



# 2019

## SYLLABUS SCHEME

### B. TECH IN ELECTRONICS & COMMUNICATION ENGINEERING



**VEER MADHO SINGH BHANDARI  
UTTARAKHAND TECHNICAL UNIVERSITY**



**SHIVALIK**  
COLLEGE OF ENGINEERING

**EVALUATION SCHEME & SYLLABUS**

**W.E.F. ACADEMIC SESSION 2009-10**

# **SCHEME OF EXAMINATION**

**&**

## **SYLLABI**

**for**

**B.Tech I<sup>st</sup> Year (Common to All B.Tech Courses)  
(Effective from the session: 2009-2010)**



**Uttarakhand Technical University, Dehradun**

**UTTRAKHANDTECHNICAL UNIVERSITY, DEHRADUN**  
**STUDY AND EVALUATION SCHEME**  
**B.Tech I<sup>st</sup> Year (Common to All B.Tech Courses)**  
**(Effective from the session: 2009-2010)**  
**Year: I, Semester-1**

S.No	Course Code	Subject	Periods			EVALUATION SCHEME					CR EDI T
						SESSIONAL EXAM			External Exam.	Subje ct Total	
			L	T	P	CT	TA	Total			
1	TMA 101	Mathematics - I	3	1	0	30	20	50	100	150	4
2	TPH 101 / TCY 101	Engg.Physics / Engg.Chemistry	3	1	0	30	20	50	100	150	4
3	THM 101	Basic Technical Communication – I	3	0	2	40	10	50	100	150	3
4	TEE 101 / TME 101	Basic Electrical Engineering / Mechanical Engineering	3	1	0	30	20	50	100	150	4
5	TCS 101 / TEC 101	Fundamentals of Computer & Programming / Fundamentals of Electronic Engineering	3	1	0	30	20	50	100	150	4
*	TES 101	Environmental Studies	2	0	0	-	-	-	-	-	-
<b>Practicals</b>											
1	PPH 101 / PCY 101	Physics / Chemistry	0	0	2	-	-	25	25	50	2
2	PEE 101 / PME 101	Basic Electrical Engineering / Mechanical Engineering	0	0	2	-	-	25	25	50	2
3	PCS 101 / PEC 101	Fundamentals of Computer & Programming / Fundamentals of Electronic Engineering	0	0	2	-	-	25	25	50	2
4	PWS 101/PED 101	Workshop Practice / Engineering Drawing	0	0	2	-	-	25	25	50	2
<b>TOTAL</b>			-	-	-					<b>950</b>	<b>27</b>

**UTTRAKHANDTECHNICAL UNIVERSITY, DEHRADUN**  
**STUDY AND EVALUATION SCHEME**  
**B.Tech I<sup>st</sup>Year (Common to All B.Tech Courses)**  
**(Effective from the session : 2009-2010)**  
**Year: I, Semester-II**  
**UTTRAKHANDTECHNICAL UNIVERSITY, DEHRADUN**

S.No	Course Code	Subject	Periods			EVALUATION SCHEME			Subj ect Tota l	CRE DIT	
						SESSIONAL EXAM					Exter nal Exa m.
			L	T	P	CT	TA	Total			
1	TMA 201	Mathematics - II	3	1	0	30	20	50	100	150	4
2	TCY 201 / TPH 201	Chemistry / Physics	3	1	0	30	20	50	100	150	4
3	THM 201	Advanced Technical Communication	3	0	2	30	20	50	100	150	3
4	TME 201 / TEE 201	Basic Mechanical Engineering / Electrical Engineering	3	1	0	30	20	50	100	150	4
5	TEC 201 / TCS 201	Fundamentals of Electronic Engineering / Fundamentals Computer & Programming	3	1	0	30	20	50	100	150	4
*	TES 201	Environmental Studies	2	0	0	30	20	50	-	50	-
<b>Practicals</b>											
1	PCY 201 / PPH 201	Chemistry / Physics	0	0	2	-	-	25	25	50	2
2	PME 201 / PEE 201	Basic Mechanical Engineering / Electrical Engineering	0	0	2	-	-	25	25	50	2
3	PEC 201 / PCS 201	Fundamentals of Electronic Engineering / Fundamentals Computer & Programming	0	0	2	-	-	25	25	50	2
4	PED201/P WS 201	Engineering Drawing / Workshop Practice	0	0	2	-	-	25	25	50	2
		<b>TOTAL</b>	-	-	-	-	-			<b>1000</b>	<b>27</b>

## MATHEMATICS –I (TMA101)

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3 1 0

### UNIT-1

#### Matrices

10L

Elementary row and column transformations Rank of matrix, linear dependence, Consistency of linear system of equations, Characteristic equation, Cayley-Hamilton theorem, Eigen values and Eigen vectors, Diagonalization, Complex and unitary matrices.

### UNIT-2

#### Differential Calculus-I

9L

Leibnitz theorem, Partial Differentiation, Euler's theorem, Change of variables, Expansion of functions of several variables.

### UNIT-3

#### Differential Calculus-II

9L

Jacobian, Approximations and errors, Extrema of functions of several variables, Lagrange method of multipliers

### UNIT-4

#### Multiple Integrals

6L

Double and triple integrals, Change of order, Change of variables, beta and gamma functions, Application to area, volume, Dirichlet integral and applications.

#### Vector Calculus

6L

Point functions, Gradient, divergence and curl of a vector and their physical interpretation, Line, surface and volume integrals, Green, Stokes and Gauss divergence theorem.

#### References:

- Advanced Engineering Mathematics, Kreyszig, Wiley India
- A Text book of Engineering Mathematics (Vol.1) by Peter V. O'Neil, Cengage Learning
- B. S. Grewal: higher Engineering Mathematics, *Khanna Publications*.
- N. Piskunov: Differential & Integral Calculus, *Moscow Peace Publications*.  
G Shankar Rao, Text book of engineering mathematics, BS Publication, Hyderabad

# ENGINEERING PHYSICS (TPH-101/201)

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3 1 0

## UNIT-I

(8L)

### **Relativistic Mechanics:**

Inertial and Non-inertial Frames, Postulates of Special Theory of Relativity, Galilean and Lorentz Transformation, Length Contraction and Time Dilation, Addition of Velocities, Mass Energy Equivalence and Variation of Mass with Velocity. **Radiation:** Kirchoff's Law, Stefan's law (only statement), Energy spectrum of Blackbody Radiation, Compton Effect.

## UNIT-II

(8L)

**Interference:** Coherent Sources, Conditions of Interference, Fresnel's Biprism Experiment, Displacement of Fringes, Interference in Thin Films – Wedge Shaped Film, Newton's Rings.

**Diffraction:** Single and n-Slit Diffraction, Diffraction Grating, Raleigh's Criterion of Resolution, Resolving Power of Grating.

## UNIT-III

(7L)

**Polarization:** Phenomenon of Double Refraction, Ordinary and Extra-ordinary Rays, Nicol Prism, Production and Analysis of Plane, Circularly and Elliptically Polarized Light, Fresnel Theory, Optical Activity, Specific Rotation, Polarimeter. **Laser:** Principle of Laser Action, Einstein's Coefficients, Construction and Working of He-Ne and Ruby Laser.

## UNIT-IV

(8L)

**Electromagnetic:** Ampere's Law and Displacement Current, Maxwell's Equations in Integral and Differential Forms, Electromagnetic Wave Propagation in Free Space and Conducting Media, Poynting Theorem. **Magnetic Properties of Materials:** Basic Concept of Para-, Dia and Ferro-Magnetism, Langevin's Theory of Diamagnetism, Phenomenon of Hysteresis and Its Applications

## UNIT-V

(9L)

### **Superconductivity:-**

Essential properties of superconductors (zero resistivity), London equations, penetration depth and coherence length, Meissner effect, critical field, critical current Isotope effect, heat capacity, Type I and Type II superconductors, Characteristics of superconductors in superconducting state, applications of superconductors. **Wave Mechanics :** Wave Particle Duality, de Broglie Concept of Matter Waves, Heisenberg Uncertainty Principle, Schrödinger Wave Equation and Its Applications: Particle in a Box.

