHYSICS II</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	(Common to ECE, EEE and EIE)	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**CONDUCTING MATERIALS**

Electron theory of solids – classical free electron theory, quantum free electron theory, Band theory of solids

### **SEMI CONDUCTING AND SUPER CONDUCTING MATERIALS**

Semi conducting materials - Introduction, Types of semi conducting materials, carrier concentration - Hall effect – determination of Hall coefficient - Superconducting Phenomena Properties of superconductors -Type I and Type II superconductors, High T<sub>c</sub> Superconductors, Application of super conductors

### **MAGNETIC MATERIAL**

Classical theory of magnetism quantum theory of paramagnetism, Ferromagnetism , Ferrites , Applications of magnetic materials

### **DIELECTRIC MATERIALS AND OPTICAL MATERIALS**

Electronic, Ionic, orientational and space charge polarization , Internal field and deduction of Clausius – Mosotti relation ,properties of Dielectric materials, classification of insulating materials optical properties of semiconductor- imperfection of crystals, Luminescence , Fluorescence and phosphorescence , Light Emitting Diode, Liquid crystal displays

### **ENGINEERING MATERIALS**

Metallic glasses as transformer core material, Nanophase materials, shape memory alloys, Biomaterials (metals & alloys, ceramics) -Non linear materials – Second harmonic generation, Optical mixing, Optical phase Conjugation, Solitons, IC packaging materials

### **TEXT BOOK**

1. Arumugam.M., Materials Science, Anuradha Agencies, Kumbakonam, 3rd Edition,2003.

### **REFERENCES**

1. Aswani K.G., A Text book of Material Science, S.Chand & Co., Ltd., New Delhi, 2nd Edition, 2001.
2. William F.Smith, Foundations of Materials Science and Engineering, McGraw-Hill, New York, 3<sup>rd</sup> Edition, 2003.
3. Wahab M.A., Solid State Physics, Narosa Publishing House, New Delhi, 1999.
4. Pillai S.O., Solid State Physics, New Age International Publication, New Delhi, 5th edition, 2003.
5. Ali Omar.M., Elementary Solid State Physics, Pearson Education, Singapore, Indian Branch, New Delhi, 2002.
6. Murthy V.S.R. et al, Structure and Properties of Engineering Materials, Tata McGraw-Hill Publishing Company Ltd, New Delhi, 2003.

<b>EEE101</b>	<b>BASIC ELECTRICAL AND ELECTRONICS ENGINEERING</b> (common to all branches)	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **ELECTRICAL CIRCUITS**

Introduction to electric circuits – laws of electric circuits– Ohm’s Law, Kirchoff’s Laws– analysis of DC circuits–mesh, nodal – introduction to AC circuits– average Value, RMS value, power and power factor–analysis of 3 phase AC circuits – balanced and unbalanced circuits

### **ELECTRICAL MACHINES**

DC Machines –principle of operation–DC generators–emf equation, characteristics, types– DC motors–shunt, series, compound– single phase transformer – principle of operation, emf equation, phasor diagram –induction motors–single phase, three phase–alternators–principle of operation, emf equation , characteristics

### **ELECTRICAL MEASUREMENTS**

Moving coil –ammeter, voltmeter – moving iron instruments – ammeter, voltmeter – dynamometer – wattmeter, energy meter

**BASIC ELECTRONICS**

Semiconductor devices – introduction, construction, types – pn junction diode –working principle, characteristics– zener diode–working principle, characteristics uni–junction transistor– operation, characteristics –field effect transistor– operation, characteristics– bipolar junction transistor– operation, characteristics–applications– half wave and full wave rectifiers

**DIGITAL ELECTRONICS**

Introduction to binary number system–logic gates –AND, OR, NOT, NAND, NOR, exclusive OR–boolean algebra– combinational circuits – half adder, full adder, half subtractor, full subtractor

**INTEGRATED CIRCUITS**

Operational amplifier–introduction, DC characteristics, AC characteristics–types of operational amplifier–inverting, non–inverting– applications– scalar, adder, Subtractor, differentiator, and integrator

**TEXT BOOKS**

1. Edward Hughes., Electrical &Electronics Technology, Pearson Education ltd, 9<sup>th</sup> edition, 2005.
2. Kothari.D.P.,and.Nagrath.I.J.,Basic Electrical Engineering, Tata McGraw Hill,2<sup>nd</sup> Edition.

**REFERENCES**

1. Malvino,A P., Electronic Principles, TataMcGraw Hill International, 1998.
2. Vincent Del tora.,Electrical Engineering fundamentals, Prentice hall of India , 2<sup>nd</sup> edition 2003.
3. Muraleedharan.K.A., Muthusubramanian .R., and Salivahanan .S., Basic Electrical and Electronics and Computer Engineering, Tata McGraw Hill, 1997.

<b>CHY 101</b>	<b>ENVIRONMENTAL SCIENCES</b> (Common to all branches)	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**NATURAL RESOURCES**

Definitions – Scope of Environmental Sciences - Forest Resource – Food Resource – Land Resource – Water – Mineral resources - Utilization of Natural Resource, Impact on Environment – Conservation of Natural Resources

**ECOSYSTEM AND BIODIVERSITY**

Concept – Structure and Function – Energy Flow in Ecosystem – Ecological Succession – Food Chain – Food Web, Ecological Pyramids – Biodiversity, Definition, Values, Threats to Biodiversity, Conservation of Biodiversity

**ENVIRONMENTAL POLLUTION**

Definition – Causes, Effects, Control Measures – Air, Water, Soil Pollution – Thermal and nuclear Pollution

**MANAGEMENT OF ENVIRONMENTAL POLLUTION**

Solid Waste Management – Treatment Methods adopted for Municipal Sewage and Industrial Effluent – Hazardous and Biomedical Waste Management

**TOOLS FOR ENVIRONMENTAL MANAGEMENT**

Environment Impact Assessment – Precautionary and Polluter Pay Principle - Constitutional Provision – Air, Water and Forest - Waste Minimization Techniques, Cleaner Technology Options – Bioremediation

**TEXT BOOK**

1. Dhameja, S.K., Environmental engineering and Management, S. K. Kataria and sons, New Delhi, 2004.

**REFERENCES**

1. Bharucha Erach, The Biodiversity of India, Mapin Publishing Pvt. Ltd., Ahmedabad, 2001.
2. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. USA, 2<sup>nd</sup> edition 2004.
3. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and
4. Standards, Vol. I and II, Enviro Media., New Delhi, 2<sup>nd</sup> edition 2004.
5. Masters, G. M., Introduction to Environmental Engineering & Science, Prentice Hall, New Delhi, 2<sup>nd</sup> edition 1997.
6. Henry, J. G., Heike, G. W. Environmental Science & Engineering, Prentice Hall International, New Jersey, 2005.

<b>CSE102</b>	<b>PROGRAMMING LANGUAGES</b> (common to all branches)	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>

**BASIC ELEMENTS OF C AND CONTROL STATEMENTS**

Introduction to C- Structure of C language – Lexical elements of C- Operators and Expressions-Operator precedence and associativity of operators -Input and Output Functions-Library Functions –Header Files-Simple Computational problems. Decision Making: if statement - if-else statement - else-if ladder - switch statement – Looping Control Structure - the break statement - ? : operator - Continue statement - goto statement – Problems using Control Structures.

**FUNCTIONS, PROGRAM STRUCTURES AND ARRAYS**

Prototypes and Functions – Declaring, defining and accessing Functions- Parameter passing methods-Recursion - Storage Classes - Automatic Variables -External Variables – Static and Register Variables – Programs using functions. Defining and Processing an Array - Passing Arrays to Functions - Multidimensional Arrays -

Arrays and Strings - Enumerated data types-Programs using sorting, searching and merging of arrays.

### **POINTERS, STRUCTURES AND UNIONS**

Pointer Fundamentals - Pointer Declarations - Passing Pointers to Functions - Arrays and Pointers - Pointers and One-Dimensional Arrays - Pointers and Multidimensional Arrays - Operations on Pointers - Pointers and Structures - Dynamic Memory Allocation – Command Line Arguments – Programs using Pointers with Functions, Arrays and Structures. Defining a Structure - Processing a Structure - User-Defined Data Types – Union – Nested structure - Structures and Pointers - Passing Structures to Functions - Self Referential Structures.

### **DATA FILES AND DATA STRUCTURES**

Opening and Closing a Data File - Creating a Data File - High Level File Operations - Processing and Updation of Data Files - Unformatted Data Files - Low Level Programming – File Handling Programs. Linked List – Creation, Insertion and Deletion of elements - Stack and Queue implementation using Linked List.

### **UNIX BASICS AND SHELL PROGRAMMING**

Shell Fundamentals - Shell Commands - Shell Decisions and Repetitions - Command line usage - Wildcard expansion - Redirection of I/O, pipes and filters. Shell Programming - Simple scripts - Specifying the interpreter - Shell variables - The Environment - Control flow; test, if, for, while, case - Command substitution - Signal catching - Shell functions - Aliases - Reading from the Standard I/P - Startup Files - basename and dirname - Expression evaluation.

### **TEXT BOOKS**

1. Byron S. Gottfried, Theory and Problems of Programming with C, Tata McGraw Hill, Second Edition, 1996.
2. Lowell Jay Arthur and Ted Burns, UNIX Shell Programming,

John Wiley & Sons Canada, Ltd, Fourth Edition, 1997.

3. Deshpande P.S, Kakde O.G, C & Data Structures , Dreamtech Press, First edition, 2004

### REFERENCES

1. Brian Kernighan W, Dennis Richie M, The C Programming language, Pearson Education,2005.
2. Johnsonbaugh R.and Kalin M, Applications Programming in ANSI C, Pearson Education, Third Edition ,2003.
3. Behrouz A.Forouzan and Richard Gilberg F, A Structured Programming Approach Using C, Brooks-Cole Thompson Learning Publications, Second Edition, 2001.
4. Bruce Molay, Understanding UNIX/LINUX Programming: A Guide to Theory and Practice, Prentice Hall, First Edition, 2002.
5. Glass, G., Ables, K. UNIX for Programmers and Users, Prentice Hall, 1999.
6. Stephen Kochan and Patrick Wood, UNIX Shell Programming, Pearson Education, Third Edition, 2003.

<b>MEC103</b>	<b>ENGINEERING MECHANICS</b> (Except CSE, IT and Bio-Tech)	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### STATICS OF PARTICLES

Fundamental principles and concepts - vector algebra, Newton's laws, gravitation, force external and internal, transmissibility - velocity and acceleration - Couple- Moment about point and about axis - Varignon's theorem - resultant of concurrent and non-concurrent coplanar forces - static equilibrium, free body diagram, reactions - Problem formulation concept in 2-D and 3-D statics.

### TRUSSES AND FRAMES

Trusses - assumptions, rigid and non-rigid trusses- simple trusses in plane and space- analysis by method of joints and by method of

sections- compound trusses-statically determinate, rigid, and completely constrained - analysis of frames and machines.

**FRICTION**

Frictional forces- laws of friction- simple contact friction - rolling resistance - belt friction.

**PROPERTIES OF SURFACES AND SOLIDS**

Centroids of lines - areas, volumes, composite bodies - center of mass - area moment of Inertia - mass moment of inertia - principal moment of inertia.

**DYNAMICS OF PARTICLES**

Displacements, velocity and acceleration, their relationship – relative motion – Curvilinear motion – Newton’s law – work Energy equation of particles – impulse and momentum – impact of elastic bodies.

**TEXT BOOK**

1. Beer, F.P., and Johnson, E.R., Vector Mechanics for Engineers – Statics and Dynamics, Tata McGraw Hill, New York, 2004.

**References:**

1. Merriam, J.L., Engineering Mechanics, Volume I – Statics, and Volume – II, Dynamics 2/e, Wiley International,1998.
2. Irving , H., Shames, Engineering Mechanics, Statics and Dynamics, Third Edition, Prentice Hall of India Pvt. Ltd., 1993.

<b>PHY 181</b>	<b>PHYSICS LABORATORY</b> (Common to all Branches)	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>

1. To determine the acceleration due to gravity using Compound Pendulum
2. To determine the Rigidity Modulus of wire using Torsional Pendulum
3. To find thickness of the given two glass plates using single optic lever
4. To determine the thermal conductivity of a bad conductor – Lee's disc method.
5. To determine the refractive index of the material of the prism
6. To find the prominent wave length of mercury spectrum using grating
7. To determine the particle size using Laser
8. To determine the coefficient of viscosity of the liquid by Poiseuille's method
9. To determine the young's modulus of given material using Uniform Bending
10. To Determine the thickness of a given material using Air wedge method
11. To determine the focal length of a biconvex lens using Newton's Rings method
12. To determine the velocity of ultrasonic waves in the liquid using ultrasonic Interferometer

<b>CSE181</b>	<b>PROGRAMMING LANGUAGE LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
	(common to all branches)	<b>0</b>	<b>0</b>	<b>3</b>	<b>1</b>

**WORD PROCESSING, SPREADSHEET, POWERPOINT**

1. To create an advertisement in Word.
2. To illustrate the concept of mail merging in word.
3. To create a spread sheet to analyze the marks of the students of a class and also to create appropriate charts.
4. To create the presentation for the department using Power Point.

**C PROGRAMMING**

5. To write a simple menu driven calculator program using switch statement
6. To write a program to print Pascal's triangle.
7. To write a program for electricity bill preparation.
8. To write a program to print the sine and cosine series.
9. To print Fibonacci series up to N numbers.

**ARRAYS AND FUNCTIONS**

10. To write a program to perform Matrix multiplication.
11. To write a program to sort a given set of numbers.
12. To write a program to perform string manipulation manipulations function like string concatenations, comparison, find the length and string copy without using library functions.
13. To write a program to arrange names in alphabetical order.
14. To write a C program to check whether a number is palindrome or not using functions.
15. To write a program to calculate the factorial of the given number using functions.

**POINTERS, STRUCTURES AND FILES**

16. To print the mark sheet of n students using structures.
17. To write a program using pointers to access the elements of an array

and count the number of occurrences of the given number in the array.

18. To write a program to find the average of numbers using files.
19. To write a program to merge the given two files arguments using command line arguments.

### **UNIX PROGRAMMING**

20. Study of Basic UNIX Commands.
21. Implement ls Command.
22. Write a shell script to determine the properties of a given file.
23. Implement grep function.
24. Write a shell script to find the factorial of given number.
25. Write a shell script to evaluate the given expression using switch-case.

<b>MAT205</b>	<b>MATHEMATICS III</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**GRAPH THEORY**

Introduction of Graphs Paths, Cycles and Trails. Vertex Degrees and Counting. Directed Graphs – Trees and Distance Basic Properties. Spanning Trees and Enumeration Optimization and Trees

**LAPLACE TRANSFORM**

Definition of Laplace Transform, Linearity property, condition for existence of Laplace Transform; First & Second Shifting properties, Laplace Transform of derivatives and integrals; Unit step functions, Dirac delta–function. Differentiation and Integration of transforms, Convolution Theorem, Inversion. Periodic functions. Evaluation of integrals by L.T., Solution of boundary value problems.

**Z – TRANSFORM**

Z–Transform : Z–transform – elementary properties – Inverse Z–transform – convolution theorem – formation of difference equation – solution of difference equation using Z–transform.

**FOURIER SERIES**

Dirichlet’s conditions – General Fourier series – odd and even functions – Half range sine and cosine series – complex form of Fourier series – Parseval’s identity – Harmonic analysis

**FOURIER TRANSFORM**

Fourier Transform : Fourier Integral formula, Fourier Transform, Fourier sine and cosine transforms. Linearity, Scaling, frequency shifting and time shifting properties. Self reciprocity of Fourier Transform. Convolution theorem. Application to boundary value problems.

**TEXT BOOK**

1. B.S.Grewal , J.S.Grewal , Higher Engineering Mathematics, Khanna Publishers, 38<sup>th</sup> Edition

**REFERENCE**

1. Kreyszig, E, Advanced Engineering Mathematics, John Wiley and Sons (Asia) Limited, Singapore, 8<sup>th</sup> Edition, 2001.

<b>ECE 201</b>	<b>ELECTRON DEVICES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**ELECTRON BALLISTICS AND INTRINSIC SEMICONDUCTORS**

Energy band structure of conductors, semiconductors and insulators – Density distribution of available energy states in semiconductors – Fermi - Dirac probability distribution function at different temperatures – Thermal generation of carriers – Calculation of electron and hole densities in intrinsic semiconductors – Intrinsic concentration – Mass Action Law

**SEMICONDUCTOR AND PN JUNCTIONS**

Majority and Minority charge carriers – Mobile charge carriers and immobile ions – Drift current in good conductors – PN junction – formation of depletion layer – junction or barrier voltage – forward biased PN junction – reverse biased PN junction – reverse saturation current – Forward & reverse V/I characteristics – junction breakdown – junction capacitance – equivalent circuit of a PN junction – Mechanism of avalanche and Zener breakdown

**BIPOLAR JUNCTION TRANSISTORS AND FIELD EFFECT TRANSISTORS**

Construction of PNP and NPN transistors – BJT current components – Emitter to Collector and Base to Collector current gains – CB and CE characteristics – Breakdown characteristics – Ebers - Moll model

– Transistor switching times – Construction and Characteristics of JFET – Relation between Pinch off voltage and drain current – MOSFET – Enhancement and depletion types

### **METAL SEMICONDUCTOR CONTACTS AND POWER CONTROL DEVICES**

Metal Semiconductor Contacts – Energy band diagram of metal semiconductor junction – Schottky diode and ohmic contacts. Power control devices – Characteristics and equivalent circuit of UJT – intrinsic stand off ratio – PNP diode – Two transistor model, SCR, Triac, Diac and IGBT

### **OPTOELECTRONIC AND OTHER DEVICES**

Spectral Response of Human Eye – Light Emitting Diode – Photo emissive devices – Photomultiplier Tube – Photo Voltaic devices – Bulk Type – Photoconductive Cells – Photodiodes – PN junction Photodiode – PIN Photodiode – Avalanche Photodiode – Piezoelectric Crystals – Voltage Variable Capacitor Diodes – Thermistors – Tunnel Diodes – Tunnel Diode Circuits

### **TEXT BOOKS**

1. Jacob Millman, Christos C.Halkias, Electronic Devices and Circuits, TMH , 1991
2. David A. Bell, Electronic Devices and Circuits, PHI., 3<sup>rd</sup> Edition, 1998

### **REFERENCES**

1. Donald A.Neaman, Semiconductor Physics and Devices, TMH, 3<sup>rd</sup> Edition., 2002
2. A.P. Malvino, Electronic Principles, TMH, 3<sup>rd</sup> Edition, 27<sup>th</sup> Reprint, 2002
3. Ben G. Streetman, Sanjay Banarjee, Solid state electronic devices, PHI, 5<sup>th</sup> Edition, 2005.
4. Thomas L Floyd, Electronic Devices (Conventional Flow Edition), Pearson Education, 7<sup>th</sup> Edition, 2005.