### **Reference Books:**

- Introduction to Special theory of Relativity Robert Resnick – Wiley India
- Physics of Atoms, Wehr Richards & Adia
- Fundamentals of Physics, Halliday, Wiley India
- Engineering Electromagnetics, William Hayt, 7<sup>th</sup> Ed.(TMH)
- Ashutosh Asthana, Engg. Physics, BS Publication, Hyderabad

**UNIT – I GENERAL & ORGANIC CHEMISTRY**

Molecular orbital diagram of diatomic molecules, valence bond theory & molecular orbital Theory linear combination of atomic orbitals, hybridization, hydrogen bonding, band theory of solids, liquid crystals with their classification applications, Bragg's Law, Fullerenes & their application, Nature of organic molecules, attacking reagents, inductive effect, electromeric, mesomeric (resonance) effect, hyper conjugation, reaction intermediates types of organic reaction (substitution, addition, elimination reaction & organic rearrangements), Saytzeff's rule, organic name reactions (cannizzaro's reaction, aldol condensation, Pinnacol-pinnacol rearrangement, Beckmann's rearrangement, Hoffmann's rearrangement), Optical isomerism & confirmations, E-Z nomenclature, R-S configuration.

**UNIT – II PHYSICAL & WATER CHEMISTRY** **10  
L**

Rate of reaction, order & molecularity of reaction, Zero order, First Order, Second order reaction, steady state approximation, concept of activation energy, energy barrier, cell potential, liquid junction potential, conductance & its variation with dilution, Transport no. Kohlraush's Law and its application, pH, buffer solution, calculation of pH of buffer mixture solubility & solubility Product, Nernst distribution law & its application, corrosion, its type, Mechanism & control, Theory of Electrochemical corrosion. Hardness of water, boiler feed water, Softening of water (Calgon Process, Zeolite process, Lime Soda process & Ion exchange process), Reverse osmosis, treatment of boiler feed water.

**UNIT – III CHEMISTRY OF ENGINEERING MATERIALS** **7  
L**

Introduction & classification of polymers, Types of Polymerization, bulk solution, suspension & emulsion, copolymers, vulcanization, PVC, Polyamides, Polyurethane, Polyethylene, Polypropylene, PET, Resins (Phenol Formaldehyde), PMMA, PAN, Rubber, Conducting and Biodegradable polymers, Pyroceramics, Toughened glass, Strengthening of glass, Refractories, Nano Composites, Protective Coatings, Fe, Al, Cu, Pb & Zn alloys, Organometallics & their applications.

**UNIT – IV FUELS & COMBUSTION** **8 L**

Classification of Fuels, calorific value of fuel, gross & net calorific value, determination of calorific value using Bomb calorimeter, Coal, Biomass and Biogas, Bio Fuel, Esterification & Transesterification, Introduction of Lubricants, Mechanism of Lubrication, Classification of Lubricant, Bio Lubricant, Flash and Fire Point, Pour Point, Cloud Point, Aniline point, Viscosity index.

**UNIT – V ANALYTICAL METHODS AND APPLICATIONS** **7 L**

Titrimetric analysis with reference to acid-base, redox, precipitation and complexometric titrations. Elementary ideas and simple applications of UV, visible, mass and NMR spectral techniques. NMR spectral techniques.

**REFERENCE BOOKS**

- Engineering Chemistry – Wiley India
- Engineering chemistry by Sivasankar, TMH, New Delhi.
- Organic Chemistry by Morrison & Boyd, Pearson Publication.
- Organic Chemistry by Loudon, Oxford University Press.
- C Parameswara Murthy, C V Agrawal and et al., Engineering Chemistry, BS Publication, Hyderabad

**BASIC ELECTRICAL ENGINEERING**  
**(TEE101/201) EE 101**  
**(AUTUMN/ SPRING) L T P**

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**3 1 0**

**UNIT-1**

**D.C. Network Theory :**

**4**

Circuit theory concepts-Mesh and node analysis. Network Theorems- Super-position theorem. Thevenin's theorem, Norton's theorem, Maximum, Power Transfer theorem, Star Delta transformation.

**Steady State Analysis of A.C. Circuits :**

**5**

Sinusoidal and phasor representation of voltage and current: single phase A.C. circuit behavior of resistance, inductance and capacitance and their combination in series & parallel and power factor, series parallel resonance-band width and quality factor : magnetic circuit.

**UNIT-2**

**Three Phase A.C. Circuits :**

**4**

Star-Delta connections, line and phase voltage/current relations, three phase power and its measurement.

**3. Measuring Instruments:**

**4**

Construction and principle of operation of voltage and current measuring instruments; introduction to power and energy meters.

**UNIT-3**

**Transformer :**

**6**

Principle of operation, types of construction, phasor diagram, equivalent circuit, efficiency and voltage regulation of single phase transformer, O.C. and S.C. tests.

**Rotating Machine**

**Unit-4**

**D.C. Machines**

**6**

Principle of electromechanical energy conversion, types of d.c. machines, E.M.F. equation, Magnetization and load characteristics, losses and efficiency, Starter and speed control of d.c. motors, their applications.

**Synchronous Machines:** Principle of Operation of Alternator and synchronous motor. **2**

**UNIT-5**

**Three phase induction Motor 4**

Principle of operation, types and methods of starting, slip-torque characteristics, applications. **Single phase Motors :** Principle of operation and methods of starting of induction motor, Stepper motor and Universal motor **3**

**References :**

1. Dr. R. K. Singh and Dr. P.S. Subramanyam, Basic Electrical Engineering, BS Publication, Hyderabad.
2. Gaikwad, Basic Electrical Engineering, Wiley India
3. A.e. Fitzgerald, D.E., Higginbotham and A Gabel, -Basic Electrical Engineering - Mc Graw Hill.
4. H. Cotton, -Advanced Electrical Technology|| Wheeler Publishing.



**MECHANICAL ENGINEERING**  
**ME 101 (Autumn / Spring)**

LTP  
3 1 0

**UNIT-1**

**Fundamental Concepts and Definitions**

**8L**

Definition of thermodynamics, System, Surrounding and universe, Phase, Concept of continuum, Macroscopic & microscopic point of view. Density, Specific volume, Pressure, temperature. Thermodynamic equilibrium, Property, State, Path, Process, Cyclic and non cyclic processes, Reversible and irreversible processes, Quasi static process, Energy and its forms, Enthalpy.

**UNIT-2**

**8L**

**Zeroth law:**

Zeroth law, Different temperature scales and temperature measurement **First law:** First law of thermodynamics. Processes - flow and non-flow, Control volume, Flow work and non-flow work, Steady flow energy equation, Unsteady flow systems and their analysis. **Second law:** Limitations of first law of thermodynamics, Essence of second law, Thermal reservoir, Heat engines. COP of heat pump and refrigerator. Statements of second law and their equivalence, Carnot cycle, Carnot theorem, Thermodynamic temperature scale, Clausius inequality. Concept of entropy.

**UNIT-3**

**8L**

**Properties of steam:**

Properties of steam, Phase transformation process and its graphical representation on P-V, T-V & T-s diagram, Mollier diagram and Steam Tables, Processes involving steam in closed and open systems.

**Introduction to I.C. Engines:** Two & four stroke S.I. and C.I. engines. Otto cycle, Diesel cycle, Dual cycle.

**UNIT-4**

**9L**

**Force system and Analysis**

**Basic concept:** Review of laws of motion, transfer of force to parallel position, resultant of planer force system, Free Body Diagrams, Equilibrium. **Friction:** Introduction, Laws of Coulomb friction, Equilibrium of bodies involving dry friction.

**Structure Analysis**

**Beams:** Introduction, Shear force and bending moment, Shear force and bending moment diagram for statically determinate and indeterminate beams.

**Trusses:** Introduction, Simple Trusses, Determination of forces in simple truss members, Method of joints and Method of section.

**UNIT-5**

**9L**

**Stress and Strain Analysis**

**Simple stress and strain:** Introduction, Normal shear stresses, Stress-strain diagrams for ductile and brittle materials, Elastic constants, One dimensional loading of members of varying cross section, Strain energy, Thermal stresses.

**Compound stress and strains:** Introduction, State of plane stress, Principal stress and strain, Mohr's circle for stress and strain.

**Pure Bending of Beams:** Introduction, Simple bending theory, Stress in beams of different cross sections. **Torsion:** Introduction, Torsion of Shafts of circular section, Torque and Twist, Shear stress due to Torque.

**Reference:**

1. Agarwal, Basic Mechanical Engineering, Wiley India

3. Holman, J.P. : Thermodynamics, Mc Graw Hill book Co. NY.

4. Singh Onkar, Bhavikatti S.S., Chandra Suresh : Introduction to Mechanical Engineering: Thermodynamics, Mechanics and Strength of Materials, New Age International Publishers

5. Yadav R. : Thermodynamics and Heat Engines, Vol I & II (SI Edition) Central Publishing House Allahabad.

# FUNDAMENTALS OF COMPUTER & PROGRAMMING (TCS 101/201)

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3 1 0

## UNIT-I

8L

Introduction to Computer Systems; Data representation: Number systems, character representation codes, Binary, hex, octal codes and their inter conversions. Binary arithmetic, Floating point arithmetic, signed and unsigned numbers IEEE standards, CPU organization, ALU, registers, memory, the idea of program execution at micro level. Concept of computing, contemporary Operating Systems such as DOS, Windows, UNIX etc. (only brief user level description). Introduction to organization and architecture of mainframe, mini and micro systems.

## UNIT-II

8L

Concept of flow chart and algorithm; Algorithms to programs: specification, top-down development and stepwise refinement, Introduction to the design and implementation of correct, efficient and maintainable programs, structured Programming, Use of high level programming language for the systematic development of programs, programmability and programming languages, Object codes, compilers. Introduction to the Editing tools such as vi or MS-VC editors.

## UNIT-III

10L

C: Data types, Identifiers, Storage class, Constant, Operators, expression, Statements, console I/O statements, Selection statements: if-else, switch, Iteration Statements: for, while, do-while, Jump statements: return, go to, break, continue, comments. Function, Call by value, Call by reference, arguments to main(), return statements, recursion, function prototypes, preprocessor directives.

## UNIT-IV

6L

Arrays:

Single dimensional arrays, two dimensional arrays, multidimensional arrays, variable length arrays. Strings, array of strings. Structures: array of structures, passing structure to function, structure pointers, structure within structures. Unions, bit fields, enumerations.

## UNIT-V

8L

Pointers: pointer variables, pointer operator, pointer expression, array of pointers, multiple indirection, pointers to functions, dynamic allocation functions.

File I/O : Streams and files, file system basics, fread, fwrite, fseek, random access I/O, fprintf(), fscanf(), standard streams.

## Reference Book

- Gupta: Computer Concepts & C Programming, Comdex
- Jones, C Programming with problem solving, Wiley India
- Let Us C : Yashwant Kanetkar [BPB]
- Mastering C ,K.R.Venugopal,S.R.Prasad[TMH]
- Computer Science- A Structured Programming Approach Using C, by Behrouz A. Forouzan, Richard F. Gilberg, Thomson, [India Edition]

# FUNDAMENTALS OF ELECTRONIC ENGINEERING (TEC 101/201)

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3 1 0

## UNIT-1

### **Semiconductor materials and properties** **4L**

Group-IV materials, Covalent bond, electron-hole concepts  
Basic concepts of energy bands in materials, concepts of forbidden gap  
Intrinsic and extrinsic semiconductors, donors and acceptors impurities

## UNIT-2

### **Junction diode and diode applications** **5L**

p-n junction, depletion layer, v- i characteristics, diode resistance, capacitance diode ratings ( average current, repetitive peak current, non-repetitive current, peak-inverse voltage).

#### **Diode Applications** **4L**

rectifiers (half wave and full wave), calculation of transformer utilisation factor and diode ratings, filter (C – filter), calculation of ripple factor and load regulation  
clipping circuits, clamping circuits, voltage multipliers

## UNIT-3

### **Breakdown diodes**

**4L**

breakdown mechanisms (zener and avalanche), breakdown characteristics,  
zener resistance, zener diode ratings, zener diode application as shunt regulator

## UNIT-4

### **Bipolar Junction Transistor** **5L**

Basic construction, transistor action, CB, CE and CC configurations, input/output Characteristics, concept of Biasing of transistors-fixed bias, emitter bias, potential divider bias

#### **Transistor Amplifier**

Graphical analysis of CE amplifier, concept of voltage gain, current gain, h-parameter model (low frequency), computation of  $A_i$ ,  $A_v$ ,  $R_i$ ,  $R_o$  of single transistor CE and CC amplifier configurations.

#### **Field Effect Transistor**

**6L**

JFET: Basic construction, transistor action, concept of pinch off, maximum drain saturation current, input and transfer characteristics, characteristics equation CG, CS and CD configurations, Introduction to self and fixed biasing

MOSFET: depletion and enhancement type MOSFET-construction, operation and characteristics. Computation of  $A_v$ ,  $R_i$ ,  $R_o$ , of single FET amplifiers using all the three configurations

#### **Switching theory and logic design**

**4L**

Number systems, conversions of bases, Boolean algebra, logic gates, concept of universal gate, concept of K- Map

#### **Operational Amplifiers**

**4L**

Concept of ideal operational amplifiers, ideal op-amp parameters, inverting, non-inverting and unity gain amplifiers, adders,

### **Reference Books:**

1. R. K. Singh & Lal Kishor, Basic Electronics Engineering, B S Publication, Hyderabad.
2. Gaikwad, Basic Electronics, Wiley India
3. A Mottershead, 'Electronic devices and circuits'. PHI, 2000.
4. Morris Mano, 'Digital Computer Design', PHI, 2003.



## BASIC TECHNICAL COMMUNICATION (THM 101)

L T P  
3 0 0

### RELEVANCE OF TECHNICAL COMMUNICATION FOR TECHNOCRATS

English Communication is an integral part of today's life. The advent of new technologies has led to the rapid development of a global village. A budding technocrat must be equipped with English language proficiency so that he / she can make a mark in this global village. Engineering students come from different backgrounds with different mother tongues. It is imperative for them to overcome their native accentual patterns and gain proficiency in speaking standard English. They also need to acquire optimum writing skills. Hence proper training in English speaking and writing is necessary. This goes hand in hand with the development of reading and listening skills. The course of Basic Technical Communication will help in the development and improvement of the communication skills and linguistic competence of engineering students.

### **OBJECTIVES:-**

1. To help students perform better in all academic subjects through greater command over the English language.
2. To promote efficiency in English language with the development of the four skills of communication i.e., LSRW (Listening, Speaking, Reading and Writing).
3. To prepare students face the challenges of their professional lives in an increasingly globalised world.