<b>ECE 202</b>	<b>DIGITAL ELECTRONICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

### **NUMBER SYSTEMS AND BOOLEAN ALGEBRA**

Review of binary, octal, hexadecimal number systems – representation of signed numbers, floating point numbers – BCD – ASCII – EBCDIC – Excess 3 codes – gray code – error detecting and correcting codes – Boolean Algebra – Postulates and theorems of Boolean Algebra – canonical forms – simplification of logic functions using K-map – Quine Mcclausky method

### **COMBINATIONAL LOGIC DESIGN**

Logic gates – half adder, full adder – parallel adder – binary adder – parity generator/checker – comparator – implementation of combinational logic functions – encoders and decoders – code converters – multiplexers and demultiplexers – implementation of logical functions using multiplexers.

### **COUNTERS AND REGISTERS**

RS, JK, JK Master-Slave, D, T flip – flops – level triggering and edge triggering – excitation tables – asynchronous, synchronous counters – modulus counters – Johnson counter – ring counter – timing waveforms – counter applications – registers – shift register – universal shift register – sequential Logic Design – Basic models of sequential machines – concept of state table – state diagram – state reduction through partitioning – implementation of sequential Circuits – Introduction to asynchronous sequential logic design.

### **MEMORY DEVICES**

Classification of memories – RAM organization – Write operation – Read operation – memory cycle – Timing wave forms – memory decoding – memory expansion – Static RAM Cell – Bipolar RAM

cell – MOSFET RAM cell – Dynamic RAM cell – ROM organization – PROM – EPROM – EEPROM – EAPROM

**PROGRAMMABLE LOGIC DEVICES**

Semi custom design – Introduction to PLDs – PAL – PLA – FPGA – Architecture of PLDs – PAL22V10, PLS100/101 – Implementation of digital functions – Logic families – RTL, DTL, TTL families, Schottky, clamped TTL, Emitter Coupled Logic(ECL), Integrated Injection Logic (IIL) – MOS inverters – CMOS inverters – comparison of performance of various logic families.

**TEXT BOOK**

1. M. Morris Mano, Digital Design, Pearson Education, New Delhi, 3<sup>rd</sup> Edition, 2003.

**REFERENCES**

1. Donald P. Leach , Albert Paul Malvino, Digital Principles and Applications, TMH, 5<sup>th</sup> Edition, New Delhi, 2003.
2. John F. Wakerly, Digital Design – Principles and Practices, Pearson Education, 3<sup>rd</sup> Edition, 2003.

<b>ECE 203</b>	<b>NETWORK ANANLYSIS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**NETWORK TOPOLOGY**

Tree and Co–tree – Twigs and links – Incidence Matrix – Circuit analysis using Tie–set and Cut–set schedule – Mesh Analysis and Nodal Analysis with DC source.

**NETWORK THEOREMS AND APPLICATIONS**

Superposition theorem – reciprocity theorem – compensation theorem – substitution theorem –maximum power transfer theorem – Thevenin's theorem – Norton's theorem– Millman's theorem – applications.

**NETWORK ANALYSIS**

S - domain network – driving point and transfer impedances and their properties – poles and zeros of network functions – time response from pole - zero plots – Immittance – loci of RLC networks – frequency response of RLC networks – frequency response from pole - zero, bode plots.

**TWO PORT NETWORKS**

Open Circuit Impedance (Z) Parameters – Short Circuit Admittance (Y) Parameters – Transmission (ABCD) Parameters and Inverse Transmission Parameters – Hybrid (h) Parameters and Inverse hybrid parameters – conversion between parameters interconnection of two-port networks – T and  $\Pi$  representation – Terminated two port networks – Lattice Networks.

**SYNTHESIS**

Hurwitz polynomials – Positive real function – Synthesis of one port networks – Synthesis of RL and RC circuits by Foster and Cauer Methods .

**TEXT BOOK**

1. Hayt W.H., Kemmerly J.E., Engineering Circuit Analysis, McGraw–Hill International Editions, 2006.

**REFERENCES**

1. Paranjothi S.R., Electric Circuit Analysis, New Age International Ltd., Delhi, 2<sup>nd</sup> Edition, 2000.
2. Franklin. F. Kuo, Network Analysis & Synthesis, John Wiley & Sons, 2<sup>nd</sup> Edition, 2002.
3. Vasudev S., Atre K., Network Theory and Filter Design, New Age International, 2<sup>nd</sup> Edition, 1995.

4. Edminister, J.A., Theory and Problems of Electric Circuits, Schaum's outline series McGraw Hill Book Company, 2<sup>nd</sup> Edition, 1983.
5. Raymond D. Carlo, Pen min Lin, Linear Circuit Analysis, Oxford Publishers.
6. Shyammohan, Sudhakar, Circuits and Networks, TMH, 2005.

<b>ECE204</b>	<b>ELECTROMAGNETIC FIELDS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**COORDINATE SYSTEMS**

Review of Vector analysis – Rectangular - Cylindrical and Spherical coordinates - their transformation.

**ELECTROSTATICS**

Coulomb's law - electric field and flux - Gauss's law - curl and divergence of electrostatic fields - electric potential - Poisson's equation - Laplace's equation - solutions to electrostatic boundary problems - method of images - work and energy in electrostatics – dipoles – polarization - field inside a dielectric - electric displacement, concepts of susceptibility - permittivity and dielectric constant - boundary conditions – capacitors - surface charge and induced charge on conductors.

**MAGNETOSTATICS**

Lorentz force - Biot–Savart law - magnetic flux density - divergence and curl of flux density - Ampere's law - magnetic vector potential – magnetization - torque and force on magnetic dipoles - boundary conditions - magnetic susceptibility and permeability

**ELECTRODYNAMICS**

Electromagnetic induction – inductance - displacement current - Maxwell's equations - Poynting's theorem - energy and momentum in electromagnetic field .

**ELECTROMAGNETIC WAVES**

EM waves in vacuum and in matter - monochromatic plane waves - wave equation - reflection and transmission at interfaces - Effect of earth's conductivity on surface wave propagation - effect of earth's magnetic field on EM waves.

**TEXT BOOK**

1. William H.Hayt, Engineering Electromagnetics, TMH, 2003

**REFERENCES**

1. Nannapaneni Narayana Rao, Elements of Engineering Electromagnetics, PHI, 4<sup>th</sup> Edition 2002.
2. E.C. Jordan & K.G. Balmain, Electromagnetic Waves and Radiating Systems, PHI, 2<sup>nd</sup> edition 2003.
3. Sadiku, Elements of Electromagnetics, Oxford University Press, 3<sup>rd</sup> Edition.
4. Martin A. plonus, Applied Electromagnetics, Mc Graw Hill, 2005.

<b>CSE 255</b>	<b>DATA STRUCTURES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**PROBLEM SOLVING**

Problem solving – Top-down Design – Implementation – Verification – Efficiency – Analysis – Sample algorithms.

**LISTS, STACKS AND QUEUES**

Abstract Data Type (ADT) – The List ADT – The Stack ADT – The Queue ADT

**TREES**

Preliminaries – Binary Trees – The Search Tree ADT – Binary Search Trees – AVL Trees – Tree Traversals – Hashing – General Idea – Hash Function – Separate Chaining – Open Addressing –

Linear Probing – Priority Queues (Heaps) – Model – Simple implementations – Binary Heap

**SORTING**

Preliminaries – Insertion Sort – Shellsort – Heapsort – Mergesort – Quicksort – External Sorting

**GRAPHS**

Definitions – Topological Sort – Shortest - path Algorithms – Unweighted shortest paths – Dijkstra’s Algorithm – Minimum Spanning Tree – Prim’s Algorithm – Applications of Depth-First Search – Undirected Graphs – Biconnectivity – Introduction to NP-Completeness

**TEXT BOOK**

1. Dromey R. G., How to Solve it by Computer, PHI, 2002.

**REFERENCES**

1. Langsam Y., Augenstein M. J., Tenenbaum A. M., Data Structures using C, Pearson Education Asia, 2004
2. Richard F. Gilberg, Behrouz A. Forouzan, Data Structures – A Pseudocode Approach with C, Thomson Brooks, 1998.
3. Aho. et.al., Data Structures and Algorithms, Pearson Education Asia, 1983.

<b>ECE281</b>	<b>ELECTRON DEVICES LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

1. Characteristics of PN Junction and Zener Diode
2. CB Mode Transistor Characteristics
3. Characteristics of CE Mode Transistor
4. JFET Characteristics and Evaluation of its parameters
5. Characteristics of MOSFET
6. Characteristics of SCR
7. DIAC and TRIAC Characteristics

8. Characteristics of UJT
9. Half wave and Full wave Rectifier
10. Transistor Biasing with and without stabilization
11. Transistor as a Switch
12. LDR, Thermistor, Photodiode Characteristics
13. Introduction to P-Spice

<b>CSE295</b>	<b>DATA STRUCTURES LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**IMPLEMENT THE FOLLOWING EXERCISES USING C**

1. Array implementation of List Abstract Data Type (ADT)
2. Linked list implementation of List ADT
3. Cursor implementation of List ADT
4. Array implementations of Stack ADT
5. Linked list implementations of Stack ADT

The following three exercises are to be done by implementing the following source files

- (a) Program for 'Balanced Parenthesis'
- (b) Array implementation of Stack ADT
- (c) Linked list implementation of Stack ADT
- (d) Program for 'Evaluating Postfix Expressions'

An appropriate header file for the Stack ADT should be #included in (a) and (d).

6. Implement the application for checking 'Balanced Parenthesis' using array implementation of Stack ADT (by implementing files (a) and (b) given above)
7. Implement the application for checking 'Balanced Parenthesis' using linked list implementation of Stack ADT (by using file (a) from experiment 6 and implementing file (c))

8. Implement the application for ‘Evaluating Postfix Expressions’ using array and linked list implementations of Stack ADT (by implementing file (d) and using file (b), and then by using files (d) and (c))
9. Queue ADT
10. Search Tree ADT – Binary Search Tree
11. Heap Sort
12. Quick Sort

<b>SEMESTER IV</b>
--------------------

<b>MAT215</b>	<b>MATHEMATICS IV</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**PROBABILITY & RANDOM VARIABLES**

Classical, relative frequency and axiomatic definitions of probability, addition rule and conditional probability, multiplication rule, total probability, Baye’s Theorem, and independence. Discrete, continuous and mixed random variables, probability mass, probability density and cumulative distribution functions, mathematical expectation, moments, moment generating function.

**STANDARD DISTRIBUTIONS**

Binomial, Geometric, Poisson, Exponential, Gamma, Normal distributions, Function of Random Variables. Joint, marginal and conditional distributions, correlation, regression lines.

**RANDOM PROCESSES**

Classification, Stationary and Markov processes, Binomial process, Poisson process, Sine–wave process, Ergodic processes.

**CORRELATION FUNCTION AND SPECTRAL DENSITY**

Auto correlation for discrete and continuous processes, Cross correlation functions, Correlation integrals. Applications, Linear systems with random inputs. Power spectral density, Cross spectral density, Applications to linear systems with random inputs.

**NUMERICAL METHODS**

Newton’s forward and backward difference formulae – Lagranges interpolation formulae – Divided differences. Initial value problems for ordinary differential equations: Fourth order Runge–Kutta method. Milne’s predictor corrector method.

**TEXT BOOK**

1. Kapur J.N. and Saxena H.C., Mathematical statistics, S.Chand & Company Ltd, New Delhi,1997.

**REFERENCES**

1. Flynn M., Probability, Random variables and random processes, Harper & Row Publishers, New York, 1982.
2. Peebles Jr., Probability, Random variables and random signal principles, McGraw Hill Publishers, 1987.
3. S.Arumugam et.al., Numerical Methods, Scitech Publications (India) Pvt. Ltd., Chennai.

<b>ECE205</b>	<b>ELECTRONIC CIRCUITS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**BJT & FET AMPLIFIERS**

Common Emitter amplifier design – Common Source FET amplifier design – Capacitor – Coupled two stage common emitter Amplifier – Director Coupling between stages – Two stage circuit with emitter follower output – dc feedback pair – BIFET circuits – small signal high frequency amplifiers – amplifier testing

**FEEDBACK AMPLIFIERS**

Series voltage negative feedback – amplifier with series voltage negative feedback – more amplifiers using series voltage negative feedback – single stage emitter current feedback – two stage amplifiers using emitter current feedback – parallel current negative feedback – additional effects of negative feedback

### **SINUSOIDAL OSCILLATORS**

Basic principles of sinusoidal oscillators – condition for oscillations – Barkhausen criteria – phase shift oscillator – Colpitts oscillator – Hartley oscillator – Wien bridge oscillator – oscillator amplitude stabilization

### **LARGE SIGNAL AMPLIFIERS**

Transformer-coupled class A amplifier – transformer coupled class B and class AB amplifiers – transformer coupled amplifier design – capacitor coupled power amplifier – modifications to improve amplifier performance – direct coupled class AB power amplifier – MOSFET power amplifier

### **WAVEFORM GENERATORS AND POWER SUPPLIES**

Waveform shaping circuits – Multivibrators – Blocking Oscillator – Schmitt trigger – Time Base Circuits – Unregulated power supplies – Linear mode power supply and switched mode power supply

### **TEXT BOOKS**

1. David A. Bell, Electronic Devices and Circuits, PHI, 3<sup>rd</sup> Edition, 2002
2. Jacob Millman & Christos C.Halkias, Integrated Electronics, TMH, 1999

### **REFERENCES**

1. Donald A.Neaman, Semiconductor Physics and Devices, TMH, 3<sup>rd</sup> Edition 2002

2. Bapat Y.N., Electronic Devices and Circuits, TMH, 9<sup>th</sup> Reprint, 1989
3. Malvino A.P., Electronic Principles, 3<sup>rd</sup> Edition, TMH, 12<sup>th</sup> Printing, 1989
4. Seda, Smith, Micro electronic circuits, Oxford, 5<sup>th</sup> Edition, 2005
5. Thomas L. Floyd, Electron Devices, Pearson Education, 5<sup>th</sup> Edition, 2004

<b>ECE206</b>	<b>SIGNALS AND SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**SIGNALS**

Classification of signals – Continuous and discrete time signals – Fourier Series Representation of periodic signals – Representation of continuous time and discrete-time Periodic signals – properties of continuous-time Fourier series and discrete-time Fourier series - properties

**SYSTEMS**

Linear Time-invariant systems - Discrete Time LTI systems – The Convolution Sum, continuous time LTI system – convolution integral - properties of LTI System

**FOURIER TRANSFORM**

The Continuous-time Fourier Transform – Representation of Aperiodic Signals, properties of the CTFT – common transform pairs – convolution and multiplication property – the Discrete-Time Fourier Transform – Representation of Aperiodic Signals – convolution and multiplication property – Duality

**LAPLACE TRANSFORM**

Definition – region of convergence – properties – analysis and characterization of LTI systems – solution of differential equations – System function algebra and block diagram representation – Unilateral Laplace Transform

**Z TRANSFORM**

Definition – region of convergence – properties of ROC – properties of z–transform– Inverse z–transform using Contour integration – residue Theorem, power series expansion and Partial fraction expansion - analysis and Characterization of LTI systems using Z transform

**TEXT BOOK**

1. Alan V. Oppenheim, et. al., Signals & Systems, Pearson Education, 2002

**REFERENCES**

1. Simon Haykin, Barry Van Veen, Signals and Systems, John Wiley, 1999
2. John C. Proakis, Signals and Systems using MATLAB, PHI, 3<sup>rd</sup> Edition,
3. John G. Proakis, Dimitris G. Manolakis, Digital Signal Processing, Principles,
4. Algorithms and Applications, 3<sup>rd</sup> Edition., PHI, 2000.
5. Lathi, Linear Signals and Systems, Oxford University press, 2005.

<b>ECE207</b>	<b>INTEGRATED ELECTRONICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**INTEGRATED CIRCUIT CHARACTERISTICS AND REALIZATION**

Monolithic Integrated Circuit Technology – Fabrication of FET–CMOS Technology – Monolithic diodes – Metal – Semiconductor contact – Integrated Circuit Resistors – Integrated Circuit capacitors – Integrated Circuit packaging – Characteristics of Integrated Circuit Components – NMOS and PMOS transistors – threshold voltage–body effect – design equations – second order effects – MOS models and small signal AC characteristics.

**OPERATIONAL AMPLIFIER**

Differential amplifier analysis – supply and temperature independent biasing – band gap references – constant current source – active load – current mirror – various stages of an operational amplifier – need for compensation – Linear and Non-Linear Applications – inverting and non-inverting amplifiers – Instrumentation amplifiers – differentiator and integrator – Logarithmic amplifiers

**WAVEFORM GENERATION AND VOLTAGE REGULATOR**

Sine wave Oscillator – low-pass and band-pass filters – comparator – multivibrators and Schmitt trigger – triangular wave generator – voltage regulators – 723, 78XX, 79XX, 317.

**VCO, PLL, 555 TIMER AND A/D CIRCUITS**

Voltage controlled Oscillator – Closed loop analysis of PLL, AM, PM, FSK modulators and demodulators – frequency synthesizers – Astable and Monostable Multivibrators using 555 Timer – Analog and Digital Interface Circuits – A/D, D/A Converters, Sigma, Delta converters, Sample and Hold circuits and multiplexers.

**MOS DEVICES**

NMOS and CMOS Inverters – stick diagram – inverter ratio – DC and transient characteristics – switching times – Super buffers – driving large capacitance loads – CMOS logic structures – transmission gates – static CMOS design – dynamic CMOS design

**TEXT BOOKS**

1. Sergio Franco, Design with operational amplifiers and analog integrated circuits, McGraw Hill, 1997.
2. Pucknell, Basic VLSI Design, PHI, 1995.