### **UNIT – I: COMMUNICATION**

- 1) Communication – Definition. Process of communication,
- 2) Types of communication—Verbal and Non-Verbal communication; Formal and Informal communication (grapevine) and their significance.
- 3) Barriers to Communication—Semantic barriers, Physical barriers, Psychological barriers, Interpersonal barriers and Organizational barriers. Language as a tool of communication.
- 4) Importance of communication with reference to students, professionals business etc.
- 5) Technical communication: Definition, Oral and Written technical communication. Difference between general writing and technical writing.
- 6) Computer-aided Technical Communication.
- 7) Style in Technical Communication. Features of technical writing.
- 8) Importance of Technical Communication

### **UNIT-2: READING SKILLS**

- 1) Importance of Reading Skills, Types of Reading Skills, Methods of Improving Reading Skills, Objectives of Improving Reading Skills
- 2) Vocabulary Building: Antonyms, Synonyms, Homophones, Word formation (Prefixes and Suffixes). One Word substitution,
- 3) Jargon/Technical Terminology – Use of Jargon and examples of Jargon.
- 4) Paragraph: Definition. Requirements of a paragraph -- Understanding, Unity, Coherence and Emphasis in a paragraph. Identifying the Topic Sentence. Development of a Paragraph using Deductive order, Inductive order, Chronological Order (Time Order), Spatial Order (Space Order), Expository Order, Question and Answer Order, Comparison and Contrast Order. Devices used to impart Coherence and Emphasis in a Paragraph. Analysis of a given Paragraph in terms of Unity, Coherence and Emphasis.
- 5) Developing Reading Skills and Reading Comprehension through the study of thematic and value based critical reading of the following essays –

1. Of Discourse by Francis Bacon
2. Unity of Minds by Dr. A.P.J. Abdul Kalam

### **UNIT-3:- WRITING SKILLS.**

- 1) Importance of Writing Skills, Types of Writing Skills, Methods for Improving Writing Skills, Objectives of Improving Writing Skills
- 2) Functional Grammar- Parts of Speech.
- 3) Common Grammatical Errors: Errors of Syntax, Concord etc.
- 4) Sentence and Paragraph construction. Writing Expository, Argumentative, Deductive etc. Paragraphs.
- 5) Précis Writing
- 6) Letter writing: Formal and Informal Letters.
- 7) Developing Writing Skills through the study of thematic and value based critical reading of the following short stories–
  1. After Twenty Years by O. Henry
  2. The Open Window by Saki (H.H. Munro)

### **UNIT 4:- LISTENING SKILLS**

- 1) Importance of Listening Skills, Process of listening, listening and hearing, Active and Passive Listening. Types of Listening: Academic listening, Appreciative listening, Attentive Listening, Critical Listening, and Discriminative listening etc.
- 2) Methods for Improving Listening Skills, Objectives of Improving Listening Skills.
- 3) Barriers to listening: Semantic barriers, Physical barriers, and Psychological barriers.
- 4) Listening Comprehension: Identifying general content, Identifying specific information.
- 5) Listening for Note taking and drawing inferences.
- 6) Developing listening skills and listening comprehension through the study of thematic and value based critical reading of the following one-act play.
  1. The Refund by Fritz Karinthy

#### **7) Practice of Listening Skills through Language Laboratory**

1. Listening to a recording of a telephone conversation for identifying specific information as well as details.
2. Listening to a recording of a railway / airport announcement for selective listening and identifying specific information.
3. Listening to a recording of a radio / television news bulletin for identifying specific as well as over-all information
4. Listening to a recording of the description of a place, event or incident for note-taking, identifying details, descriptions and overall idea.
5. Listening to a recording of a lecture / talk on for note taking and identifying facts and drawing conclusions.
6. Listening to a recording of a television panel discussion on any topic for identifying facts, analyzing those drawing inferences and explaining the conclusion of the discussion in a logical manner.
7. Listening to passages that are read out for practicing note taking and identifying general and detailed content.
8. Listening to dialogues that are read out for identifying specific, general and detailed content.

## **UNIT-5:- SPEAKING SKILLS.**

- 1) Importance of Speaking Skills, Types of Speaking, Methods for Improving Speaking Skills, Objectives of Improving Speaking Skills
- 2) Organs of Speech, Mechanism of Speech.
- 3) Phonetics: Classification of English Sounds, Vowel (short vowels and long vowels), Consonants, Diphthongs, Phonemes, Allophones, Phonetic transcription.
- 4) Syllable: Definition, Types of Syllable. Monosyllabic, Polysyllabic words etc.
- 5) Stress, Rhythm, Intonation: Rising Tone, Falling Tone and Rising-Falling Tone.
- 6) Everyday Conversation: Tips and characteristics of a good conversation. Common manners and etiquette.
- 7) Debate, Making a speech, Role play,
- 8) Extempore, JAM Session (just a minute session).
- 9) **Practice of Speaking Skills through Language Laboratory**
  1. Practicing the following modules through self-learning software:
    - a. Grammar with special emphasis on Tenses
    - b. Pronunciation: of consonants, vowels, syllables and individual words c. Word Stress: based on accentual patterns
    - d. Rhythm in speech based on content words and strong words e. Intonation: rising, falling and rising-falling tone
    - f. Pause groups
    - g. Speech making / public speaking
  2. Introducing self and others keeping in mind kinesics.
  3. Common conversation practice (making small talk etc.).
  4. Asking for permission.
  5. Making requests.
  6. Describing events / people / places
  7. Extempore.
  8. JAM Session (Just a Minute Session).
  9. Role play
  10. Holding informal discussions.
  11. Logical presentation of one's views on a given topic.
  12. Delivering a speech using Stress, Rhythm and Intonation.

**Note:** The two class tests for theory will be of 10 marks each and two class tests of Basic Technical Communication will be of 10 marks each so that the total marks for class test will be of 40 marks and 10 marks will be for tutorial/attendance/home assignments. The subject faculty is requested to send the class test marks indicating both for theory and lab separately.

(b) Kindly make following changes in the structure of B.Tech. Ist year syllabus. In the subject of THM 101 Basic Technical Communication indicate

### **SUGGESTED REFERENCES BOOKS:**

- Kavita Tyagi & Padma Misra Basic Technical Communication, PHI, New Delhi
- Norman Lewis: Word Power Made Easy, W.R Goyal Pub. & Distributors.
- Rutherford A: Basic Communication Skills; Person Education, N. Delhi
- Joans Daniel: English Pronouncing Dictionary, Cambridge
- John Seely: The Oxford Guide to Writing and Speaking. OUP, Delhi
- Mohammad Aslam: Introduction of English Phonetics and Phonology Cambridge
- Y Kameswari, Successful Career Soft Skills and Business English, BS Publications, Hyderabad

**ENVIRONMENTAL STUDIES (TES  
101/201)**

**UNIT-1 NATURAL RESOURCES: 8 L**

**Renewable and Non-renewable Resources :**

Natural resources and associated problems.

- a) **Forest resources :** Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.
- b) **Water resources :** Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.
- c) **Mineral resources :** Use and exploitation, environmental effects of extracting and using mineral resources, case studies.
- d) **Food resources :** World food problems, changes caused by agriculture and over-grazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.
- e) **Energy resources :** Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Case studies.
- f) **Land resources :** Land as a resource, land degradation, man induced landslides, soil erosion and desertification.
  - Role of an individual in conservation of natural resources.
  - Equitable use of resources for sustainable lifestyles.

**UNIT- 2 ECOSYSTEMS 6 L**

- Concept of an ecosystem.
- Structure and function of an ecosystem.
- Producers, consumers and decomposers.
- Energy flow in the ecosystem.
- Ecological succession.
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the following ecosystems :-
  - a. Forest ecosystem
  - b. Grassland ecosystem
  - c. Desert ecosystem
  - d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

**UNIT- 3 BIODIVERSITY AND ITS CONSERVATION 4 L**

- Introduction – Definition : genetic, species and ecosystem diversity.
- Biogeographical classification of India
- Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values
- Biodiversity at global, National and local levels.
- India as a mega-diversity nation
- Hot-spots of biodiversity.
- Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.



- Endangered and endemic species of India
- Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity.

**UNIT- 4 ENVIRONMENTAL POLLUTION & SOCIAL ISSUES**

**7 L**

- Definition
- Cause, effects and control measures of :-
  - a. Air pollution
  - b. Water pollution
  - c. Soil pollution
  - d. Marine pollution
  - e. Noise pollution
  - f. Thermal pollution
  - g. Nuclear hazards
- Disaster management : floods, earthquake, cyclone and landslides.
- From Unsustainable to Sustainable development
- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Environmental ethics : Issues and possible solutions.
- Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies.
- Wasteland reclamation.
- Consumerism and waste products.

**REFERENCE BOOK**

- M Ajni Reddy, Text book of environmental Science, BS Publication, Hyderabad
- Environmental Studies by Daniel, Wiley India
- Environmental Studies by Erach Bharucha, University Press.
- Fundamental of Ecology, E.P.Odum, Cengage Learning.
- Environmental Science and Engineering by Wright, Pearson Publication.
- First Ecology by Beeby and Brennan, Oxford University Press.
- Environment Science by Miller, Cengage Learning, New Delhi.
- Hand book of Environmental laws, Rules, Guidelines, Compliances and Standards Vol. 1 & Vol. 2, Bharat Publication, New Delhi.

## ENGINEERING DRAWING (PED 101/201)

L T P  
0 0 2

### 1. Introduction

Graphics as a tool to communicate ideas, Lettering and dimensioning, Construction of geometrical figures like pentagon and hexagon.

### 2. Orthographic Projection

Principles of orthographic projections, Principal and auxiliary planes, First and Third angle projections. Projection of points. Pictorial view. Projection of lines parallel to both the planes. Parallel to one and inclined to other, Inclined to both the planes. Application to practical problems. Projection of solid in simple position, Axis or slant edge inclined to one and parallel to other plane, Solids lying on a face or generator on a plane. Sectioning of solids lying in various positions, True shape of the section. Development of lateral surfaces, sheet metal drawing.

### 3. Isometric Projection

Principles of isometric projection, Isometric projection using box and offset methods.

1. Bhatt. N.D.: Elementary Engineering Drawing, Charoathar Publishing.
2. D A Hindoliya, Text book of Egg. Graphics, BS Publication, Hyderabad

## WORKSHOP PRACTICE (PWS 101/201)

L T P  
0 0 2

**1. Carpentry Shop:** 1. Study of tools and operation and carpentry joints. 2. Simple exercise using jack plain. 3. To prepare half- lap corner joint, mortise and tennon joints. 4. Simple exercise on woodworking lathe.

**2. fitting Bench Working Shop :** 1. Study of tools and operations 2. Simple exercises involving filling work. 3. Making perfect male-female joint 4. Simple exercise involving drilling/tapping/dieing.

**3. Black Smithy Shop :** 1. Study of tools and operations 2. Simple exercises based on black smithy operations such as upsetting, drawing down, punching, bending, fullering & swaging.

**4. Welding Shop :** 1. Study of tools and operations . 2. Simple butt joint. 3. Lap joint. 4. oxy acetylene welding.

**5. Sheet metal shop :** 1. Study of tools and operations. 2. Making funnel complete with soldering. 3. Fabrication of tool box, tray, electrical panel box etc

**6. Machine Shop :** 1. Study of tools and operations. 2. Plane turning. 3. Step turning. 4. Taper turning 5. Threading. 6. Single point cutting tool grinding.

**Reference:**

1. Hajra, Bose, Roy: Workshop Technology Vol 1 & 2, Media Promoters
2. Raghuvanshi B.S.: Workshop Technology, Vol 1 & 2, Dhanpatrai

**C Programming Lab (PCS-101\PCS201)****List of Experiments**

1. Practice of all internal and External DOS Commands
2. Practice of all UNIX commands and write simple shell script.
3. WAP to perform simple arithmetic operations using different data types.
4. WAP to swap two numbers without using third variable.
5. WAP to find out whether the given number is prime or not.
6. WAP using conditional operator to determine whether a year is leap year or not.
7. WAP to print the ASCII code and their equivalent characters.
8. WAP to print corresponding days of a week using switch case.
9. WAP to print factorial of a number using recursion.
10. WAP to print Fibonacci series using function.
11. WAP to print an array and find greatest element of the array.
12. WAP to arrange elements of a given array in ascending order.
13. WAP for Matrix multiplication and find the inverse of resultant matrix.
14. WAP to print name, price & no. of pages of 3 books using structures.
15. WAP to remove the trailing blanks in a string input by the user, and print the resulting string using pointer.

**CHEMISTRY PRACTICALS (CPY 101/201)**

L T P  
0 0 2

**LIST OF EXPERIMENTS**

1. Determination of alkalinity in the given water sample.
2. Determination of temporary & permanent hardness in water sample using EDTA as standard solution.
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in the given water sample by Mohr's method.
5. Determination of iron content in the given ore by using external indicator.
6. Determination of Acid & Base no. in lubricating oil by potentiometric method.
7. Determination of Equivalent weight of Iron by the chemical displacement method. The equivalent weight of copper is 63.5  
(Note : The procedure to be followed in carrying the above experiment is given as annexure)
8. Determination of viscosity index of lubricating oil.
9. Determination of iron concentration in sample of water by colorimetric method.  
The method involves the use of KCNS as colour developing agent & the measurements are carried out at  $\lambda_{\text{max}}$  480nm.

Note : The general procedure of estimation is given on pp653-8 of the textbook Of Quantitative Chemical Analysis by A.I.Vogel 6<sup>th</sup> Edition, Publisher : Pearson Education Ltd.2000

10. Determination of heat of neutralization of Hydrochloric acid & Sodium hydroxide

11. Determination of flash & fire point of lubricating oil
12. Determination of Carbon residue of lubricating oil.
13. Determination of Sulphated ash of motor oil.
14. Determination of saponification value of lubricating oil & vegetable oil.
15. Separation of metal ions by paper chromatography.

## MATHEMATICS-II ( TMA-201 )

**L T P**  
**3 1 0**

### **Unit-1**

#### **Differential Equations**

**8**

Ordinary differential equations of first order, Exact differential equations, Linear differential equations of first order, Linear differential equations of nth order with constant coefficients, Complementary functions and particular integrals, Simultaneous linear differential equations, Solutions of second order differential equations by changing the dependent and independent variables, Method of variation of parameters.

### **Unit-2**

#### **Laplace Transform**

**10**

Laplace transform, Existence theorem, Laplace transform of derivatives and integrals, Inverse Laplace transform, Laplace transform of periodic function, Unit step function, Convolution theorem, Applications to solve simple linear and simultaneous linear differential equations.

### **Unit-3**

#### **Infinite Series**

**8**

Introduction, Sequences, Series: Convergence, Series of positive terms, Comparison tests, Integral tests, Comparison of ratio's, D'Alembert ratio test, Raabe's test, Cauchy root test, Alternating series: Leibnitz rule, Power series, Uniform convergence, Weierstrass's M-test, Properties of uniformly convergent series.

### **Unit-4**

#### **Fourier Series and Partial Differential Equations**

**8**

Periodic functions, Trigonometric series, Fourier series of periodic function, Euler's formula, Functions having arbitrary period, Change of intervals, Even and odd functions, Half range sine and cosine series.

Introduction to partial differential equations, Linear partial differential equations with constant coefficients of second order and their classifications: parabolic, hyperbolic and elliptic with illustrative examples.