**REFERENCES**

1. Roy Choudhry.D., Shail Jain, Linear Integrated Circuits, New Age International (Pvt) Ltd., 2000.
2. Sedra A.S. and Smith K.C., Microelectronic Circuits, Oxford University Press
3. Neil H.E. Weste and Kamran Eshraghian, Principles of CMOS VLSI Design, Pearson Education ASIA, 2<sup>nd</sup> Edition, 2000.
4. Eugene D.Fabricius, Introduction to VLSI Design, McGraw Hill International Editions, 1990.
5. Wayne Wolf, Modern VLSI Design System on chip, Pearson Education.2002.

<b>ECE208</b>	<b>CONTROL SYSTEM ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**SYSTEM REPRESENTATION**

Basic elements in control systems – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – Block diagram reduction techniques – Signal flow graphs. Components– AC and DC servomotors, Stepper Motors, Synchros, Hydraulic and Pneumatic Systems

**TIME RESPONSE**

Time response – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – P, PI, PID modes of feed back control.

**FREQUENCY RESPONSE**

Frequency response – Bode plot – Polar plot – Nichols chart – Determination of closed loop response from open loop response –

Correlation between frequency domain and time domain specifications.

**STABILITY OF CONTROL SYSTEM**

Characteristic equation – Location of roots in S plane for stability – Routh Hurwitz criterion – Root locus construction – Effect of pole, zero addition – Gain margin and phase margin – Nyquist stability criterion.

**COMPENSATION TECHNIQUES AND APPLICATIONS**

Performance criteria – Lag, lead and lead-lag networks – compensator design using Bode plots; Applications– attitude control of a satellite, lateral and longitudinal control of an aircraft.

**TEXT BOOK**

1. Ogata, Modern Control Engineering, 4<sup>th</sup> Edition, Pearson Education, New Delhi, 2003.

**REFERENCES**

1. I.J. Nagrath & M. Gopal, Control Systems Engineering, New Age International Publishers, 2003.
2. B.C. Kuo, Automatic Control Systems, PHI., New Delhi, 1995.
3. N. Bandyopadhyay, Control Engineering Theory and Practice, PHI, 2003.

<b>ECE282</b>	<b>ELECTRONIC CIRCUITS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

1. Transistor as an Amplifier
2. FET Biasing Methods
3. FET as an Amplifier
4. Class B Complementary symmetry power amplifier
5. Oscillators ( Phase shift, Hartley , Wien bridge )
6. Mutivibrators

7. Phase controlled rectifier using SCR
8. Clipper and Clamper Circuits
9. Waveform Generators
10. Regulated Power Supply
11. Switched Mode Power Supply
12. Schmitt Trigger, Zero crossing detector
13. Simulation of rectifiers, waveform generators, oscillators using PSpice

<b>ECE283</b>	<b>INTEGRATED ELECTRONICS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

1. Realization of Logic gates. (AND, OR, NOT, NAND, NOR, XOR, EXNOR)
2. Adder and Subtractor
3. Code converters
4. Combinational logic design using Multiplexers and Demultiplexers.
5. Realization of RS, JK, T, D Flip flops circuits
6. Synchronous Counters and Asynchronous Counters
7. Shift registers
8. Measurement of Op–amp Parameters. (Gain, Input offset Voltage, Input offset current, Bias Current, CMRR, Output Voltage, Slew rate)
9. Operational Amplifier applications (Inverter, Non–inverter, summer, Buffer, Subtractor, Integrator, Differentiator)
10. Precision Rectifier, Instrumentation Amplifier.
11. Astable Mutivibrator using op–amp – Square, Triangular & Rectangular Wave Generators.
12. Astable & Monostable Multi vibrators using IC 555 Timer.
13. A/D Converters & D/A Converters.
14. Sigma, Delta convertors
15. VHDL Programming

<b>SEMESTER V</b>
-------------------

<b>ECE301</b>	<b>DIGITAL SIGNAL PROCESSING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**BASIC ELEMENTS**

Digital Signal Processing System —advantages of digital over analog signal processing - Applications of DSP, FFT algorithms – Radix-2 FFT algorithms – decimation in time – decimation in Frequency algorithms –Applications of FFT algorithms

**IIR FILTERS**

Design of Butterworth filters - Chebyshev Type I and Type II filters  
- IIR filter design using bilinear transformation - impulse invariant

transformation - frequency transformation in analog and digital domain

**FIR FILTERS**

Design of Linear phase FIR filters using Rectangular, Hamming, Kaiser windows – Design of linear phase FIR filters using frequency sampling techniques

**FINITE WORD LENGTH EFFECTS**

Number representations – fixed point and floating point numbers - Quantization of fixed and floating point numbers, coefficient of quantization - over flow error – truncation error – co-efficient of quantization error - limit cycle oscillation – signal scaling

**MULTIRATE DSP**

Decimation by a factor D - Interpolation by a factor I - Filter design and implementation for sampling rate conversion - multistage implementation of sampling rate conversion – Sampling rate conversion by an arbitrary factor – applications of multirate signal processing

**TEXT BOOK**

1. John G Proakis, Dimtris G Manolakis, Digital Signal Processing Principles, Algorithms and Application, PHI, 3<sup>rd</sup> Edition, 2000.

**REFERENCES**

1. Oppenheim and Schaffer, 'Discrete Time Signal Processing', PHI, 1992.
2. S.K.Mitra, “Digital Signal Processing– A Computer based approach”, TMH, 1998.

<b>ECE302</b>	<b>ANALOG COMMUNICATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**ELECTRONIC COMMUNICATION**

Communication process, source of information, channels, Noise – System noise sources, Noise & feed back - Noise figure – electromagnetic spectra - base band and pass band signals, modulation process – need, band width requirements–frequency spectra of non–sinusoidal signals - continuous and discrete spectra – band pass system

### **MODULATION**

Amplitude Modulation and angle modulation basic principles, mathematical relationships - Frequency Modulation and Phase modulation – basic principles, mathematical relationships. Comparison of various modulation techniques , spectral analysis of different modulators.

### **TRANSMITTER**

Modulators– amplitude modulator, suppressed carrier DSB modulator – balanced modulator – Single Side Band modulator – filter method, phase shift method - ISB modulators - vestigial side band modulator, Frequency Modulator – direct & indirect method – phase modulator Spectral analysis of these modulators Transmitters – AM transmitter, low level and high level SSB transmitter , pilot carrier – FM transmitter – narrow band and wide band, FM stereo transmitter.

### **RECEIVER**

Receiver–Sensitivity , selectivity , signal to noise ratio - demodulators–diode detector–FM detectors - Phase detector–ratio detector– Foster–Seely discriminator – AM receiver–TRF receiver, super heterodyne receiver, double super heterodyne receiver – SSB receiver, communication receiver, AGC circuitry - FM receiver – FM stereo receiver– carrier thresholding. capture effect.

### **NOISE IN ANALOG SYSTEMS**

Introduction, Narrowband noise - representation of narrow band noise in terms of inphase and quadrature components -

representation of narrow band noise in terms of envelope and phase components - Noise in CW modulation systems: Noise in linear receivers using coherent detection - Noise in linear receivers using envelope detection - Noise in FM receivers.

**TEXT BOOK**

1. Taub and Schilling, Principles of communication systems, TMH,1995

**REFERENCES**

1. Simon Haykins, communication systems, John Wiley and sons, 4<sup>th</sup> Edition,2001
2. Dennis Roody and John Coolen, “Electronic communication”, PHI, 4<sup>th</sup> Edition,2003.
3. Farrel G.Stremler, “Introduction to Communication Systems”, John Wiley, 2<sup>nd</sup> Edition, 1982.

<b>ECE303</b>	<b>TRANSMISSION LINES AND WAVEGUIDES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**TRANSMISSION LINES**

Definition of characteristic impedance – Propagation Constant – general solution of the transmission line – The Two standard forms for voltage and current of a line terminated by an impedance – reflection coefficient – wavelength and velocity of propagation– waveform distortion – distortion less transmission line –inductance loading of telephone cables–input impedance of lossless lines – reflection on a line not terminated by  $Z_0$  – transfer impedance – reflection factor and reflection loss – T and  $\Pi$  Section equivalent to lines.

**STANDING WAVES**

The Quarter wave line and impedance matching – the half wave line – circle diagram for the dissipation less line – Smith Chart – application of the Smith Chart – conversion from impedance to reflection coefficient and vice-versa-impedance to admittance conversion and vice versa – input impedance of a lossless line terminated by an impedance – single stub matching and double stub matching.

**WAVES BETWEEN PARALLEL PLANES**

Transverse electric and transverse magnetic waves – characteristics of TE and TM waves – transverse electromagnetic waves – velocities of propagation – attenuation of TE and TM waves in parallel plane guides

**RECTANGULAR WAVEGUIDES**

Transverse Electric Waves in Rectangular Waveguides – characteristic of TE and TM waves – cutoff wavelength and phase velocity – impossibility of TEM waves in waveguides – Dominant mode in rectangular waveguide – Attenuation of TE and TM modes in rectangular waveguides – wave impedances – characteristic impedance – excitation of modes.

**CIRCULAR WAVEGUIDES**

Solution of field equations in cylindrical co-ordinates – TM and TE waves in circular guides – wave impedances and characteristic impedance – dominant mode in circular waveguide – excitation of modes – Microwave cavities, rectangular cavity resonators, circular cavity resonator, semicircular cavity resonator

**TEXT BOOK**

1. J.D.Ryder, Networks, Lines and Fields, PHI, New Delhi, 2003.

**REFERENCES**

1. E.C. Jordan and K.G.Balmain “Electro Magnetic Waves and Radiating System, PHI, New Delhi, 2003
2. David M.Pozar, Microwave Engineering, John Wiley, 2002.
3. David K.Cheng,Field and Waves in Electromagnetism, Pearson Education, 1989.

<b>ECE304</b>	<b>MICROPROCESSORS AND MICROCONTROLLERS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **INTEL’S X86**

Introduction, Register set, data formats, addressing modes, interrupts, memory hierarchy, pipelining, segmentation, paging, real and virtual mode execution, protection mechanism, task management.

### **ARCHITECTURE OF INTEL X86**

CPU block diagrams, Pin diagrams and internal descriptions of – 80286,386,486 and Pentium, instruction formats. Intel X86 Instruction set , assembler directives.

### **ARITHMETIC CO-PROCESSORS**

Data formats – 80287 architecture– Pin diagram, internal architecture, status register, control register, tag register, Instruction set–data transfer, arithmetic comparison transcendental operations, constant operations and control instructions, interfacing 80287 with 80286 - introduction to 80387, 80487, programming examples.

### **8051 MICROCONTROLLER**

8051 Micro controller hardware– I/O pins, ports and circuits– External memory –Counters and Timers–Serial Data I/O– interrupts– Interfacing to external memory and 8255.

### **8096 MICROCONROLLER**

8096 CPU Structure–Register file–Assembly language –Addressing mode–Instruction set– simple programs.

**TEXT BOOKS**

1. Tabak D, Advanced Microprocessors, McGraw Hill, 2<sup>nd</sup> Edition, 2002
2. Mohammed Ali Mazidi and Janice Gillispie Mazidi, The 8051 Microcontroller and Embedded Systems, Pearson Education Asia, New Delhi, 2003.

**REFERENCES**

1. Brey B B , The Intel Microprocessors, PHI, 4<sup>th</sup> Edition, 2005.
2. Hall D V, Microprocessors & Interfacing, McGraw Hill, 2<sup>nd</sup> Edition, 2003.
3. Kenneth J Ayala, 8051 Microcontroller Architecture Programming and Application, Penram International, 2<sup>nd</sup> Edition, 1996.

<b>ECE381</b>	<b>DIGITAL SIGNAL PROCESSING LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**PROGRAMMING USING MATLAB**

1. Generation of continuous time and discrete time Signals
2. Linear and circular convolution of two sequences
3. Circular convolution using DFT
4. Design of IIR filters– Butterworth , Chebyshev Type I and II
5. Design of FIR filters using windows

6. Calculation of FFT of a signal using DIT and DIF algorithm

**PROGRAMMING USING PROCESSOR**

1. Generation of basic signals using DSP
2. Study of various addressing modes of DSP
3. Implementation of IIR filter
4. Implementation of FIR filter
5. Calculation of FFT

<b>ECE 382</b>	<b>MICROPROCESSOR LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

1. Write a program using 8085 and verify for :
  - a. addition of two 8-bit numbers.
  - b. addition of two 8-bit numbers (with carry).
2. Write a program using 8085 and verify for :
  - a. 8-bit subtraction (display borrow)
  - b. 16-bit subtraction (display borrow )
3. Write a program using 8085 for multiplication of two 8- bit numbers by repeated addition method. Check for minimum number of additions and test for typical data.
4. Write a program using 8085 for multiplication of two 8- bit numbers by bit rotation method and verify.
5. Write a program using 8085 for division of two 8- bit numbers by repeated subtraction method and test for typical data.
6. Write a program using 8085 for dividing two 8- bit numbers by bit rotation method and test for typical data.
7. Write a program using 8086 for division of a defined double word (stored in a data segment) by another double word Division and verify.
8. Write a program using 8086 for finding the square root of a given number and verify.

9. Write a program using 8086 for copying 12 bytes of data from source to destination and verify.
10. Write a program using 8086 and verify for:
  - a. Finding the largest number from an array.
  - b. Finding the smallest number from an array.
11. Write a program to interface a two digit number using seven-segment LEDs. Use 8085/8086 microprocessor and 8255 PPI.
12. Write a program using 8096 for arranging an array of numbers in descending order and verify.
13. Write a program using 8096 for arranging an array of numbers in ascending order and verify.
14. Write a program for finding square of a number using 8096.

<b>SEMESTER VI</b>
--------------------

<b>ECE305</b>	<b>DIGITAL COMMUNICATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**SAMPLING AND BAND LIMITED SIGNALLING**

Sampling theorem – Sampling of Band pass and low pass, Pulse modulation –PAM– PPM – PWM. Multiplexing – TDM,

FDM. Uniform and nonuniform quantisation. PCM, DPCM, delta & adaptive delta modulation. Calculation of quantization noise. Noise in PCM and delta modulation.

### **BASE BAND DATA TRANSMISSION**

Base band binary data transmission system– inter symbol interference– Nyquist pulse shaping criteria– line coding, pulse shaping, scrambling techniques, regenerative repeaters - Eye diagram - Equalization– Adaptive equalization. Detection of error probability, Gaussian probability function– properties– error function complementary error function.

### **DIGITAL MODULATION**

Vector representation of waveforms - G-S procedure. Coherent and Non-coherent detection optimum receiver for AWGN – correlation receiver and matched filter receiver, digital modulation Formats, coherent binary modulation techniques, Comparison of binary and quadrature modulation techniques, power spectra, bandwidth efficiency.

### **INFORMATION THEORY AND CODING**

Discrete messages–amount of information–average information–entropy information rate–Shannon’s theorem–capacity of gaussian channel–bandwidth–S/N trade off–coding–parity check bit coding–block codes coding and decoding probability of error with coding–convolution codes – cyclic codes.

### **SPREAD SPECTRUM SYSTEMS**

Pseudo noise sequences – generation, correlation properties – direct sequence spread spectrum systems – frequency hop systems – processing gain – antijam and multipath performance.

### **TEXT BOOKS**

1. Taub and Schilling, Principles of Communication Systems, Mc Graw Hill, 2<sup>nd</sup> Edition, 25<sup>th</sup> Reprint, 2003

2. Simon Haykins, Digital Communications, John Wiley, 1<sup>st</sup> Edition, Reprint, 2004

**REFERENCES**

1. Harold Kolimbinis, Digital Communication Systems, PHI, 2001
2. John.G.Proakis, ‘Digital Communication’, McGraw–Hill Inc., 4<sup>th</sup> Edition, Malaysia, 2000
3. M.K.Simen, ‘Digital Communication Techniques, Signal Design & Detection’, PHI, 2003
4. Edward. A. Lee and David. G. Messerschmitt, “Digital Communication”, Allied Publishers 2<sup>nd</sup> edition, 2003

<b>ECE306</b>	<b>COMPUTER COMMUNICATION NETWORKS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**DATA COMMUNICATION FUNDAMENTALS AND OSI REFERENCE MODEL**

Overview of Data Communication and Networking – Analog / Digital signals and transmission, Simplex / Half and Full duplex and Synchronous / Asynchronous communication – Multiplexing – Transmission Media – Circuit switching – Network Configuration, Concepts of layering, ISO's OSI reference model – Physical Layer Standards – RS 232C, RS 449

**DATA LINK LAYER**

Error detection and correction – data link control and protocols – flow and error control – sliding window protocol – ARQ schemes – HDLC protocol – Point to Point Protocol –Logical Link Control (LLC) and Medium Access Sub–layer functions – LAN standards – IEEE 802.3(CSMA/CD) – Fast Ethernet – Giga Bit Ethernet, IEEE 802.4 (Token Bus), IEEE 802.5 (Token Ring), IEEE 802.11 (Wireless LAN), Standards

**NETWORK LAYER**

Network layer – Services – Virtual circuits and Data-grams – Inter-networking – Addressing – Routing – Link state and Distance Vector Routing – Congestion control algorithms – Network Layer Protocols – ARP, RARP, IPv4, ICMP, IPv6 and ICMPv6 – Unicast Routing – RIP, OSPF, BGP and Multicast Routing – IGMP, DVMRP.

### **TRANSPORT LAYER**

Transport layer – Services – Processes to Processes Delivery – Transmission Control Protocol (TCP) – User Datagram Protocol – Data Traffic – Congestion Control and Quality of Service – Techniques to improve QOS – Integrated Services – Differentiated Services.

### **SESSION, PRESENTATION AND APPLICATION LAYERS**

Network security – Cryptography, Message Security, Digital Signature, User Authentication, Key Management, Security Protocols in Internet – DNS, E-mail (SMTP), FTP, HTTP, Voice over IP.

### **TEXT BOOKS**

1. Forouzan , Data Communications and Networking, TMH, 3<sup>rd</sup> Edition, 2004.
2. William Stallings , Data and Computer Communications, PHI, 7<sup>th</sup> Edition, 2003.