### **Unit-5**

#### **Applications of Partial Differential equations**

**8**

Method of separation of variables for solving partial differential equations, One dimensional wave equation, Laplace equation in two dimensions, Heat conduction equations of one dimension and two dimension.

#### **References:**

1. A Text book of Engineering Mathematics (Vol.2) by Peter V. O'Neil, Cengage Learning.
2. B. S. Grewal: Higher Engineering Mathematics, *Khanna Publications*.
3. C. Prasad, Advanced Mathematics for Engineers, Prasad Mudralaya.

4. E. Kreyszj: Advanced Engineering Mathematics, Wiley Eastern.
5. M.D. Raisinghania: Ordinary & Partial Differential Equations, S. Chand Publication.

## **ADVANCED TECHNICAL COMMUNICATION**

**L T P**  
**3 0 2**

**MAXIMUM MARKS -100**

### **UNIT 1 : TECHNICAL COMMUNICATION**

1. Introduction to technical communication, types of technical communication, history of the development of technical communication.
2. Difference between general and technical communication, importance of technical communication.
3. Characteristic features of technical communication. Elements of style in technical communication.
4. Process of preparing a technical document.
5. Elements, features and objectives of scientific articles, research papers, dissertation and thesis.

### **UNIT 2:-BUSINESS COMMUNICATION**

1. Importance and Features of Business Communication
2. Business Correspondence – Principles, Features, Types, Format and layout of Business letter.
3. Types of Business Correspondence – letters of Enquiry, Quotation, Order, Instructions, Sales, Credit, Complaint, Collection etc.
4. Some more types of Business Correspondence -- Notice, Agenda, Minutes, Memorandum.
5. Job Application letters -- Covering letter, Resume, Bio-data and C.V.

### **UNIT 3:- TECHNICAL PROPOSAL and TECHNICAL REPORT**

1. Technical Proposal – Introduction, purpose, features, types, format, importance, process of preparation. Writing technical proposals.
2. Technical Report -- Features, Types, Style, Format, Relevance. Writing Technical Reports.

### **UNIT 4:-LITERATURE**

1. Critical reading and thematic, value-based study of the Novella, ‘Animal Farm’ by George Orwell.
2. Critical review, study of theme, plot, symbolism, characterization, style of writing etc.

### **UNIT 5:- SOFT SKILLS**

**This unit should be covered in classroom teaching as well as judicious use of language lab, (There should be optimum use of software’s related to accent, presentation skills etc.)**

1. Kinesics, Para language, Proxemics.
2. Presentation skills - Features, Types, Structure, Aids and Importance.
3. Interpersonal communication skills – Role of Personality and its various attributes like EQ, attitude, motivation, stress management and accepting criticism in determining efficacy of interpersonal communication.

4. Corporate communication skills – Role of business etiquette, conducting meetings, managing conflict, negotiation, team spirit, decision-making, time management and problem solving skills.
5. Group Discussion skills - Features and Importance
6. Facing Interviews - Interview Tips.

❖ **Practice of Soft Skills using Language Laboratory**

1. Practicing the following modules through self-learning software:
  - a. Pronunciation: of consonants, vowels, syllables and individual words
  - b. Word Stress: based on accentual patterns
  - c. Rhythm in speech based on content words and strong words
  - d. Intonation: rising, falling and rising-falling tone
  - e. Pause groups
  - f. Presentation skills
2. Participating in Mock Interviews
3. Participating in Group Discussions
4. Giving Presentations keeping in mind Kinesics, Para language, and Proxemics
5. Participating in Role Play for enhancing interpersonal and corporate communication skills

**SUGGESTED REFERENCE BOOKS**

- Kavita Tyagi & Padma Misra, Advance Tech. Communication, PHI, New Delhi
- Gupta  
Advanced Technical Communication, Cambridge University Press, N. Delhi
- George Orwell  
Animal Farm, Penguin Publishing Company, N. Delhi
- Sharma & Mohan  
Business Correspondence and Report Writing, TMH, N Delhi.
- Rubens  
Science & Technical Writing, Foundation books, Cambridge, N. Delhi
- Daniel Riordan  
Technical Communication, Cengage Learning, N. Delhi
- Raman & Sharma  
Technical Communication, OUP, N. Delhi
- Wallace, Masters  
Personality Development, Cengage Learning, N. Delhi
- Robert Barrass  
Students Must Write, Foundationbooks, Cambridge, N. Delhi
- Bhaskar Rao, Successful Career Soft Skills and Business English, BS Publications, Hyderabad
- Chakrawarthy: Soft Skills for Professionals, Wiley India

# PHYSICS PRACTICALS

(Autumn / Spring )

ASP 11

L T P  
0 0 2

## List of Experiments (At least Ten)

1. To determine the wavelength of monochromatic light by Newton's ring.
2. To determine the wavelength of monochromatic light with the help of Fresnel's biprism.
3. To determine the focal length of two lenses by nodal slide and locate the position of cardinal points.
4. To determine the specific rotation of cane sugar solution using half shade polarimeter.
5. To determine the wavelength of spectral lines using plane transmission grating.
6. To determine the specific resistance of the material of given wire using Carey Foster's bridge.
7. To determine the variation of magnetic field along the axis of a current carrying coil and then to estimate the radius of the coil.
8. To verify Stefan's Law by electrical method.
9. To calibrate the given ammeter and voltmeter.
10. To study the Hall effect and determine Hall coefficient, carrier density and mobility of a given semiconductor material using Hall-effect set up.
11. To determine energy band gap of a given semiconductor material.
12. To determine E.C.E. of copper using Tangent or Helmholtz galvanometer.
13. To draw hysteresis curve of a given sample of ferromagnetic material and from this to determine magnetic susceptibility and permeability of the given specimen.
14. To determine the ballistic constant of a ballistic galvanometer.
15. To determine the viscosity of a liquid.

**Note : Additional experiments may be added based on contents of syllabus.**

**CHEMISTRY PRACTICALS**  
**(Autumn / spring)**

**ASP 13**

**L T P**  
**0 0 2**

**LIST OF EXPERIMENTS ( AT LEAST TEN)**

1. Determination of alkalinity in the given water sample.
2. Determination of temporary and permanent hardness in water sample using EDTA as standard solution.
3. Determination of available chlorine in bleaching powder.
4. Determination of chloride content in the given water sample by Mohr's method.
5. Determination of iron content in the given ore by using external indicator
6. pH-metric titration.
7. Determination of Equivalent weight of Iron by the chemical displacement method. The equivalent weight of copper is 63.5  
(Note : the procedure to be followed in carrying the above experiment is given as annexure)
8. Viscosity of an addition polymer like polystyrene by Viscometer.
9. Determination of iron concentration in sample of water by colorimetric method. The method involves the use of KCNS as colour developing agent and the measurements are carried out at  $\lambda_{\max}$  480 nm.  
Note : The general procedure of estimation is given on pp653-8 of the textbook of Quantitative Chemical Analysis by A.I. Vogel 6<sup>th</sup> Edition, Publisher : Pearson education Ltd. 2000)
10. Determination of heat of neutralization of Hydrochloric acid and Sodium hydroxide
11. Determination of amount of dissolved oxygen in water
12. Separation of metal ions by paper chromatography
13. Preparation of iodoform from acetone
14. Preparation of Sodium Cobaltinitrile salt.
15. Element detection & functional group identification in organic compounds



**BASIC ELECTRICAL + ELECTRONICS LAB**  
**EE P 11 (Autumn / Spring )**

**List of Practical**

**L T P**  
**0 0 2**

**FEP 11**

**Fundamentals of Electronics Lab (Any Ten)**

1. Study of diode characteristics.
2. To study a half wave and full wave rectifier circuit.
3. Determination of ripple factor of capacitive and non capacitive filter for HW and FW diode rectifier circuit.
4. Study of characteristics of Zener Diode as constant voltage.
5. Verification of Application of Zener Diode as shunt regulator.
6. Study of Clipper and Clamper Circuit with different waveforms.
7. Determination of characteristics of BJT in CB and CE configuration.
8. Determination of characteristics of FET in CS and CD configuration.
9. Study of BJT as single stage amplifier and determination of  $A_v$ ,  $V_i$ ,  $R_i$  and  $R_o$ .
10. Study of AND, NAND, OR, NOR and EXOR gates.
11. Verification of Universal gates.

**List of Practical**

**L T P**  
**0 0 2**

**FEP 11**

**Fundamentals of Electrical Engineering Lab (Any Ten)**

1. Verification of Network Theorems.
2. Study of diode characteristics. Study of phenomenon of resonance in RLC series circuit.
3. Measurement of power in a three phase circuit by two wattmeter method.
4. Measurement of efficiency of a single phase transformer by load test.
5. Determination of parameters and losses in a single phase transformer by OC and SC test.
6. Study of characteristic of DC Motor.
7. Study of characteristic of AC Motor.
8. DC generator characteristics.
9. 10. Speed control of dc shunt motor.
10. Study running and reversing of a three phase induction motor.
11. Study of a single phase energy meter.

**MECHANICAL ENGINEERING LAB**  
**MEP 11 (Autumn / Spring)**

**List of Practical**

**L T P**  
**0 0 2**

**A minimum of 10 experiments from the following :**

1. Study of Steam engine and steam turbine models.
2. Study of 2-stroke and 4-stroke I.C.E. models.
3. Study of Fiat engine and/ or Diesel engine prototype.
4. Study of a vapour compression Refrigeration unit tutor/refrigerator.
5. Study of a window type air conditioner.
6. To conduct the tensile test on a UTM and determine ultimate Tensile strength, percentage elongation for a steel specimen.
7. To conduct the compression test and determine the ultimate compressive strength for a specimen.
8. To conduct the Impact test (Izod / charpy) on the Impact testing machine and to find the impact strength.
9. To determine the value of acceleration due to gravity by Atwood's Machine apparatus.
10. To verify the principle of moment by Bell Crank Lever Apparatus
11. To determine the moment of inertia of a flywheel apparatus about its axis of rotation
12. To verify Newton's second law of motion by Fletcher's Trolley apparatus
13. To find out coefficient of friction by combined inclined plane & friction slide apparatus
14. To determine the velocity ratio, mechanical advantage & efficiency of a single purchase crab apparatus & draw graph between load vs effort, mechanical advantage and efficiency.
15. To determine the velocity ratio, mechanical advantage & efficiency of a double purchase crab apparatus.

## COMPUTERS LABORATORY (Autumn / Spring)

CSP 11

L T P  
0 0 2

### List of Practicals

1. Practice of some internal and External DOS Commands
  2. Write simple batch program.
  3. File and program management in windows
  4. Familiarization with the ftp ,http etc. supported by various protocols
  5. Practice of some UNIX commands
  6. Write simple shell script
  7. Introduction to text editing and word processing
  8. Exposure to advance feature supported by some editors
  9. Net Surfing
  10. Creation and usage of E- mail account
  11. Write small program using C language
  12. Handling of data structure in C
  13. Familiarizing mail account using PINE, deleting, creating folder/ mail-messages, adding signature, creating directory of addresses.
  14. Compressing data file using WINZIP & WINRAR
  15. Introduction to various extension of files as TXT, EXE, BAK, BAT, BMP, DOC, XLS, PPT, PDF, HTML, JPEG, MPEG, MP3, DAT & AVI
- Note :** List may be modified according to new software available.

**2<sup>nd</sup> Year syllabus of Electronics and Communication Engineering**  
**Semester-III-ECE**

Subject Code	Subject	L T P	Marks		Credit
			E + S	Total	
TCS-301	Computer Based Numerical Technique	2-1-0	75+25	100	3
TEC-301	Electronic Devices and Circuits	3-1-0	100+50	150	4
TEC-302	Digital Electronic and Design Aspects	3-1-0	100+50	150	4
TEC-303	Electronic Measurement and Instrumentation	3-1-0	100+50	150	4
TEE-301	Network Analysis and Synthesis	3-1-0	100+50	150	4
THM-301	Engineering Economics	2-0-0	75+25	100	2
<b>PRACTICAL:</b>					
PEC-351	Electronics Circuits Lab	0-0-2	25+25	50	3
PEC-352	Digital Electronics Lab	0-0-2	25+25	50	2
PEE-353	Measurement Lab	0-0-2	25+25	50	2
Personality development/GP				50	
<b>TOTAL</b>				<b>1000</b>	<b>28</b>

**Semester-IV-ECE**

Subject Code	Subject	L T P	Marks		Credit
			E + S	Total	
TEC-401	Electro Magnetic Field Theory	3-1-0	100+50	150	4
TEC-402	Analog Integrated Circuits	3-1-0	100+50	150	4
TCS-403	Computer Organization and Architecture	2-1-0	75+25	100	3
TEC-404	Signal and Systems	3-1-0	100+50	150	4
TEC-405	Analog Communication	3-1-0	100+50	150	4
TEC-406	Solid State Devices and Semiconductor Materials	2-1-0	75+25	100	2
<b>Practical</b>					
PEC -451	Analog Integrated Circuit Lab	0-0-2	25+25	50	2
PEC -452	Circuit Design on PCB	0-0-2	25+25	50	3
PEC-453	Analog Communication Lab	0-0-2	25+25	50	2
Personality Development/GP				50	
<b>TOTAL</b>				<b>1000</b>	<b>28</b>

Sl. No.	TEC 301 ELECTRONIC DEVICE AND CIRCUIT	
1.	<b>Unit-I</b> <b>Crystal Properties and charge Carriers in Semiconductors:</b> Elemental and compound semiconductor materials, crystal lattice structure <b>Magnetic material:-</b> Origin of magnetic dipoles in solids, permanent magnetic dipoles, diamagnetic paramagnetic, ferromagnetic anti-ferromagnetic and ferry-magnetic materials	5
2.	<b>Unit-II</b> <b>Transistor amplifier Frequency response:</b> Bipolar Transistor as amplifier, Ebers mole and h-parameter model high Frequency model) high frequency response of common source, common collector, common base. High frequency response of common source, common gate, common drain.	10
3.	<b>Unit-III</b> <b>Feedback:</b> Concept of feedback, classification feedback, Analysis of different type of feedback. <b>Oscillators:</b> Concept of oscillators, condition of oscillations, frequency and amplitude stability of oscillations, analysis of quartz, Hartely, colpitts, RC phase shift, Wein bridge and UJT oscillators	10
4.	<b>Unit-IV</b> <b>Multistage and Tuned Amplifiers:</b> Introduction to multistage amplifiers, cascade amplifiers, coupling of amplifiers, direct coupled, differential coupling, and transformer coupled amplifier, Darlington amplifier and its analysis, bootstrapping, tuned and double tuned voltage amplifiers	10
5.	<b>Unit-V</b> <b>Multivibrator:</b> Astable, mono-stable, and bi-stable multivibrators	5

**Reference Books:**

1. Electronic Devices Circuit and SSD, R K Singh and D S Chauhan, Vikash Publication, Delhi
2. Boylestad, Electronic Devices and Circuit Theory, 10/e, Pearson
3. Donald A Neaman, "Semiconductor Physics and Devices Basic Principles" 3rd Ed TMH India.