### **REFERENCES**

1. Brijendra Singh, Data Communication and Computer Networks, PHI, 2004.
2. Michael A.Gallo, William A. Hancock, Computer Communication and Networking Technologies, Thomson Asia, 2003.
3. S.Tanenbaum , Computer Networks, Pearson Education Asia Inc., 4<sup>th</sup> Edition, 2004.
4. Leon-Garcia, Widjaja : Communication Networks, Fundamental Concepts and Key Architecture, TMH, 2<sup>nd</sup> Edition, 2004.

5. Gerd E.Keiser : Local Area Networks, TMH, 2<sup>nd</sup> Edition, 2002

<b>ECE383</b>	<b>COMMUNICATION SYSTEMS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

1. Amplitude modulation – collector modulation – measurement of modulation Index
2. Characteristics of AM receiver (Selectivity & Sensitivity)
3. Characteristics of FM receiver (Selectivity & Sensitivity).
4. Frequency Converter ( Mixer )
5. PLL characteristics and demodulation using PLL
6. Time division multiplexing
7. Pulse modulation– PAM / PWM /PPM
8. Line coding & Decoding
9. Delta modulation / Differential pulse code modulation
10. Digital modulation –ASK, PSK, QPSK, FSK

<b>ECE384</b>	<b>COMMUNICATION NETWORKS LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

1. PC to PC Communication  
(Parallel Communication using 8 bit parallel cable  
Serial communication using RS 232C )
2. Ethernet LAN protocol
3. Token bus and token ring protocols
4. Implementation and study of stop and wait protocol
5. Implementation and study of Goback–N and selective reject protocols
6. Implementation of distance vector routing algorithm
7. Implementation of link state routing algorithm
8. Implementation of data encryption and decryption
9. Implementation of DS–SS technique using Spread Spectrum trainer kits.

10. Implementation of FH-SS technique using Spread Spectrum trainer

**SEMESTER VII**

<b>ECE401</b>	<b>OPTICAL COMMUNICATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**OPTICAL FIBERS**

Overview of optical communication – Need for optical communication – Comparison with the electrical communication – Optical Fiber light guides theory - Ray theory – Mode theory– Snell’s law – Critical angle – Acceptance angle – Numerical Aperture. Types of fibers: Step and Graded index fibers - Wave propagation in multi mode and single mode optical fibers – Attenuation – dispersion – Polarization

**SIGNAL DEGRADATION OPTICAL FIBERS**

Attenuation – Absorption losses, Scattering losses, Bending Losses, Core and Cladding losses, Signal Distortion in Optical Wave guides– Information Capacity determination –Group Delay–Material and Wave guide Dispersion, Signal distortion in SM fibers–Polarization Mode dispersion, Intermodal dispersion, Pulse Broadening in GI fibers–Mode Coupling –Design Optimization of SM fibers–RI profile and cut–off wavelength.

**OPTICAL SOURCES**

Direct and indirect Band gap materials–LED structures –Light source materials –Quantum efficiency and LED power, Modulation of a LED, lasers Diodes–Modes and Threshold condition –Rate equations –External Quantum efficiency –Resonant frequencies –LASER Diodes, Temperature effects– Quantum laser, Fiber amplifiers– Power Launching and coupling, Fiber –to– Fiber joints, Fiber splicer and connector.

**FIBER OPTICAL RECEIVERS**

PIN and APD diodes –Photo detector noise, SNR, Detector Response time, Avalanche Multiplication Noise –Comparison of Photo detectors –Fundamental Receiver Operation – preamplifiers, Error Sources –Receiver Configuration –Probability of Error – Quantum Limit.

**LIGHT WAVE SYSTEM**

Point-to-Point links System considerations –Link Power budget – Rise – time budget –Noise Effects on System Performance– Operational Principles of WDM, dispersion compensation techniques – Self phase modulation, Kerr effect Solitons– Semiconductor laser amplifiers – LAN and cascaded in-line amplifiers– Erbium-doped Amplifiers. Digital transmission system

### TEXT BOOK

1. Gerd Keiser, Optical Fiber Communication, McGraw Hill International, Singapore, 3<sup>rd</sup> Edition., 2000

### REFERENCES

1. J.Senior, Optical communication, Principles and Practice, PHI, 1994.
2. J.Gower, Optical communication system, PHI, 2001.
3. G.P. Agarwal, " Fiber optic communication systems ", John Wiley & Sons, 2<sup>nd</sup> Edition 1997.
4. Franz & Jain, Optical communication Systems and components, Narosa Publications, New Delhi, 2000.

<b>ECE402</b>	<b>MODELLING OF DIGITAL CIRCUITS USING HDL</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

### CMOS CHIP DESIGN

Logic design with CMOS – MOSFETS as switches, Basic logic gates in CMOS, complex logic gates, transmission gates - Multiplexers and latches - CMOS chip design options: Full custom ASICs, Std. Cell based ASICs, Gate Array based ASICs Channelled, Channelless and structured GA, Programmable logic structures; 22V10, Programming of PALs, Programmable Interconnect, Reprogrammable GA - Xilinx programmable GA, ASIC design flow.

### SEQUENTIAL CIRCUIT DESIGN

Analysis of Clocked Synchronous Sequential Networks (CSSN) - Modeling of CSSN – State Stable Assignment and Reduction –

Design of CSSN – Design of Iterative Circuits – ASM Chart – ASM Realization.

### **ASYNCHRONOUS SEQUENTIAL CIRCUIT DESIGN**

Analysis of Asynchronous Sequential Circuit (ASC) – Flow Table Reduction – Races in ASC – State Assignment – Problem and the Transition Table – Design of ASC – Static and Dynamic Hazards – Essential Hazards – Data Synchronizers – Designing Vending Machine Controller – Mixed Operating Mode Asynchronous Circuits.

### **SYSTEM DESIGN USING VHDL**

VHDL Description of Combinational Circuits – Arrays – VHDL Operators – Compilation and Simulation of VHDL code – Modeling using VHDL – Flip Flops – Registers – Counters – Sequential Machine – Combinational Logic Circuits – VHDL code for serial adder, binary multiplier – binary divider – complete Sequential Systems – design of a simple microprocessor.

### **SYSTEM DESIGN VERILOG HDL**

Overview of digital design with Verilog HDL, hierarchical modelling concepts, modules and port definitions, gate level modelling, data flow modelling, behavioral modelling, task & functions, test bench.

### **TEXT BOOKS**

1. Weste & Eshraghian, Principles of CMOS VLSI design, Addison Wesley, 2<sup>nd</sup> Edition, 1993.
2. Donald G. Givone, Digital principles and Design, TMH, 2002.

### **REFERENCES**

1. John M Yarbrough, Digital Logic applications and Design, Thomson Learning, 2001
2. Nripendra N Biswas, Logic Design Theory, PHI, 2001
3. Charles H. Roth Jr., Digital System Design using VHDL, Thomson Learning, 1998.

4. Charles H. Roth Jr., Fundamentals of Logic design, Thomson Learning, 2004.
5. Stephen Brown and Zvonk Vranesic, Fundamentals of Digital Logic with VHDL Design, TMH, 2002.
6. Navabi.Z., VHDL Analysis and Modeling of Digital Systems, McGraw International, 1998
7. Peter J Ashendem, The Designers Guide to VHDL, Harcourt India Pvt Ltd, 200
8. Samir Palnitkar; Verilog HDL , Guide to Digital design and synthesis, Pearson Education, 3<sup>rd</sup> Edition , 2003.

<b>ECE481</b>	<b>MICROWAVE AND OPTICAL COMMUNICATION LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

**A. MICROWAVE**

1. Characteristics of Reflex Klystron Oscillator
2. Characteristics of Gunn Diode Oscillator
3. Study of Power Distribution in directional coupler, E / H Plane Tee, Magic Tee.
4. Radiation pattern of Horn Antenna.
5. Frequency Measurement
6. Microwave Power Measurement.
7. VSWR Measurements and Impedance measurement.

**B. OPTICAL COMMUNICATION**

1. D.C. Characteristics of LED and PIN Photo Diode
2. Optical transmission using Analog Modulation
3. System bandwidth Determination by Intensity Modulation.
4. Data transmission through Fiber Optic Link.
5. Time Division Multiplexing
6. PI Characteristics of LASER diode.

<b>ECE482</b>	<b>VLSI DESIGN LABORATORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>0</b>	<b>0</b>	<b>3</b>	<b>2</b>

1. Study of Simulation tools
2. Study of Synthesis tools
3. Place and Route and back annotation for FPGAs
4. Study of development tool for FPGAs for schematic entry and verilog
5. Design of traffic light controller using verilog simulation tools
6. Design and simulation of pipelined serial and parallel adder to add/ subtract 8 number of size, 12 bits each in 2's complement
7. Design and simulation of back annotated verilog files for multiplying two signed, 8 bit numbers in 2's complement.
8. Study of FPGA board and testing on board LEDs and switches using verilog codes
9. Testing the traffic controller design on the FPGA board
10. Design a Realtime Clock (2 digits, 7 segments LED displays each for HRS., MTS, and SECS.) and demonstrate its working on the FPGA board.

<b>MAJOR ELECTIVES</b>
------------------------

<b>ECE316</b>	<b>ANTENNA AND WAVE PROPAGATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

**ANTENNA FUNDAMENTALS**

Basic antenna parameters – patterns , beam area, radiation intensity, beam efficiency, directivity, gain, resolution, antenna aperture, effective height – Friis transmission formula – fields from oscillating dipole, antenna field zone – pointing vector, polarization.

**RADIATION FIELDS OF ANTENNA**

Short electric dipole – fields of a short dipole – radiation resistance of short electric dipole – thin linear antenna – radiation resistance of  $\lambda/2$  antennas – fields of a thin linear antenna with a uniform traveling wave.

**ARRAY OF POINT SOURCES**

Array of two isotropic point sources – non isotropic but similar point sources – principles of pattern multiplication – pattern synthesis by pattern multiplication – non isotropic and dissimilar point sources – linear array of n- isotropic point sources of equal amplitude and spacing – null direction for arrays of n-isotropic point sources of equal amplitude and spacing.

**ANTENNAS**

Loop antenna – far field pattern of circular loop antennas with uniform current, radiation resistance and directivity of loop antenna – helical antenna, modes of helical antenna – horn antenna – patch (or) microstrip antenna – yagi uda antenna – frequency independent antenna – lens antenna – turnstile antenna – circularly polarized antenna.

**PROPAGATION**

Modes of propagation – sky wave propagation, propagation of radiowave through ionosphere, critical frequency, effects of earth's magnetic field on ionospheric radiowave propagation, effects of dielectric constant ( $k_r$ ) and conductivity( $\sigma$ ) of the ionosphere, collision frequency, virtual height, Maximum usable frequency, calculation of MUF, Skip distance, Ionospheric abnormalities – space wave propagation, range of space wave propagation – effective earth's radius – effect of earth's curvature on troposphere propagation – field strength of space or tropospheric wave – duct propagation.

**TEXT BOOKS**

1. John D.Kraus, Ronald Marhefka, Antennas for all applications, TMH, 3<sup>rd</sup> Edition, 2004.
2. E.C.Jordan, Balmain, ElectroMagnetic Waves and Radiating Systems, PHI, 1968, Reprint 2003.

**REFERENCES**

1. Prasad K.D., “Antennas and wave propagation”, Satya Prakashan, 3<sup>rd</sup> Edition, 2002
2. R.E.Collins, Antennas and Radio Propagation, McGraw Hill, 1987.
3. Ballany, Antenna Theory, John Wiley & Sons, 2<sup>nd</sup> Edition, 2003.

<b>ECE317</b>	<b>MEASUREMENTS AND INSTRUMENTATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

**INDICATING INSTRUMENTS**

Basic characteristics of measuring devices – errors in measurements, standards and calibration – Moving Coil – Moving Iron – Hot wire – Electrostatic and Electrodynamic meters – Ammeters, Voltmeters, frequency meter, Watt meter, energy meter.

**MEASUREMENT OF RLC**

Measurement of low, medium & high resistance – Wheatstone bridge, Kelvin double bridge, Carey - Foster bridge – Ohmmeter – Megger – measurement of inductance and capacitance using Maxwell bridge, Wien bridge, Hay's bridge, Schering's bridge, Anderson bridge, Campbell bridge

**ELECTRONIC METERS AND CRO**

D.C, A.C voltmeters, ammeters, multimeter, power meter, Q-meter, true RMS meter, vector impedance meter, vector voltmeter – component measuring instrument – CRO, Special Oscilloscopes.

**DIGITAL MEASUREMENTS**

Review of A/D, D/A techniques – F/V and V/F conversion techniques – Digital voltmeters and multimeters – Digital phase meters – Digital tachometers – Digital frequency, period and time measurements – Low frequency measurements – Automatic time and frequency scaling – Sources of error.

**DIGITAL DISPLAY & RECORDING DEVICES**

Digital storage oscilloscopes – Digital printers and plotters – CDROMS – Digital magnetic tapes – dot matrix and LCD display CRO – colour monitor – digital signal analyser – digital data acquisition.

**TEXT BOOKS**

1. A.K. Sawhney, Electrical & Electronic Measurements and Instrumentation, Dhanpath Rai & Co , 2004.
2. Albert D. Helfrick & William D. Cooper, Modern Electronic Instrumentation & Measurement Techniques, PHI, 2002.

**REFERENCES**

1. Kalsi H. S., Electronic Instrumentation, TMH, 1995.
2. Bouwens A.J., Digital Instrumentation, McGraw Hill, 1984.

<b>ECE318</b>	<b>INFORMATION THEORY AND CODING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**ALGEBRA**

Groups – fields – binary field arithmetic – construction of Galois field – basic properties – computations, vector spaces, matrices

**INFORMATION THEORY**

Information and entropy – properties of entropy of a binary memoryless source –extension of a binary memoryless source – source coding theorem – Shannon fano coding - Huffman coding

**SHANNON'S THEOREM AND MUTUAL INFORMATION**

Binary symmetric channel – mutual information – properties – channel capacity – Hartley, Shannon Law – channel coding theorem - Lempel-Ziv coding

**LINEAR AND CYCLIC CODES**

Linear block codes – generator matrices – parity check matrices – encoder – syndrome and error correction – minimum distance –error correction and error detection capabilities – cyclic codes – coding and decoding

**OTHER CODING TECHNIQUES**

Convolutional codes – encoder – generator matrix – state diagram – distance properties - maximum likelihood decoding – viterbi decoding – sequential decoding –Hadamard matrices and Hadamard codes – BCH codes – description, decoding – Reed Solomon codes

**TEXT BOOKS**

1. Norman Abramson, Information Theory, John Wiley, 2002.
2. Shu Lin, Costello D.J., Error Control Coding - Fundamentals and Applications, PHI, 2000.

**REFERENCES**

1. Simon Haykin, Digital Communications, John Wiley, 2001.
2. Taub & Schilling, Principles of Communication System, TMH, 1998.
3. Tomasi, Electronic Communication, Fundamentals Through Advanced, Pearson Education, 2001.
4. Sklar, Digital Communication, Pearson Education, 1999.
5. Cover T., and Thomas, Elements of Information Theory, John Wiley & Sons 1991.

<b>ECE319</b>	<b>RADIO AND SATELLITE COMMUNICATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>4</b>	<b>0</b>	<b>0</b>	<b>4</b>

**RADIO TRANSMITTERS**

Basic communication systems – transmitters, channel and noise considerations – need for modulation – AM, FM techniques – voice signal processing – echo control techniques – AM broadcasting – SSB in telephone communication – FM transmitters – FM stereo broadcasting – allocation of frequency band for AM and FM broadcasting.

**RADIO RECEIVERS**

Receiver parameters – tuning range, tracking, selectivity, sensitivity, gain – TRF receiver – Super heterodyne receiver – choice of IF, image frequency rejection, AGC, delayed AGC – electronically tuned receivers – integrated circuit receivers – FM broadcast receivers – FM stereo receivers

**SATELLITE COMMUNICATION SYSTEMS**

Frequency allocation for satellite services – orbits and orbital parameters – launching methods – importance of Geostationary satellites – antennas and feed system – satellite tracking system –

telemetry and attitude control – space craft sub system – pay load, repeaters, power sub system, repeaters and relay towers – link budgeting.

**MULTIPLE ACCESS TECHNIQUES**

Frequency division multiple access - time division multiple access - code division multiple access - access protocols for data traffic.

**APPLICATIONS**

Satellite - fixed and mobile services – RADARSAT, VSAT, INMARSAT, INTELSAT, navigation satellites – satellite services and internet –Standards for radio and satellite communication.

**TEXT BOOKS**

1. Dennis Roddy , Satellite Communications, ,Mc Graw Hill , 3<sup>rd</sup> Edition, 2000.
2. Charles W.Bostian, Satellite communication, Wiley, 2002.

**REFERENCE**

1. Roddy& Coolen, Electronic Communications, PHI, 4<sup>th</sup> Edition, 2002.

<b>ECE341</b>	<b>TELEVISION ENGINEERING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**VIDEO ENGINEERING**

Elements of Television system – Basic block schematic of television transmitter and receiver, camera, picture tube – scanning, composite video signal – vertical and horizontal synchronization

**TELEVISION CAMERA**

Working principle of CCD – colour television camera – block schematic explanation modulation – positive and negative modulation – comparison - high level and low level modulation - comparison – Vestigial side band transmission.

**COLOUR TELEVISION**

compatibility consideration – chromaticity diagram – Luminance and chrominance – color difference signal and its generation – Frequency interleaving – Colour TV picture tubes – CRT, LCD and plasma displays – Monochrome and colour reception – Basic colour television systems – PAL and NTSC, Block schematic explanation.

**VIDEO CODING AND VIDEO COMPRESSION**

Demand for video compression – video image representation – quantization of image data intraframe compression techniques – DPCM – DCT based transform coding – Motion compensation – H. 261 – video conference coding standard – MPEG video compression – digital audio broadcasting – digital audio and Video Techniques.

**DIGITAL TV AND HDTV**

Standards – Direct broadcast from satellites – digital representation of audio and video signals – digital recording of audio and video signals – signal representation – advantages and disadvantages of digital recording – Compact Discs – basic concept of audio and video compression and decompression – JPEG, MPEG compression standards – Video CD – digital audio Broadcasting – Multimedia – multimedia applications – video conferencing .

**TEXT BOOK**

1. R R, Gulati, Monochrome and colour television, Wiley Eastern Ltd.

**REFERENCES**

1. Bernad Grob, Basic Television Engineering, Mc Graw Hill
2. A.M.Dhake, Television and Video Engineering, TMH, 2<sup>nd</sup> Edition,
3. Fred Halsal, Multi Media Communication, Pearson Education.

<b>ECE342</b>	<b>ADVANCED DIGITAL SIGNAL PROCESSING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **DISCRETE RANDOM SIGNAL PROCESSING**

Discrete Random Processes – Ensemble averages, stationary processes, Autocorrelation and Auto covariance matrices – Parseval's Theorem – Wiener-Khintchine Relation – power spectral density – Periodogram – Spectral Factorization – filtering random processes – Low Pass Filtering of White Noise – parameter estimation – bias and consistency.

### **SPECTRUM ESTIMATION**

Estimation of spectra from finite duration signals – non-parametric methods – correlation method, periodogram estimator, performance analysis of estimators -unbiased, consistent estimators – modified periodogram – Bartlett and Welch methods – Blackman –Tukey method – parametric Methods - AR, MA, and ARMA model based spectral estimation – Parameter Estimation -Yule-Walker equations, solutions using Durbin's algorithm.

### **LINEAR ESTIMATION AND PREDICTION**

Linear prediction – forward and backward predictions – Solutions of the Normal equations – Levinson-Durbin algorithms – least mean squared error criterion –Wiener filter for filtering and prediction – FIR Wiener filter and Wiener IIR filters, Discrete Kalman filter.

### **ADAPTIVE FILTERS**

FIR adaptive filters – adaptive filter based on steepest descent method –Widrow-Hoff LMS adaptive algorithm, Normalized LMS –

Adaptive channel equalization –Adaptive echo cancellation – Adaptive noise cancellation –Adaptive recursive filters (IIR) – RLS adaptive filters –Exponentially weighted RLS, sliding window RLS.

**MULTIRATE DIGITAL SIGNAL PROCESSING**

Mathematical description of change of sampling rate –interpolation and decimation , decimation by an integer factor, Interpolation by an integer factor, Sampling rate conversion by a rational factor, Filter implementation for sampling rate conversion – direct form FIR structures – polyphase filter structures – time-variant structures – multistage implementation of multirate system – application to sub band coding – Wavelet transform and filter bank implementation .

**TEXT BOOK**

1. Monson H.Hayes, Statistical Digital Signal Processing and Modeling, John Wiley and Sons, Inc., Singapore, 2002.

**REFERENCES**

1. John G. Proakis, Dimitris G.Manolakis, Digital Signal Processing, Pearson Education, 2002.
2. John G. Proakis, Algorithms for Statistical Signal Processing, Pearson Education, 2002.
3. Dimitris G. Manolakis, Statistical and adaptive signal Processing, McGraw Hill, Newyork, 2000.
4. Emmanuel C.Ifeachor, Barrie W.Jervis, Digital Signal Processing A Practical Approach, Addison Wesley, 1993.
5. A.V. Oppenheim , Schafer, Discrete Time Signal Processing, Prentice Hall, 1989.

<b>ECE 343</b>	<b>ADVANCED DIGITAL SYSTEM DESIGN</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**ADVANCED TOPICS IN BOOLEAN ALGEBRA**

Shannon's expansion theorem – Consensus theorem – Octal designation – Run measure –INHIBIT - INCLUSION - AOI - Driver - Buffer gates, Gate expander, Reed Muller expansion – Synthesis of multiple output combinational logic circuits by product map method – Design of static hazard free and dynamic hazard free logic circuits.

### **SYNCHRONOUS CIRCUITS**

Analysis and Design of Clocked Synchronous Sequential Networks (CSSN) - Analysis of Asynchronous Sequential Circuit (ASC) – Flow Table Reduction – Races in ASC – State Assignment – Problem and the Transition Table – Design of ASC – Static and Dynamic Hazards – Essential Hazards – Data Synchronizers – Designing Vending Machine Controller - ASM Chart - ASM Realization.

### **FAULT DIAGNOSIS AND TOLERANCE**

Fault Classes and Models – Fault Diagnosis and Testing – Test Generation - Fault Table Method – Path Sensitization Method – Boolean Difference Method – Kohavi Algorithm – Tolerance Techniques.

### **PROGRAMMABLE LOGIC DEVICES**

Basic Concepts - Programmable Logic Element (PLE), Programmable Logic Array(PLA), Programmable Array Logic (PAL), Structure of Standard PLD's, Complex PLD's (CPLD), System Design Using PLD's - design of combinational and sequential circuits using PLD's - Introduction to Field Programmable Gate Arrays - Types of FPGA, Xilinx XC3000 series, Logic Cell Array(LCA), Configurable Logic Blocks (CLB) - Input/Output Block (IOB) - Programmable Interconnect Point (PIP), Introduction to Actel ACT2 family and Xilinx XC4000 families - design examples.

### **HARDWARE DESCRIPTION LANGUAGE**

VHDL description of combinational circuits – arrays – VHDL operators – compilation and simulation of VHDL Code – Modeling using VHDL – Flip Flops – Registers – counters – Sequential Machine – Combinational Logic Circuits - VHDL Code for – serial adder, binary multiplier – binary divider – complete sequential systems – design of a Simple Microprocessor.

**TEXT BOOKS**

1. William I. Fletcher, An Engineering Approach to Digital Design, PHI, 1996.
2. Charles H.Roth, Fundamentals of Logic Design, Thomson Publication Company, 2003.

**REFERENCES**

1. Donald D.Givone, Digital Principles and Design, TMH , New Delhi, 2003.
2. Nripendra N Biswas, Logic Design Theory, PHI, 2001
3. Stephen Brown and Zvonk Vranesic, Fundamentals of Digital Logic with VHDL Design TMH, 2002.
4. Navabi.Z, VHDL Analysis and Modeling of Digital Systems,. McGraw Hill, 1998
5. Parag K Lala, Digital System design using PLD, BS Publications, 2003.

<b>ECE344</b>	<b>MULTIMEDIA COMPRESSION TECHNIQUES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**INTRODUCTION**

Overview of information theory – redundancy – need for compression – evolution of data compression - applications – Taxonomy of compression techniques – overview of source coding, source models – coding – uniquely decodable codes – prefix codes- Kraft McMillan Inequality.

**QUANTIZATION THEORY**

Scalar quantization theory – overview, uniform, adaptive, nonuniform, Entropy coded Quantization – Vector quantization theory – overview, LBG algorithm –Tree structured vector, structured vector quantizers – rate distribution theory – Evaluation techniques –error analysis and methodologies.

### **TEXT COMPRESSION**

Compaction techniques – Huffmann coding – Adaptive Huffmann Coding – Arithmetic coding – Shannon - Fano coding – dictionary techniques – LZW family algorithms.

### **AUDIO COMPRESSION**

Audio signal representation – compression techniques Frequency domain and filtering – Basic sub-band coding – G.722– MPEG audio – progressive encoding for audio – Silence compression – speech compression techniques –Vocoders.

### **IMAGE COMPRESSION**

Predictive techniques – DM, PCM, DPCM – optimal predictors and optimal quantization – contour based compression, Quad trees – transform coding – JPEG Standard – Sub-band coding algorithms – Design of Filter banks – Wavelet based compression –EPIC, SPIHT coders – JPEG 2000 standards.

### **TEXT BOOK**

1. Khalid Sayood, Introduction to Data Compression, Morgan Kauffman Harcourt India, 2<sup>nd</sup> Edition, 2000.

### **REFERENCES**

1. David Salomon, Data Compression – The Complete Reference, Springer Verlag New York Inc., 2<sup>nd</sup> Edition, 2001.
2. Yun Q.Shi, Huifang Sun, Image and Video Compression for Multimedia Engineering - Fundamentals, Algorithms & Standards, CRC press, 2003.

3. Peter Symes, Digital Video Compression, McGraw Hill Pub., 2004.
4. Mark Nelson, Data compression, BPB Publishers, New Delhi, 1998.
5. Mark S.Drew, Ze-Nian Li, Fundamentals of Multimedia, PHI, 1<sup>st</sup> Edition, 2003.

<b>ECE425</b>	<b>NETWORK MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**DATA COMMUNICATIONS AND NETWORK MANAGEMENT OVERVIEW**

Communications protocols and standards –Network Management goals – Organization and functions – Network and System Management – Network Topology – LAN, Network node components –Hubs, Bridges, Routers, Gateways, Switches – WAN – ISDN –Transmission Technology

**NETWORK STANDARDS, MODELS AND LANGUAGE**

OSI Network management model – Organizational model – Information model, communication model – Abstract Syntax Notation - Encoding structure – Macros Functional model CMIP/CMIS

**SIMPLE NETWORK MANAGEMENT PROTOCOL (SNMP)**

SNMP model – Organizational model – System Overview – The information model – communication model – Functional model – SNMP proxy server – Management information – protocol remote monitoring

**BROADBAND NETWORK MANAGEMENT**

Broadband networks and services – ATM Technology – VP, VC – ATM Packet, integrated service, ATM LAN emulation, Virtual LAN – ATM Network Management – ATM Network reference model – integrated local management interface – ATM Management Information base –M1, M2, M3, M4 Interface

**NETWORK MANAGEMENT APPLICATIONS**

Configuration management – Fault management – performance management – event correlation techniques – security Management – Accounting management – Report Management

**TEXT BOOK**

1. Mani Subramanian, Network Management Principles and practice, Addison Wesley, New York, 2000

**REFERENCES**

1. Salah Aidarous, Thomas Plevayk, Telecommunications Network Management. Technologies and Implementations , IEEE press, New Delhi, 1998
2. Lakshmi G. Raman, Fundamentals of Telecommunication Network Management, IEEE Press, New Delhi, 1999

<b>ECE426</b>	<b>SPREAD SPECTRUM TECHNIQUES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**FEATURES AND NEW TRENDS**

Definition and features of spread spectrum systems – Historical remarks on spread spectrum – New trends of commercial applications

**FUNDAMENTALS OF SPREAD SPECTRUM**

Direct-sequence spread spectrum systems – Frequency-hopping and time-hopping spread spectrum systems – Chirp spread spectrum systems – Hybrid systems

**SPREADING SEQUENCES**

Maximal-length sequences – Gold codes – Non-linear codes – Walsh orthogonal codes – PN signal analysis – PN code acquisition and tracking – Dither loop – Serial and parallel acquisition method.

**PERFORMANCE CHARACTERISTICS**

Performance of spread spectrum system in a jamming environment – Multi-Carrier CDMA System – Orthogonal Frequency Division Multiplexing System.

**APPLICATIONS**

commercial applications of spread spectrum – global positioning system, mobile communications, digital broadcasting, wireless LAN.

**TEXT BOOKS**

1. R.L. Peterson, et. al., Introduction to Spread Spectrum Communications, PHI, 1995.
2. R.C. Dixon, Spread Spectrum Systems with Commercial Applications, John Wiley & Sons, 3<sup>rd</sup> Edition, 1994.

**REFERENCE**

1. A.J. Viterbi, CDMA-Principles of Spread Spectrum Communication, Addison -Wesley, 1995.
2. M.K. Simon, Spread Spectrum Communications Handbook , McGraw-Hill, 1994.

<b>ECE427</b>	<b>MICROWAVE DEVICES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**BASICS OF MICROWAVES**

Introduction to microwaves – microwave frequency range – significance of microwave frequency range – applications of microwaves – Microwave passive components – Wave guides. Cavity resonators – rectangular and circular cavities – Q factor- Coupling two cavities – Microwave network analysis - Behavior of Wire, Resistors, Capacitors, Inductors at high frequencies.

**MICROWAVE PASSIVE DEVICES**

Scattering matrix –concept of N port scattering matrix representation – properties of S matrix- S matrix formulation of two port junction – Microwave junctions – Tee junctions – magic Tee – Rat race – corners – bends and twists – directional couplers – two hole directional couplers – S matrix of microwave components – ferrites – microwave properties and applications – termination – gyrator – isolator – circulator – phase changer – attenuator.

**MICROWAVE SEMICONDUCTOR DEVICES**

Microwave semiconductor devices – characteristics – operation and application of BJTs and FETs – principles of tunnel diodes – varactor and step recovery diodes – transferred Electron Devices – Gunn diode – Avalanche transit time devices – impact avalanche transit time devices and trapped mode avalanche transit time devices – parametric devices – principles of operation – applications of parametric amplifier .Microwave monolithic integrated circuit (MMIC) – materials and fabrication techniques

**MICROWAVE TUBES & MICROWAVE MEASUREMENTS**

Microwave tubes – High frequency limitations – Principle of operation of Multicavity Klystron, Reflex Klystron, traveling wave tube, Magnetron – Measurement of power, wavelength, impedance, SWR, attenuation, Q and Phase shift. Network Analyzers, Anechoic chambers – Microwave safety measures.

**MICROWAVE AMPLIFIERS**

Microwave amplifiers – amplifier classes – efficiency – dynamic range – Negative resistance amplifiers – LNA – Gunn diode as Oscillator – amplifier – PIN diode -switches - phase shifters - mixers - mixer diodes and matching - single-ended and balanced diode mixers- FET mixers – detectors.

**TEXT BOOK**

1. Samuel Y Liao , Microwave Devices & Circuits, PHI, 3<sup>rd</sup> Edition, 2003.

**REFERENCES**

1. Collin, Foundations for microwave engineering, McGraw Hill, 2<sup>nd</sup> Edition 2002
2. David M. Pozar, Microwave Engineering, John Wiley & sons, 2<sup>nd</sup> Edition 2003.

<b>ECE428</b>	<b>VLSI SIGNAL PROCESSING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**INTRODUCTION TO DSP SYSTEMS**

Introduction to DSP Systems -ypical DSP algorithms – iteration bound – data flow graph representations, loop bound and iteration bound – longest path matrix algorithm – pipelining and parallel processing – pipelining of FIR digital filters, parallel processing, pipelining and parallel processing for low power.

**RETIMING**

Retiming - definitions and properties - unfolding – an algorithm for unfolding, properties of unfolding, sample period reduction and parallel processing application – algorithmic strength reduction in filters and transforms – 2-parallel FIR filter, 2-parallel fast FIR filter, DCT algorithm architecture transformation, parallel architectures for rank-order filters, Odd- Even Merge- Sort

architecture, parallel rank-order filters.

### **FAST CONVOLUTION**

Fast convolution – Cook-Toom algorithm, modified Cook-Toom algorithm – pipelined and parallel recursive and adaptive filters – inefficient/efficient single channel interleaving – look-ahead pipelining in first-order IIR filters – look-ahead pipelining with power-of-two decomposition – clustered look-ahead pipelining – parallel processing of IIR filters – combined pipelining and parallel processing of IIR filters – pipelined adaptive digital filters – relaxed look-ahead, pipelined LMS adaptive filter.

### **BIT-LEVEL ARITHMETIC ARCHITECTURES**

Scaling and roundoff noise- scaling operation, roundoff noise, state variable description of digital filters, scaling and roundoff noise computation, roundoff noise in pipelined first-order filters – bit-level arithmetic architectures- parallel multipliers with sign extension, parallel carry-ripple array multipliers, parallel carry-save multiplier, 4x 4 bit Baugh- Wooley carry-save multiplication tabular form and implementation – design of Lyon's bit-serial multipliers using Horner's rule – bit-serial FIR filter – CSD representation, CSD multiplication using Horner's rule for precision improvement.

### **PROGRAMMING DIGITAL SIGNAL PROCESSORS**

Numerical Strength Reduction – subexpression elimination, multiple constant multiplications, iterative matching – linear transformations - synchronous, wave and asynchronous pipelining – synchronous pipelining and clocking styles – clock skew in edge-triggered single-phase clocking, two-phase clocking, wave pipelining, asynchronous pipelining bundled data versus dual rail protocol – programming digital signal processors – general architecture with important features – low power design – needs for low power VLSI chips – charging and discharging capacitance –short-circuit current of an inverter – CMOS leakage current – basic principles of low power design.

**TEXT BOOKS**

1. Keshab K.Parhi, VLSI Digital Signal Processing systems, Design and implementation, Wiley Inter Science, 1999.
2. Gary Yeap, Practical Low Power Digital VLSI Design, Kluwer Academic Publishers, 1998.

**REFERENCES**

1. Mohammed Isamail and Terri Fiez, Analog VLSI Signal and Information Processing, Mc Graw-Hill, 1994.
2. Jose E. France, Yannis Tsividis, Design of Analog - Digital VLSI Circuits for Telecommunication and Signal Processing, Prentice Hall, 1994.

<b>ECE429</b>	<b>DIGITAL IMAGE PROCESSING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**IMAGE ANALYSIS AND IMAGE TRANSFORMS**

Components of an image processing system - image representation – gray scale and color images – image sampling and quantization – two dimensional orthogonal transforms - DFT, FFT, Haar transform, KLT, DCT, wavelets.

**IMAGE ENHANCEMENT**

Image enhancement in the Spatial Domain - background – basic grey level transformations – histogram processing – enhancement using arithmetic/logic operations – basic of spatial filtering – smoothing spatial filters – sharpening spatial filters – combining spatial enhancement methods – image enhancement in the frequency domain -background – introduction to Fourier transform and frequency domain – smoothing frequency domain filters –

sharpening frequency domain filters – homomorphic filters – implementation.

### **IMAGE RESTORATION**

Model of the image degradation process – noise models – restoration in the presence of noise - periodic noise reduction by frequency domain filtering – Linear, position invariant degradation – estimating the degrading function – inverse filtering – minimum mean square error filtering – constrained least square filtering – geometric mean filter – geometric transformations.

### **IMAGE SEGMENTATION**

Detection of discontinuities – edge linking and boundary detection – thresholding – region based segmentation – segmentation by morphological watersheds – use of motion in segmentation.

### **MORPHOLOGICAL IMAGE PROCESSING**

Preliminaries – dilation and erosion – opening and closing – hit-or-miss transformation – some basic morphological algorithms – extension to gray scale images – boundary descriptors – regional descriptors – use of principal components for description – relational descriptors

### **TEXT BOOK**

1. Rafael C. Gonzalez and Richard E. Woods, Digital Image Processing, 2nd Edition, Pearson education, 2002.

### **REFERENCES**

1. A. K. Jain, Fundamentals of digital image processing, PHI, 1989.
2. W. K. Pratt, Digital image processing, Prentice Hall, 1989.

<b>ECE430</b>	<b>MICROWAVE INTEGRATED CIRCUITS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**MICROSTRIP LINES**

Introduction – types of MICs and their technology – propagating models, Analysis of MIC by conformal transformation, numerical analysis, hybrid mode analysis – losses in microstrip – slot line and coplanar wave guide.

**LUMPED ELEMENTS FOR MICs**

Coupled microstrip – even and odd mode analysis – directional couplers, branch line couplers – design and fabrication of lumped elements for MICs – comparison with distributed circuits

**ACTIVE DEVICES FOR MICs**

Ferromagnetic substrates and inserts – microstrip circulators, phase shifters, microwave transistors, parametric diodes and Amplifiers – PIN diodes – transferred electron devices – IMPATT, BARITT, Avalanche diodes, microwave transistors circuits

**MICROSTRIP CIRCUIT DESIGN AND APPLICATIONS**

Introduction – impedance transformers – filters, high and low power circuits – MICs in satellites and RADAR.

**MMIC TECHNOLOGY**

Fabrication process of MMIC – hybrid MICs – configuration – dielectric substances, thick and thin film technology - testing methods – encapsulation and mounting of devices.

**TEXT BOOKS**

1. Hoffman R.K, Handbook of Microwave integrated circuits, Artech House, Boston, 1987.
2. Gupta .K.C and Amarjit Singh, Microwave Integrated circuits, John Wiley, 1975.

**REFERENCE**

1. Yoshihiro Konishi, Microwave Integrated circuits, Marcel Dekker Technology & Industrial Arts, 1991.

<b>ECE431</b>	<b>WIRELESS COMMUNICATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**CELLULAR CONCEPT**

Frequency reuse – channel assignment strategies – hand off strategies – interference and system capacity – Trunking and grade of Service – improving coverage and capacity in cellular systems.

**RADIO PROPAGATION**

Free Space Propagation Model – propagation Mechanisms – reflection, diffraction and scattering – models for path loss – small scale, multipath propagation - parameters of mobile multipath channels – small scale fading types.

**MULTIPLE ACCESS TECHNIQUES**

FDMA – TDMA – CDMA – spread spectrum multiple access – multiplexing and OFDM – Packet Radio protocols – capture effect – capacity of cellular systems.

**EQUALIZATION, DIVERSITY AND CODING**

Linear and nonlinear equalization – adaptive equalization – diversity techniques – RAKE Receiver – fundamentals of channel coding – Block codes and finite fields – convolutional codes – coding gain – Trellis coded Modulation – Turbo Codes.

**WIRELESS STANDARDS**

GSM – IS-95 –UMTS – IMT-2000 – signaling – call control – mobility management and location tracing.

**TEXT BOOK**

1. T.S.Rappaport, Wireless Communications: Principles and Practice, 2<sup>nd</sup> Edition, Pearson Education, 2003.

**REFERENCES**

1. W.C.Y.Lee, Mobile Communications Engineering: Theory and applications, 2<sup>nd</sup> Edition, McGraw-Hill International, 1998.
2. R. Blake, Wireless Communication Technology, Thomson Delmar, 2003.

<b>ECE432</b>	<b>DSP INTEGRATED CIRCUITS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**VLSI CIRCUIT TECHNOLOGIES**

Standard digital signal processors – application specific ICs for DSP – DSP systems – DSP system design – Integrated circuit design – MOS transistors - MOS logic – VLSI process technologies – trends in CMOS technologies

**DIGITAL SIGNAL PROCESSING**

Digital signal processing – sampling of analog signals, selection of sample frequency – Signal-processing systems – frequency response, Transfer functions – signal flow graphs – Filter structures – adaptive DSP algorithms – DFT-The discrete fourier transform, FFT-The Fast Fourier Transform algorithm – image coding – discrete cosine transforms

**DIGITAL FILTERS**

FIR filters – FIR filter structures, FIR chips – IIR filters – Specifications of IIR filters – mapping of analog transfer functions – mapping of analog filter structures – Multirate systems –

interpolation with an integer factor  $L$  – sampling rate change with a ratio  $L/M$ , multirate filters – finite word length effects – parasitic oscillations – scaling of signal levels – Round-off noise – measuring round-off noise – coefficient sensitivity, Sensitivity and noise

### **DSP ARCHITECTURES**

DSP system architectures – standard DSP architecture – Ideal DSP architectures – multiprocessors and multicomputers – systolic and wave front arrays – shared memory architectures – mapping of DSP algorithms onto hardware – implementation based on complex PEs – shared memory architecture with bit – serial PEs.

### **ARITHMETIC UNITS**

Conventional number system – Redundant number system – Residue number system -bit-parallel and bit-serial arithmetic, basic shift accumulator, reducing the memory size, complex multipliers, improved shift-accumulator - layout of VLSI circuits, FFT processor, DCT processor and Interpolator.

### **TEXT BOOKS**

1. Lars Wanhammer, DSP Integrated Circuits, Academic press, New York 1999.
2. A.V.Oppenheim et.al, Discrete-time Signal Processing, Pearson education, 2000.

### **REFERENCES**

1. Emmanuel C. Ifeachor, Barrie W. Jervis, Digital signal processing A practical approach, Pearson education, 2<sup>nd</sup> Edition, 2001.
2. Keshab K.Parhi, VLSI digital Signal Processing Systems design and Implementation, John Wiley & Sons, 1999.

<b>MINOR ELECTIVES</b>
------------------------

<b>ECE 321</b>	<b>DIGITAL MOS CIRCUITS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>3</b>

**CHARACTERISTICS OF MOS TRANSISTORS**

Review of the basics physics –I-V & C-V characteristics - Short channel and narrow channel effects in MOSFETs – sub threshold conduction - channel length modulation - drain induced barrier lowering - hot carrier effects -velocity saturation of charge carriers

**SCALING IN MOSFETS**

Constant voltage and constant field scaling - digital MOSFET model - series connection of MOSFETs – body effect. Scaling issues in interconnects. Latch up in CMOS and methods for preventing latch up.

**MOS INVERTERS**

Resistive load - NMOS load - pseudo NMOS and CMOS inverters - calculation of input high and low and output high and low levels - power dissipation - calculation of delay times for CMOS inverter - CMOS ring oscillator - design of super buffer - estimation of interconnect parasitics and calculation of interconnect delay. Static CMOS logic circuits - CMOS NOR, NAND, AOI and OAI gates - full adder - SR and JK latches - C<sup>2</sup>MOS latch - Pass transistors and Transmission gates - simple circuits using TG – basic principles of pass transistor logic - voltage bootstrapping

**PSEUDO NMOS**

Tri-state circuits – clocked CMOS – Dynamic CMOS circuits – solutions for charge sharing - DOMINO Logic- NORA – TSPC logic styles – Dual rail logic networks – Implementation of general VLSI system components such as decoders, encoders, Flip Flops and Registers- Method of Logical Effort for high speed CMOS design - BiCMOS logic circuits - BiCMOS inverter with resistive base pull down and active base pull down - BiCMOS switching transients - simple gates using BiCMOS – Advanced CMOS logic styles

**CMOS CLOCKING STYLES**

Clock generation and distribution - Arithmetic Circuits in CMOS VLSI - high speed adders, subtractors and multipliers – CMOS Memory structures – RAM and DRAM design –Sense amplifier design - Low power design techniques –MT CMOS – VTCMOS basic ideas of adiabatic logic. Floor planning and Routing – Input

and Output circuits – special CMOS device structures such as SOI, DTMOS, Radiation Hard CMOS, Fin FETs.

**TEXT BOOKS**

1. Sung-Mo Kang & Yusuf Leblebici, CMOS Digital Integrated Circuits - Analysis & Design, 2<sup>nd</sup> Edition, McGraw Hill, 2001.
2. Jan M Rabaey, Digital Integrated Circuits - A Design Perspective, Prentice Hall, 2001.

**REFERENCES**

1. Yuan Taur & Tak H Ning, Fundamentals of Modern VLSI Devices, Cambridge Univ.Press, 2004.
2. Ken Martin, Digital Integrated Circuit Design, Oxford Univ. Press, 2003.

<b>EEE355</b>	<b>SOFT COMPUTING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**ARTIFICIAL NEURAL NETWORKS**

Basic concepts - Single Layer Perceptron- Multilayer Perceptron - Supervised and Unsupervised learning – Backpropagation networks - Kohonen's self organizing networks - Hopfield network.

**FUZZY SYSTEMS**

Fuzzy sets and Fuzzy reasoning - Fuzzy matrices - Fuzzy functions - Decomposition - Fuzzy automata and languages - Fuzzy control methods - Fuzzy decision making-Fuzzy logic controller design.

**NEURO - FUZZY MODELING**

Adaptive networks based Fuzzy interface systems - Classification and Regression Trees - Data clustering algorithms - Rule based structure identification - Neuro-Fuzzy controls

**GENETIC ALGORITHMS**

GA technology-Steady state algorithm-Survival of the Fittest – Fitness function- Fitness Computations - Cross over - Mutation - Reproduction - Rank method - Rank space method-Hybrid genetic-genetic encoding-GA Vs Conventional algorithm.

**SOFT COMPUTING AND CONVENTIONAL AI**

AI search algorithm - Predicate calculus - Rules of inference – Semantic networks - Frames - Objects - Hybrid models - Applications.

**TEXT BOOKS**

- 1 .Jang J.S.R., et.al., Neuro-Fuzzy and Soft computing, Prentice Hall,1998.
2. Timothy J.Ross, Fuzzy Logic with Engineering Applications, McGraw Hill, 1997.
3. Laurene Fausett, Fundamentals of Neural Networks, Prentice Hall, 1994.

**REFERENCES**

1. George J. Klir and Bo Yuan, Fuzzy sets and Fuzzy Logic, Prentice Hall, 1995.
2. Nih J.Nelsson, Artificial Intelligence - A New Synthesis ,Harcourt Asia Ltd., 1998.
3. D.E .Goldberg, Genetic Algorithms: Search, Optimization and Machine Learning, Addison Wesley, N.Y , 1989.

<b>EEE365</b>	<b>ELECTRICAL MACHINES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**D.C. MACHINES**

Constructional details – emf equation – Methods of excitation – Self and separately excited generators – Characteristics of series, shunt and compound generators – Principle of operation of D.C. motor – Back emf and torque equation – Characteristics of series, shunt and compound motors.

### **TRANSFORMERS**

Constructional details – Principle of operation – emf equation – Transformation ratio – Transformer on no load – Parameters referred to HV/LV windings – Equivalent circuit – Transformer on load – Regulation.

### **INDUCTION MOTORS**

Construction – Types – Principle of operation of three phase induction motors – Equivalent circuit - speed control – Single phase induction motors.

### **SYNCHRONOUS MACHINES**

Construction of synchronous machines-Types – Induced emf – Voltage regulation- Generator-Load Characteristics – Synchronous motor.

### **SPECIAL MACHINES**

Brushless DC motor – Reluctance motor – Hysteresis motor – Stepper motors-Universal motor.

### **TEXT BOOKS**

1. D.P.Kothari and I.J.Nagrath, Basic Electrical Engineering, TMH, 2<sup>nd</sup> Edition, 2002.
2. BL. Theraja and A.K. Theraja, Electrical Technology –Volume 2, S.Chand & Co., 2004.

### **REFERENCES**

1. S.K.Bhattacharya, Electrical Machines, TMH, 2<sup>nd</sup> Edition, 1998.
2. S.K.Pillai, A First Course on Electrical Drives, New Age International, 2<sup>nd</sup> Edition, 2002.

<b>INT355</b>	<b>INTERNET AND WEB TECHNOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**BASICS OF NETWORKS**

Introduction to Internet and Web – Basics of computer networks – Topologies – signaling methods – Internet and its basics – Web servers – Browsers – Issues for the design of networking – Security issues.

**WEBSITE AND WEBCASTING TECHNIQUES**

Introduction – Creation of a website – Hyper text and HTML – Document structuring tags – Dynamic HTML – XML – Search Engines – Tools – Channels Push Technology.

**JAVA PROGRAMMING**

Language basics – Java classes – constructors – Java objects and their creations – Interfacing methods – Classes – Data encapsulation techniques – Java IO.

**JAVA COMPONENTS / NETWORK PROGRAMMING**

Computer Interface – Creation of GUI – Applets – Java Beans – CORBA – EJBs – Network Programming – Socket creation – URL classes – Socket classes – Programming for security.

**DYNAMIC FUNCTIONALITY IN WEB PAGES**

CGI – Four steps for CGI – Script specification – CGI Script languages – Dynamic page functionalities using servelets – JSPs – ASPs – COMs – DCOMs,.

**TEXT BOOK**

1. RajKamal, Internet and Web Technologies, TMH, 2005.

**REFERENCE**

1. Markur Pope, Mastering Internet Programming , Galgotia Publications, 1996.

<b>EIE355</b>	<b>ADVANCED CONTROL SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**STATE VARIABLE ANALYSIS AND DESIGN**

Concepts of state variables and state model, State models for Linear Continuous time Systems, Solution of State Equations, Controllability and Observability, Pole placement by state Feedback, Observer Systems.

**SAMPLED - DATA SYSTEMS**

Introduction, sampled data systems, closed-loop feedback sampled-data systems, stability analysis in z-plane, performance of a sampled-data second-order system, closed-loop systems with digital compensation.

**NONLINEAR SYSTEMS**

Common physical Nonlinearities- phase plane method- Describing function method- stability analysis by describing function method- Lyapunov's stability criterion

**OPTIMAL CONTROL**

Problem formulation, necessary conditions of optimality, state regulator problem, Matrix Riccati equation, infinite time regulator problem, output regulator and tracking problems, Pontryagin's minimum principles, time - optimal control problem.

**FUZZY CONTROL**

Fuzzy sets and linguistic variables, The fuzzy control scheme, Fuzzification and defuzzification methods, Applications, Comparison between conventional and fuzzy control

**TEXT BOOK**

1. K.Ogata, Modern Control Engineering, PHI, 2002.

**REFERENCES**

1. B.C.Kuo, Automatic Control Systems, PHI, 1995.
2. R.Dorf and R.H.Bishop, Modern Control Systems, Addison Wesley, 2001.
3. M.Gopal, Digital Control and State Variable Methods, TMH, 2003.
4. I.J. Nagrath and M. Gopal, Control system Engineering, New age International, 2003.
5. B. K. Bose, Modern Power Electronics and AC Drives, Pearson Education, 2003.

<b>CSE355</b>	<b>ARTIFICIAL INTELLIGENCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>4</b>

**PRODUCTION SYSTEMS AND AI**

Production systems, search strategies for AI: Hill climbing, Backtracking, Graph search, properties of AO\*, monotone restriction, AO\* algorithm.

**PREDICATE CALCULUS**

Specialized production systems , searching game trees, min max procedure, alpha beta procedure. Introduction to predicate calculus. Resolution refutation systems. Answer extraction.

**REPRESENTATION OF KNOWLEDGE**

Basic Plan-Generating System: Robot problem solving system. Structured representation of knowledge: Semantic networks, frames, scripts. Dealing with uncertainty, non-monotonic reasoning.

**EXPERT SYSTEMS**

Introduction to expert systems. Inference: Forward chaining and backward chaining. Deduction process. Languages and tools.

**KNOWLEDGE ACQUISITION AND UNCERTAINTY**

Explanation facilities, knowledge acquisition, dealing with uncertainty, fuzzy reasoning, Introduction to natural language. Understanding, perception, learning; explanation facilities and knowledge acquisition.

**TEXTBOOK**

1. Nilsson N. J , Principles of Artificial Intelligence , Narosa Publishing House, New Delhi, 1990.

**REFERENCES**

1. Patterson D.W, Introduction to Artificial Intelligence and Expert Systems , Prentice Hall, New Delhi, 1990.
2. Rolston D.W, Principles of Artificial Intelligence & Expert systems development, McGraw Hill, Singapore, 1988.
3. Rich E and Knight K, Artificial Intelligence, 2<sup>nd</sup> Edition, TMH, New Delhi, 1990.

<b>EIE365</b>	<b>MEDICAL ELECTRONICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**BIO-ELECTRIC CONCEPTS**

Cell and its Structure -Origin of resting and action potential – Bioelectric Potentials – Electrode Theory – Types of pre amplifiers - Isolation amplifier - Differential amplifier - Instrumentation amplifier - bridge amplifier - chopper amplifier

**PHYSIOLOGY**

Electro Physiology of Heart – ECG – Physiology of Central Nervous System – EEG – Evoked Potential – Physiology of Eye – ERG – EMG, Analysis of ECG and EEG – Patient monitoring system.

### **HEART-LUNG MACHINE**

Kidney Machine – Nerve Stimulators –Short wave Diathermy - Microwave Diathermy - Ultrasonic diathermy - Surgical diathermy - anesthetic monitor

### **MEDICAL IMAGING**

Ultrasonic imaging – Radiology- X-rays in tissue- Nuclear medicine, tracing techniques, gamma camera - Nuclear magnetic imaging- Magnetic Resonance Imaging - Smoothing medical images - Positron Emission Tomography

### **MEASURING DEVICES**

Measurement of Blood flow – Lung Volume – Cardiac output – Oxygen Saturation of Blood – Blood Cell Counters – Flame photometer.

### **TEXTBOOK**

1. Joseph J. Carr and John M. Brown, Introduction to Biomedical Equipment Technology, Pearson Education, 2001.

### **REFERENCES**

1. Myer Kutz, Standard Handbook of Biomedical Engineering & Design, McGraw-Hill, 6<sup>th</sup> edition, 2000.
2. John G. Webster, Medical Instrumentation Application and Design, John Wiley & Sons, 1999.
3. Khandpur R.S., Hand book of Biomedical Instrumentation”, TMH, 2000.

<b>CSE365</b>	<b>ADVANCED COMPUTER ARCHITECTURE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **FUNDAMENTALS OF COMPUTER DESIGN**

Review of fundamentals of CPU, Memory and IO – Performance evaluation – Instruction set principles – Design issues – Example Architectures.

### **INSTRUCTION LEVEL PARALLELISM**

Pipelining and handling hazards – Dynamic Scheduling – Dynamic hardware prediction – Multiple issue – Hardware based speculation – Limitations of ILP – Case studies.

### **INSTRUCTION LEVEL PARALLELISM**

Compiler techniques for exposing ILP – Static branch prediction – VLIW & EPIC – Advanced compiler support – Hardware support for exposing parallelism - Hardware versus software speculation mechanisms – IA 64 and Itanium processor.

### **MEMORY AND I/O**

Cache performance – Reducing cache miss penalty and miss rate – Reducing hit time – Main memory and performance – Memory technology. Types of storage devices – Buses – RAID – Reliability, availability and dependability – I/O performance measures – Designing an I/O system.

### **MULTIPROCESSORS AND PARALLELISM**

Symmetric and distributed shared memory architectures – Performance issues – Synchronization – Models of memory consistency – Multithreading.

### **TEXT BOOK**

1. John L.Hennessey and David A.Patterson, Computer Architecture: A Quantitative Approach, Morgan Kaufmann, 3<sup>rd</sup> Edition, 2003.

### **REFERENCE**

1. D.Sia, et. al, Advanced computer Architectures: A Design Space Approach, Addison Wesley, 2000.

<b>HUMANITIES ELECTIVES</b>
-----------------------------

<b>HSS001</b>	<b>TOTAL QUALITY MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**QUALITY MANAGEMENT**

Definitions – TOM framework, benefits, awareness and obstacles - Quality – vision, mission and policy statements - Customer Focus – customer perception of quality, Translating needs into requirements, customer retention. Dimensions of product and service quality. Cost of quality.

**PRINCIPLES AND PHILOSOPHIES OF QUALITY MANAGEMENT**

Overview of the contributions of Deming, Juran Crosby, Masaaki Imai, Feigenbaum, Ishikawa, Taguchi, Shingeo and Walter Shewhart - Concepts of Quality circle, Japanese 5S principles and 8D methodology.

**STATISTICAL PROCESS CONTROL AND PROCESS CAPABILITY**

Meaning and significance of statistical process control (SPC) – construction of control charts for variables and attributed - Process capability – meaning, significance and measurement – Six sigma concepts of process capability - Reliability concepts – definitions, reliability in series and parallel, product life characteristics curve - Business process re-engineering (BPR) – principles, applications, reengineering process, benefits and limitations.

## **TOOLS AND TECHNIQUES FOR QUALITY MANAGEMENT**

Quality functions development (QFD) – Benefits, Voice of customer, information organization, House of quality (HOQ), building a HOQ, QFD process. Failure mode effect analysis (FMEA) – requirements of reliability, failure rate, FMEA stages, design, process and documentation.

## **TAGUCHI TECHNIQUES**

Taguchi techniques – introduction, loss function, parameter and tolerance design, signal to noise ratio - Seven old (statistical) tools - Seven new management tools - Bench marking and POKA YOKE.

## **REFERENCES**

1. Dale H.Besterfield et al, Total Quality Management, Perarson Education, 3<sup>rd</sup> Edition, (First Indian Reprints 2004).
2. Shridhara Bhat K, Total Quality Management – Text and Cases, Himalaya Publishing House, 1<sup>st</sup> Edition, 2002.
3. William J.Kolarii, Creating quality, Mcgraw Hill, 1995
4. Poornima M.Charantimath., Total quality management, Pearson Education, 1<sup>st</sup> Indian Reprint, 2003.

<b>HSS002</b>	<b>ENGINEERING MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## **DEMAND AND REVENUE ANALYSIS**

Demand Forecasting - Production Analysis - Cost and Supply Analysis, Price and output Determination - Investment Analysis - Plant Location - Economic Optimization.

## **FORMS OF BUSINESS AND FUNCTIONS**

Types of Business Organisation, Forms - Planning - Organizing - Designing effective organisations - Coordination

**HUMAN RESOURCE DEVELOPMENT**

Motivating individuals and workgroups - Leadership for Managerial Effectiveness - Team working and Creativity - Managerial Communication - Personal Management – Time Management - Stores Management - Career Planning.

**FINANCIAL MANAGEMENT**

Product development - Management techniques in product development - Nature of controlling - Operations Management - Just-in-Time.

**GLOBAL ENVIRONMENT**

Managing World Economic Change - The global environment - Multinational Strategies - Economic Cycles and Director Investment - Change and Organisation Development - Managerial Ethics and Social responsibilities.

**REFERENCES**

1. Harold Koontz& Heinz Weihrich, Essentials of Management, Tata McGraw Hill publishing company Ltd.
2. Koontz, Weihrich& Aryasri, Principles of Management, Tata McGraw Hill publishing company Ltd.
3. Tripathi& Reddy, Principles of Management, Tata McGraw Hill publishing company Ltd.
4. Hampton, Management, Tata McGraw Hill publishing company Ltd.
5. L.M.Prasad, Principles of Management.

<b>HSS003</b>	<b>INDIAN ECONOMIC DEVELOPMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**INDIAN ECONOMIC SCENARIO**

Indian economy before and after Independence - National income trends and compositions. Sources of capital formation and savings -

Sectoral growth. Demographic trends in India and its effect on economic development - Occupational structure of the labour force.

### **ECONOMIC PLANNING AND POLICY**

Indian Economic Planning, fiscal policy, Monetary Policy, Unemployment in India and other economic policies

### **INDUSTRIAL DEVELOPMENT**

Industry: Industrial development during the planning period - Industrial policies Industrial licensing policy – MRTP Act, FERA and FEMA - Growth and problems of small-scale industries - Role of Public sector enterprises in India's industrialization. Impact of economic reforms on Indian industrial sector after 1991.

### **FOREIGN TRADE**

External Sector - Role of foreign trade. Trends in exports and imports - Composition and direction of India's foreign trade - Balance of payments crisis and the New Economic Reforms – Export promotion measures and the new trade policies - Foreign capital – FDI, aid: Multinational corporations in India

### **AREAS OF CONCERN**

Poverty and inequality. Unemployment. Rising prices. Industrial relations. Industrial structure and causes of industrial backwardness.

### **REFERENCES**

1. Agrawal, A.N. Indian Economy. Problems of Developmental Planning, Wiley Eastern Ltd., Calcutta, latest edition.
2. Ahluwalia, I.J. and I.M.D. Little (eds.), India's Economic Reforms and Development, Essays in honour of Manmohan Singh, Oxford University Press, New Delhi, 1999.
3. Alam, K., Agricultural Development in North East India: Constraints and Prospects, Deep & Deep Publications, New Delhi, 1993.

4. Choudhuri, Primit. Aspects of Indian Economic Development, Lord George Allen & Unwin Ltd., London, 1975.
5. Dutt, R.C., The Economic History of India Under Early British Rule, Low Price Publications, Delhi, 1950.
6. Dutt, Ruddar and K.P.M. Sundaram, Indian Economy, S. Chand & Co. Ltd., New Delhi, 2001.

<b>HSS004</b>	<b>INDUSTRIAL PSYCHOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **ROLE OF PSYCHOLOGY**

Role of the psychologist in industry, the field of occupational Psychology - Study of behaviour in work situation and applications of Psychological principles to problems of selection, Placement, Counseling and training

### **DESIGN OF WORK ENVIRONMENTS**

Human engineering and physical environment techniques of job analysis, Social environment- Group dynamics in Industry Personal psychology - Selection, training, placement, promotion, counseling, job motivations, job satisfaction .Special Study of problem of fatigue, boredom and accidents,

### **UNDERSTANDING CONSUMER BEHAVIOUR**

Consumer behaviour; study of consumer preference, effects of advertising, Industrial morale - the nature and scope of engineering psychology, its application to industry

### **WORK METHODS**

Efficiency at work, the concept of efficiency, the work curve, its characteristics - The work methods; hours of work, nature of work, fatigue and boredom, rest pauses. The personal factors; age abilities, interest, job satisfaction The working environment - noise,

illumination, atmospheric conditions - Increasing efficiency at work; improving the work methods, Time and motion study, its contribution and failure resistance to time and motion studies, need for allowances in time and motion study.

### **WORK AND EQUIPMENT DESIGN**

Criteria in evaluation of job-related factor, job design, human factors, Engineering information, input processes, mediation processes, action processes, methods design, work space and its arrangement, human factors in job design. Accident and Safety - The human and economic costs of accidents, accident record and statistics, the causes of accidents situational and individual factors related to accident reduction

### **REFERENCES**

1. Tiffin,J and McCormic E.J., Industrial Psychology, Prentice Hall, 6<sup>th</sup> Edition., 1975.
2. McCormic E.J., Human Factors engineering and design, McGraw Hill, 4<sup>th</sup> Edition, 1976.

<b>HSS005</b>	<b>CONSUMER PSYCHOLOGY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **CONSUMER BEHAVIOUR**

Introduction – Consumer behaviour – concepts – dimensions of consumer behaviours – application of consumer behaviour knowledge in marketing decisions – approaches to the study of consumer behaviour.

### **LEARNING AND DECISION MAKING PROCESS**

Motivation, ability and opportunity; exposure, attention and perception Categorizing and comprehending information Attitude formation and change – memory and retrieval Process of decision making – psychographics Consumer behaviour outcomes – consumer welfare

**GROUP BEHAVIOUR**

Group dynamics and consumer reference groups – Family – Social class cultural and sub-cultural aspects – cross cultural consumer behaviour.

**INFLUENCER BEHAVIOR**

Personal influence and opinion leadership – diffusion of innovations – consumer decision – making process – models of consumer decision process – Nicosia- Howard Sheth and Engel-Kollat model- post purchase behaviour

**CONSUMERISM**

Consumer protection – difficulties and challenges in predicting consumer behaviour – online consumer behaviour – organizational and industrial buyer behaviour – consumer behaviour in Indian context – emerging issues.

**REFERENCES**

1. David L.Loudon, Albert J Della Bitta, Consumer Behaviour, McGraw Hill, New Delhi, 2002.
2. Jay D. Lindquist and M.Joseph sirgy, Shopper, buyer & consumer Behaviour, Theory and Marketing application, Biztantra Publication, New Delhi, 2005.
3. Sheth Mittal, Consumer Behaviour A Managerial Perspective, Thomson Asia (P) Ltd., Singapore, 2003.
4. K.K.Srivastava, Consumer Behaviour in Indian Context, Goal Gotia Publishing Co, New Delhi, 2002.
5. S.L. Gupta & Sumitra Pal, Consumer Behaviour an Indian Perspective, Sultan Chand, New Delhi, 2001.
6. Ms.Raju, Dominique Xavedel, Consumer behaviour, Concepts Applications and Cases, Vikas publishing house (P) Ltd., New Delhi, 2004.

<b>HSS006</b>	<b>PROFESSIONAL ETHICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
---------------	----------------------------	----------	----------	----------	----------

		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
--	--	----------	----------	----------	----------

### **ENGINEERING ETHICS**

Functions of Being a Manager – Stock holder and stakeholder management - Ethical treatment of employees - ethical treatment of customers- supply chain management and other issues.

### **ENGINEERING AS SOCIAL EXPERIMENTATION**

Senses of Ethics – Variety of moral issues – Types of inquiry – Moral dilemmas - Moral Autonomy – Kohlberg’s theory – Gilligan’s theory – Consensus and Controversy – Professions and Professionalism – Professional ideals and virtues – Theories about right action – Self-interest – Customs and religion – Use of Ethical Theories.

### **ENGINEER RESPONSIBILITY FOR SAFETY**

Corporate social responsibility - Collegiality and loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Discrimination.

### **RESPONSIBILITY AND RIGHTS**

Moral imagination, stake holder theory and systems thinking - One approach to management Decision – making Leadership.

### **GLOBAL ISSUES**

Multinational Corporations – Environmental Ethics – Computer Ethics – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Moral Leadership – Sample code of conduct.

### **REFERENCES**

1. Mike Martin and Roland Schinzinger, Ethics in Engineering, McGraw Hill, New York, 1996.

2. Charles D Fledderman, Engineering Ethics, Prentice Hall, New Mexico, 1999.
3. Laura Schlesinger, How Could You Do That: The Abdication of Character, Courage, and Conscience, Harper Collins, New York, 1996.
4. Tom Rusk, The Power of Ethical Persuasion: From Conflict to Partnership at Work and in Private Life, Viking, New York, 1993.

<b>HSS007</b>	<b>OPERATIONS MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**PRODUCTION AND OPERATION MANAGEMENT**

Production and Operations Management (POM) – Need, History, System, Types, functions and communication in POM.

**MATERIAL AND INVENTORY MANAGEMENT**

Material Management (MM) – Handling Technology (Robots, Automated storage and retrieval systems (ASRS) and methods (JIT, / Kanban, ABC Systems) - Independent Demand Inventory Models – Fixed order system, Basic EOQ, EBQ Models, Quantity discount models - Dependent Demand Inventory models – MRP and MRP II systems Introduction to ERP, e-business and e-operations strategies.

**PLANNING AND FORECASTING**

Strategic, Tactical, Operational, Aggregate and Capacity Planning - Planning Product design and development – Applications of CAD, CAM, Computer Integrated Manufacturing

**FORECASTING AND SCHEDULING:**

Forecasting – Types, Methods (Qualitative and Quantitative), Types of variation in data, Minimizing forecasting errors and selection of forecasting methods. Johnson’s Algorithm for job sequencing (n job thro’ 2 machines, n jobs thro’ 3 machines, n jobs thro’ m machines and 2 jobs thro’ m machines) Use of Gantt charts, Queuing analysis and Critical Ratios as methods for job scheduling.

### **FACILITY, LAYOUT LOCATION AND WORK MEASUREMENT**

Facility Location Decisions (FLcD) – Facility Layout Decision (FlyD) – Types - Fixed Position, and Production, Process, Flexible - Methodologies (Distance Minimising, Computer software systems (CRAFT, CORELAP, ALDEP), Line Balancing and performance ratios, work measurement methods (WM) - Time study, methods-time measurement,

### **REFERENCES**

1. R.Paneer Selvam, Production and Operations Management, PHI, 2002.
2. Sang M Lee and Marc J Schniederjans, Operation Management, All India Publishers and Distributors, 1<sup>st</sup> Indian Edition, 1997.
3. Robert H. Lowson, Strategic operations Management (The new competitive advantage), Vikas Publishing House, 1<sup>st</sup> Indian reprint, 2003.

<b>HSS008</b>	<b>BASICS OF ECONOMICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **DEFINITION AND SCOPE OF ECONOMICS**

Definitions by A. Smith, A. Marshal and L. Robbins, P.Samuelson and their critical examination - Nature and scope of Economics - Micro-economics in relation to other branches of Economics.

### **LAW OF DEMAND**

Elasticity of demand - price, income and cross, concepts and measurement - Marshallian theory of consumers' behaviour and its critical examination - Indifference curve analysis - Price, income and substitution effects - Giffen goods- Engel curve.

### **MARKET STRUCTURE**

Definition of market. Concepts of product and factor markets. Different types of market: perfect competition, monopoly, imperfect competition, monopolistic, competition and oligopoly. Demand and Supply schedules. Price determination under perfect competition in long and short run. Price determination under monopoly. Discriminating monopoly.

### **MACRO-ECONOMICS**

Meaning, Macro-economic Policy and Its Objectives and Instruments - National Income and Social Accounting - Concepts, components, and measurement - Basic circular flow of income model, Unemployment, trade cycle, Inflation - causes, types, effects and control.

### **COMMERCIAL AND CENTRAL BANKS**

Credit creation, monetary policy and tools - Balance of payments - Items in the balance of payments account, equilibrium in the balance of payments.

### **REFERENCES**

1. Ackley, G., Macroeconomics: Theory and Policy, Macmillan Publishing Company, New York, 1978.
2. Gupta, S.B., Monetary Economics, S. Chand & Co., New Delhi, 1994.
3. Ruddar Datt and K.P.M.Sundharam, Indian Economy, S.Chand & Company Ltd., New Delhi, 2003.
4. Kindleberger, C.P., R.D. Irwin, International Economics, Home Wood, 1973.

5. Lewis, M.K. and P.D. Mizan, Monetary Economics, Oxford University Press, New Delhi, 2000.
6. Ahuja H.L., Economic Environment of Business, Macroeconomic analysis, S.Chand & Company Ltd., New Delhi, 2005.
7. Gupta, G.S. Macroeconomics, Theory and Applications, Tata McGraw-Hill publishing company Ltd., New Delhi, 2001.
8. D.N.Dewedi, Macro economic – Theory and policy, Tata McGraw-Hill publishing company Ltd., New Delhi, 2001.

<b>HSS010</b>	<b>INTERNATIONAL TRADE AND FINANCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **INTERNATIONAL TRADE**

International Trade – Meaning and Benefits – Basis of International Trade – Foreign Trade and Economic Growth – Balance of Trade – Balance of Payment – Current Trends in India – Barriers to International Trade – WTO – Indian EXIM Policy.

### **EXPORT AND IMPORT FINANCE**

Special need for Finance in International Trade – INCO Terms (FOB, CIF, etc.) – Payment Terms – Letters of Credit – Pre Shipment and Post Shipment Finance – Forfeiting – Deferred Payment Terms – EXIM Bank – ECGC and its schemes – Import Licensing – Financing methods for import of Capital goods.

### **FOREX MANAGEMENT**

Foreign Exchange Markets – Spot Prices and Forward Prices – Factors influencing Exchange rates – The effects of Exchange rates in Foreign Trade – Tools for hedging against Exchange rate variations – Forward, Futures and Currency options – FEMA – Determination of Foreign Exchange rate and Forecasting.

### **DOCUMENTATION IN INTERNATIONAL TRADE**

Export Trade Documents - Financial Documents – Bill of Exchange-Type- Commercial Documents - Performa, Commercial, Consular,

Customs, Legalized Invoice, Certification of Origin Certificate Value, Packing List, Weight Certificate, Certificate of Analysis and Quality, Certificate of Inspection, Health certificate. Transport Documents - Bill of Landing, Airway Bill, Postal Receipt, Multimodal Transport Document. Risk Covering Document: Insurance Policy, Insurance Cover Note. Official Document: Export Declaration Forms, GR Form, PP From, COD Form, Softer Forms, Export Certification, Certification of Origin, GSPS – UPCDC Norms

### **EXPORT PROMOTION SCHEMES**

Government Organizations Promoting Exports – Export Incentives : Duty Exemption – IT Concession – Marketing Assistance – EPCG, DEPB – Advance License – Other efforts I Export Promotion – EPZ – EQU – SEZ and Export House.

### **REFERENCES**

1. Apte P.G., International Financial Management, Tata McGraw Hill.
2. Larceny & Bhattacharya, International Marketing, Sultan Chand & Sons.
3. B.M.Wali and AB Kalkumdrikas, Export Management, Sterling Publishers Pvt., Ltd.
4. Websites of WTO, World Bank, IMF, Ministry of Commerce, ECGC and EXIM Bank.

<b>HSS011</b>	<b>INFORMATION SYSTEMS FOR MANAGERIAL DECISION MAKING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **INFORMATION SYSTEM**

Establishing the framework – business model – information system architecture – evolution of information systems.

### **INFORMATION SYSTEM**

Functional areas, Finance, marketing, production, personnel – levels, Concepts of DSS, EIS, ES – comparison, concepts and knowledge representation – managing international information system.

### **SYSTEM DEVELOPMENT**

Modern information system – system development life cycle – structured methodologies – designing computer based method, procedures control, designing structured programs.

### **IMPLEMENTATION AND CONTROL**

Testing security – coding techniques – detection of error – validation – cost benefits analysis – assessing the value and risk information systems.

### **SOFTWARE ENGINEERING**

Software engineering qualities – design, production, service, software specification, software metrics, and software quality assurance – software life cycle models – verification and validation.

### **REFERENCES**

1. Kenneth C. Laudon and Jane Price Laudon, Management Information systems Managing the digital firm, Pearson Education, Asia.
2. Gordon B.Davis, Management Information system: Conceptual Foundations, Structure and Development, McGraw Hill, 1974.
3. Joyce J. Elam, Case series for Management Information System, Silmon and Schuster, Custom Publishing, 1996.
4. Steven Alter, Information system – A Management Perspective, AddisonWesley, 1999.
5. James AN O' Brein, Management Information Systems, Tata McGraw Hill, New Delhi, 1999.
6. Turban Mc Lean, Wetherbe, Information Technology Management making connection for strategic advantage, John Wiley, 1999.

7. Ralph M.Stair and George W.Reynolds, Principles of Information Systems – A Managerial Approach Learning, 2001.

<b>HSS012</b>	<b>ADVERTISING AND MEDIA SERVICES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**ADVERTISING MANAGEMENT**

Advertiser – facilitating institutions – perspectives on advertising

**ADVERTISING PROCESS**

Advertising planning and decision-making – situation analysis – marketing program – segmentation strategies – social and legal factors Advertising objectives – image and competitive position – Attitude and market structure – behavioural objectives Communications – persuasion and market processes

**BUDGET & MEDIA PLANNING**

Budget decision - copy decisions – copy testing  
Media decisions – media planning, Economic, social and legal constraints - Media Research

**MEASURING EFFECTIVENESS**

Ad testing validity and reliability of ads – measuring impact of advertisements

**OTHER COMMUNICATION TECHNIQUES**

Sales Promotion – personal Selling – Product Management

**REFERENCES**

1. Kenneth Clow. Donald Baack, Integrated Advertisements, Promotion and Marketing communication, PHI, 2003.
2. S.H.H.Kazmi, Satish K Batra, Advertising & Sales Promotion, Excel Books, New Delhi, 2001.

- George E Belch, Michel A Belch, Advertising & Promotion, McGraw Hill, Singapore, 1998.

<b>HSS013</b>	<b>COST ANALYSIS AND CONTROL</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COSTING**

Costing, Elements of costing, Types of cost, Preparation of cost sheet.

**COST ANALYSIS**

Marginal costing, Cost - volume – Profit analysis, Break-Even-Analysis, Break – Even-Chart, Applications.

**CONTROL TECHNIQUES**

Budgeting and Budgetary control, Types of Budgets , Preparation of purchase Budget, Flexible budgets, Cash Budget, Sales Budget, Materials Budget, Master Budget, Zero based Budgeting.

**STANDARD COSTING**

Types of Standards, Setting up of standards, Advantages and Criticism of Standard Costing – Control through variances.

**ACTIVITY BASED COSTING**

Transfer Pricing, Target costing, Life Style Costing, Activity Based Costing (only theory).

**REFERENCES**

- Saxena. K, Vashist. C.D., Advanced Cost Accounting and Cost Systems, S-Chand & Sons Publishers.
- Jain & Narang, Advances Cost Accounting Kalyani Publishers.
- Cost Management, The Institute of Chartered Accountants of India.
- Blocher. J, et. al., Cost Management: A Strategic Emphasis, McGraw-Hill, 3<sup>rd</sup> Edition, 2005

5. Sha, Cases in Cost Management: a Strategic Emphasis, South-Western, 2001
6. Bhabatosh Bangerjee, Financial Policy and Management , PHI
7. Anthony.Dearden , Vancil, Management Control Systems, Irwin

<b>HSS014</b>	<b>MARKETING MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**MARKETING**

Meaning - concept - functions - marketing Planning & implementation marketing Programmes - Marketing environment – Market Segmentation and consumer behaviour – Influencing factors, Decision process – Marketing mix – Marketing department.

**PRODUCT**

Meaning - Product planning - policies - positioning - New product development Product life cycle – BCG Matrix-branding. Packing, labeling.

**PRICING**

Pricing objectives – Setting and modifying the price – Different pricing method Product line pricing and new product pricing

**DISTRIBUTION**

Nature of Marketing channels - Types of Channel flows - Channel functions - Channel co-operation, conflict and competition - Direct Marketing Telemarketing, Internet shopping.

**PROMOTION**

Promotion Mix - Advertisement - Message - copy writing – Advertisement budgeting - Measuring advertisement effectiveness - Media strategy - sales promotion -Personal selling, publicity and direct marketing

**REFERENCES**

1. Philip Kotler, Marketing Management- Analysis Planning and Control, Prentice Hall of India, New Delhi.
2. Cundiff, Still & Govoni, Fundamentals of Modern Marketing, Prentice Hall of India, New Delhi.
3. Ramaswamy. V S & Namakumari. S, Marketing Management- Planning Implementation and Control, Macmillan Business Books, 2002.
4. Jobber, Principles and Practice of Marketing, McGraw-Hill.

<b>HSS015</b>	<b>MANAGEMENT CONCEPTS AND TECHNIQUES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**DEVELOPMENT OF MANAGEMENT THOUGHT**

Scientific Management Movement, Administrative Movement, Human-Relations Movement, Decision-Science Movement, Behavioral Movement, Systems Movement, Contingency Movement

**ESSENTIALS OF PLANNING**

Objectives, goals, Programmed Decisions and Un programmed Decisions; Decision-Making, Creativity in Decision-Making, Forecasting and Strategy to Formulation.

**EFFECTIVE ORGANIZING**

Span of Control, Departmentation, Authority; Responsibility, Bureaucracy and Adhocracy; Group Dynamics

**REALITIES OF ORGANIZATIONAL LIFE**

Organizational Politics, Organizational Power, Organizational Conflict

**COMMUNICATION & CONTROL**

Communication Process Evaluation, Control Process, Qualities of a Good Control System, Management Audit, Human – Offset Accounting, Cost Benefit Analysis.

### REFERENCES

1. Harold Koontz & Heinz Weihrich, Essentials of Management, Tata McGraw Hill publishing company Ltd.
2. Koontz, Weihrich & Aryasri, Principles of Management, Tata McGraw Hill publishing company Ltd.
3. Tripathi & Reddy, Principles of Management, Tata McGraw Hill publishing company Ltd.
4. Hampton, Management, Tata McGraw Hill publishing company Ltd.
5. L.M.Prasad, Principles of Management.

<b>HSS017</b>	<b>INTERNATIONAL ECONOMICS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### THEORY OF INTERNATIONAL TRADE

The Basic Trade Model, Heckscher-Ohlin-Samuelson Model, Effects of Tariffs & Quotas, Theory of Factor Movements - New Theories of International Trade and Industrial Policies.

### EXCHANGE RATE & BALANCE OF PAYMENT

The Balance of Payments and National Accounts, Determinants of Exchange Rates The Exchange-Rate Regime Choice and a Common Currency Area, International Debt and Currency Crises.

### INTERNATIONAL REGULATORY AUTHORITY

Political Economy of Trade Disputes, the FTA and the WTO - The role of the IMF and other International Financial Organizations.

**PROTECTION OF WORLD TRADE**

Reasons, International Movements of Capital - The Balance of Trade and Other Measures of International Transactions. Export and import policies.

**INTERNATIONAL MACROECONOMICS**

European Monetary Unification and the Euro - Preferential Trading Arrangements and the NAFTA International Policies for Economic Development, Trade Outsourcing and Off shoring

**REFERENCES**

1. N. Bhagwati, A. Panagariya and T. N. Srinivasan, Lectures on International Trade, MIT Press, 2<sup>nd</sup> edition, 1998.
2. M. Obstfeld and K. Rogoff, Foundation of International Macroeconomics, McGraw-Hill, 1996.
3. Romer, D., Advanced Macroeconomics, McGraw Hill, 1996.

<b>HSS018</b>	<b>COMMUNICATION SKILLS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**COMMUNICATION IN BUSINESS**

Systems approach, forms of business communication, management and communication, factors facilitating communication.

**COMMUNICATION PROCESS**

Interpersonal perception, selective attention, feedback, variables, listening barriers to listening, persuasion, attending and conducting interviews, participating in discussions, debates and conferences, presentation skills, paralinguistic features, oral fluency development.

**BUSINESS CORRESPONDENCE**

Business letter, memos, minutes, agendas, enquiries, orders, sales letters, notice, tenders, letters of application, letter of complaints.

**TECHNICAL REPORTS**

Format, choice of vocabulary, coherence and cohesion, paragraph writing, organization.

**PROJECT REPORTS**

Project proposal, project reports, appraisal reports.

**REFERENCES**

1. Sharan J.Genrson and Steven M.Gerson, Technical Writing - Process and Product, Pearson Education, 2000.
2. Raymond V.Lesikar, et.al., Lesikass Basic Communication, Tata McGraw Will, 8<sup>th</sup> Edition, 1999.
3. Stevel. E. Pauley, Daniel G.Riordan, Technical Report Writing Today, AITBS Publishing & Distributors, India 5<sup>th</sup> Edition, 2000.
4. Robert L.Shurter, Effective letters in business, 3<sup>rd</sup> Edition, 1983.
5. McGraith, Basic Managerial Skills for all, PHI, 6<sup>th</sup> Edition, 2002.
6. Halliday, M.A, Ky R.Hasan, Cohesion in English, Longman, London, 1976.

<b>HSS019</b>	<b>OPERATIONS RESEARCH</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**LINEAR PROGRAMMING**

Introduction to applications of operations research in functional areas of management - Linear Programming - formulation, solution by graphical and simplex methods (Primal - Penalty, Two Phase), Special cases - Dual simplex method.

**TRANSPORTATION MODELS AND ASSIGNMENT MODELS**

Transportation Models (Minimising and Maximising Cases) – Balanced and unbalanced cases – Initial Basic feasible solution by N-W Corner Rule, Least cost and Vogel's approximation methods - Check for optimality - Solution by MODI / Stepping Stone method -

Cases of degeneracy - Transshipment Models - Assignment Models (Minimising and Maximising Cases) – Balanced and Unbalanced Cases - Solution by Hungarian and Branch and Bound Algorithms - Travelling Salesman problem - Crew Assignment Models.

### **INTEGER LINEAR PROGRAMMING AND GAME THEORY**

Solution to pure and mixed integer programming problem by Branch and Bound and cutting plane algorithms - Game Theory - Two person Zero sum games - Saddle point, Dominance Rule, graphical and LP solutions.

### **REPLACEMENT MODELS AND DECISION THEORY**

Replacement Models-Individuals replacement Models (With and without time value of money) – Group Replacement Models - Decision making under risk – Decision trees – Decision making under uncertainty.

### **PROJECT MANAGEMENT METHOD AND SIMULATION**

PERT / CPM – Drawing the network, computation of processing time, floats and critical path. Resource leveling techniques - Application of simulation techniques for decision making.

### **REFERENCES**

1. Kalavathy S, Operations Research, Vikas Publishing House, Second Edition, third Reprint 2004.
2. Paneerselvam R., Operations Research, Prentice Hall of India, Fourth Print, August 2003.
3. Tulsian P.C, Vishal Pandey, Quantitative Techniques (Theory and Problems), Pearson Education, Asia, First Indian Reprint 2002.

<b>HSS020</b>	<b>HUMAN RESOURCE MANAGEMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

### **BASIC FUNCTIONS**

Functions of a human resources manager - recruitment and selection processes interview methods.

**EVALUATION AND DEVELOPMENT**

Performance appraisal, Training and development, disciplinary procedures, collective bargaining and employee welfare.

**TRENDS**

The recent methods and trends in HRM with a few case studies in the context of globalization.

**STRATEGIC ROLE**

Job analysis Personnel planning and recruiting Employee testing and selection, interviewing candidates, Appraising performance.

**CAREER AND COMPENSATION**

Managing careers Compensation Benefits and services Labor relations and collective bargaining Employee safety and health

**REFERENCES**

1. Decenzo and Robbins, Human Resource Management, Wiley, 6<sup>th</sup> edition, 2001.
2. Biswajeet Pattanayak, Human Resource Management, Prentice Hall of India, 2001.
3. Eugene McKenna and Nic Beach, Human Resource Management, Pearson Education.
4. Dessler, Human Resource Management, Pearson Education Limited, 2002.
5. Mamoria C.B and Mamoria S., Personnel Management, Himalaya Publishing.
6. Wayne Cascio, Managing Human Resources, McGraw-Hill, 1998.
7. Ivancevich, Human Resource Management, McGraw-Hill, 2002.

<b>HSS021</b>	<b>PUBLIC FINANCE THEORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
---------------	------------------------------	----------	----------	----------	----------

		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
--	--	----------	----------	----------	----------

### **THE ROLE AND SIZE OF THE PUBLIC SECTOR**

Economic Rationale for Public Sector Interventions, Market Efficiency and Market Failure, Distributional Concerns, The Nature and Magnitude of Public Sector Interventions, Defining the Responsibilities and Measuring the Size of the Public Sector

### **PUBLIC EXPENDITURE POLICY**

Public Goods and Private Goods, Public Choice in Determining the Level of Public Expenditure, Public Sector Production and Provision, Government Failure, and Private Sector Participation/Public-Private Partnerships in Production and Provision, Government Social Protection Policies, Assessment of Public Sector Expenditure Efficiency and Effectiveness.

### **PUBLIC RESOURCE MOBILIZATION**

Economics of Taxation, Taxation of Income and Wealth, Taxation of Consumption and Trade, Taxation and the Environment, Taxation and Natural Resources, Tax Incentives, Compliance, and Enforcement, Tax Reform, User Charges.

### **INTERGOVERNMENTAL FISCAL RELATIONS**

Fiscal Federalism and Fiscal Decentralization, Resource Transfers.

### **LOCAL GOVERNMENT FINANCE**

Local Government Debt Financing, Fiscal Balance, Deficit Financing, and Capital Formation.

### **REFERENCES**

1. Harvey S Rosen, Public Finance
2. Richard A. Musgrave, Peggy B. Musgrave, Public Finance Theory and Practice, Tata Mc Graw Hill.

<b>HSS022</b>	<b>BANKING THEORY</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
---------------	-----------------------	----------	----------	----------	----------

		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
--	--	----------	----------	----------	----------

### **EVOLUTION OF BANKING SYSTEM**

Central Banking functions, Reserve Bank control over banks.

### **BANKER - CUSTOMER RELATIONSHIP**

Bank as borrowers, customer accounts, duties of paying and collecting bankers.

### **LENDING BY BANKS**

RBI control over loans and advances, Securities for loans.

### **AGENCY SERVICES BY BANKS**

Banker as bailee, safe deposit vaults, credit cards.

### **CONSUMERS OF BANKING SERVICES**

Protection against deficiency in banking services.

### **REFERENCES**

1. M.L.Tannan, Tannan's Banking Law and Practice in India, India Law House, New Delhi, 1997.
2. S.N.Gupta, The Banking Law in theory and Practice Vol. I & II, Universal Law Publishing Co., 1999.
3. M.S.Parthasarathy, Banking Law-Leading Indian Cases, N.M.Tripathi, 1985.
4. L.C.Goyle, Law of Banking and Bankers, Eastern Law House, 1995.

<b>HSS023</b>	<b>ENTREPRENEURSHIP DEVELOPMENT</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**BASIC CONCEPT**

Entrepreneurship as a Career – Entrepreneur – Personality Characteristics of Successful. Entrepreneur – Knowledge and Skills Required for an Entrepreneur.

**ENTREPRENEURIAL ENVIRONMENT**

Business Environment - Role of Family and Society - Entrepreneurship Development Training and Other Support Organisational Services - Central and State Government Industrial Policies and Regulations - International Business.

**BUSINESS PLAN PREPARATION**

Sources of Product for Business – Pre-feasibility Study - Criteria for Selection of Product - Ownership - Capital - Budgeting Project Profile Preparation - Matching Entrepreneur with the Project - Feasibility Report Preparation and Evaluation Criteria.

**LAUNCHING OF SMALL BUSINESS**

Finance and Human Resource Mobilization Operations Planning - Market and Channel Selection - Growth Strategies - Product Launching.

**MANAGEMENT OF SMALL BUSINESS**

Monitoring and Evaluation of Business - Preventing Sickness and Rehabilitation of Business Units - Effective Management of small Business.

**REFERENCES**

1. Hisrich, Entrepreneurship, Tata McGraw Hill, New Delhi, 2001.
2. P. Saravanavel, Entrepreneurial Development, Ess Pee kay Publishing House, Chennai, 1997.
3. S.S.Khanka, Entrepreneurial Development, S.Chand and Company Limited, New Delhi, 2001.

4. Prasama Chandra, Projects – Planning, Analysis, Selection, Implementation and Reviews, Tata McGraw-Hill Publishing Company Limited, 1996.
5. P.C.Jain (ed.), Handbook for New Entrepreneurs, EDII, Oxford University Press, New Delhi, 1999.
6. Staff College for Technical Education, Manila and Centre for Research and Industrial Staff Performance, Bhopal, Entrepreneurship Development, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1998.