Sl. No	TEC 302  <b>DIGITAL ELECTRONICS AND DESIGN ASPECT</b>	
1.	<b>Unit-I</b> <b>Introduction:</b> Characteristics of digital system, Types of Digital circuits, Number system: Direct conversion between bases Negative numbers & BCD and their arithmetic's, Boolean algebra, Minimization of Boolean Functions: K Map up to 6 variable and multiple output circuits, Quine Mcclusky method, error detection & correcting codes, Hamming & cyclic codes	(8)
2.	<b>Unit-II</b> <b>Combinational Logic Circuits:</b> Design Procedure, adders, subtractors & code conversion, Multiplexers/Demultiplexers, encoder/decoders, decimal adders & amplitude comparators, ROM as decoder, PLA & PAL	(7)
3.	<b>Unit-III</b> <b>Sequential Logic Circuits:</b> Flip-Flops and their conversions, analysis and synthesis of synchronous sequential circuit, excitation table, state table & diagram. Design of synchronous counters, shift registers and their applications, Finite State Machine	(8)
4.	<b>Unit-IV</b> <b>Logic Families:</b> Diode, BJT & MOS as a switching element concept of transfer characteristics, Input characteristics and output characteristics of logic gates, TTL, Tri-state logic, open collector output, IIL,ECL,NMOS,CMOS, Pass Transistor Logic Interfacing between logic families, packing density, power consumption & gate delay.	(6)
5.	<b>Unit-V</b> <b>Hazard and Fault Detection:</b> Static and dynamic Hazard: Gate delay, Generation of spikes, Determination of hazard in combinational circuits, Fault detection methods: Fault Table & Path sensitizing methods. <b>Memories:</b> Sequential, Random Access, NMOS & CMOS Static and Dynamic Memory elements, one and multi-dimensional selection arrangement, Read-only memories, Formation of memory banks, internal & External address decoding	(10)

**Reference Books:**

1. Digital Systems: Principles and Design, Raj Kamal, Pearson
2. M. Morris Mano and M. D. Ciletti, Digital Design, M. Morris Mano and M. D. Ciletti, 4th Edition, pearson
3. Switching Circuit & Logic Design, Hill & Peterson, Wiley

Sl. No.	TCS-302  <b>Computer Based Numerical Technique</b>	<b>L T P</b> <b>2 0 0</b>
1.	<b>Unit-I</b> <b>Introduction:</b> Numbers and their accuracy, Computer Arithmetic, Mathematical preliminaries, Errors and their Computation, General error formula, Error in a series approximation. <b>Solution of Algebraic and Transcendental Equation:</b> Bisection Method, Iteration method, Method of false position, Newton-Raphson method, Methods of finding complex roots, Muller's method, Rate of convergence of Iterative methods, Polynomial Equations	<b>8</b>
2.	<b>Unit-II</b> <b>Interpolation:</b> Finite Differences, Difference tables <b>Polynomial Interpolation:</b> Newton's forward and backward formula <b>Central Difference Formulae:</b> Gauss forward and backward formula, Stirling's, Bessel's, Everett's formula.	<b>5</b>
3.	<b>Unit-III</b> <b>Numerical Integration and Differentiation:</b> Introduction, Numerical differentiation <b>Numerical Integration:</b> Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Boole's rule, Waddle's rule.	<b>6</b>
4.	<b>Unit-IV</b> <b>Statistical Computation:</b> Frequency chart, Curve fitting by method of least squares, fitting of straight lines, polynomials, exponential curves etc, Data fitting with Cubic splines, Regression Analysis, Linear and Non linear Regression, Multiple regression, Statistical Quality Control methods.	<b>8</b>

**Reference Books:**

1. Digital Systems: Principles and Design, Raj Kamal, Pearson
2. M. Morris Mano and M. D. Ciletti, Digital Design, M. Morris Mano and M. D. Ciletti, 4th Edition, pearson

Sl. No.	TEC 303 ELECTRONIC INSTRUMENTATION AND MEASUREMENTS	
1.	<b>Unit-I</b> <b>Unit, dimensions and standards:</b> Scientific notations and metric prefixes. SI electrical units, SI temperature scales, Other unit systems, dimension and standards. Measurement Errors: Gross error, systematic error, absolute error and relative error, accuracy, precision, resolution and significant figures, Measurement error combination, basics of statistical analysis. PMMC instrument, galvanometer, DC ammeter, DC voltmeter, series ohm meter	8
2.	<b>Unit-II</b> Transistor voltmeter circuits, AC electronic voltmeter, current measurement with electronic instruments, multimeter probes Digital voltmeter systems, digital multimeters, digital frequency meter System, Voltmeter and ammeter methods, Wheatstone bridge, low resistance measurements, low resistance measuring instruments AC bridge theory, capacitance bridges, Inductance bridges, Q meter	8
3.	<b>Unit-III</b> <b>Analog to digital converter:</b> Transfer characteristics, A/D conversion technique: Simple potentiometer and servo method, successive approximation method ramp type, integrating and dual slope integrating method <b>D/A Converter:</b> Transfer characteristic, D/A conversion technique, digital mode of operation, performance characteristics of D/A converters. <b>Display Devices:</b> Alpha numeric display using LCD and LED Specification of digital meters, Display digits and count resolution, sensitivity, accuracy, speed and settling time etc.	9
4.	<b>Unit-IV</b> <b>CRO:</b> CRT, wave form display, time base, dual trace oscilloscope, measurement of voltage, frequency and phase by CRO, Oscilloscope Probes, Oscilloscope specifications and performance. Delay time based Oscilloscopes, Sampling Oscilloscope, DSO, DSO Applications	6
5.	<b>Unit-V</b> <b>Signal generator and analyzer:</b> Signal generator: Sine wave, non-sinusoidal signal and function generators, frequency synthesis techniques and digital signal generators <b>Signal analyzers:</b> Spectrum analyzer and distortion, <b>Concept of ECG, EMI, EMC, EEG</b> etc. <b>Recorders:</b> X-Y recorders, plotters	8

**Reference Books:**

1. David A. Bell, "Electronic Instrumentation and Measurements", 2nd Ed., PHI , New Delhi 2008
2. Elements of Electronic Instrumentation and Measurement, 3/e, Carr. Pearson
3. Oliver and Cage, "Electronic Measurements and Instrumentation", TMH, 2009.
4. Alan S. Morris, "Measurement and Instrumentation Principles", Elsevier (Buterworth Heinmann), 2008



Sl. No	TEE 301 NETWORK ANALYSES AND SYNTHESIS	
1.	<b>Unit-I</b> <b>Graph Theory:</b> Graph of a Network, definitions, tree, co tree, link, basic loop and basic cut set, Incidence matrix, cut set matrix, Tie set matrix Duality, Loop and Node methods of analysis.	(8)
2.	<b>Unit-II</b> <b>Network Theorems (Applications to ac networks):</b> super-position theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem, Reciprocity theorem. Millman's theorem, compensation theorem, Tellegen's theorem.	(8)
3.	<b>Unit-III</b> <b>Network Functions:</b> Concept of Complex frequency, Transform Impedances Network functions of one port and two port networks, concept of poles and zeros, properties of driving point and transfer functions, time response and stability from plot, frequency response and Bode plots.	(9)
4.	<b>Unit-IV</b> <b>Two Port Networks:</b> Characterization of LTI two port networks , ZY, ABCD and h-parameters, reciprocity and symmetry. Inter-relationships between the parameters, inter-connections of two port networks, Ladder and Lattice networks. T & $\pi$ Representation.	(8)
5.	<b>Unit-V</b> <b>Network Synthesis:</b> Positive real function, definition and properties; Properties of LC, RC and RL driving point functions, synthesis of LC, RC and RL driving point immittance functions using Foster and Cauer first and second forms.	(7)

**Reference Books:**

1. Network Analysis with Applications, 4/e (with CD), Stanley. pearson
2. Franklin F. Kuo, "Network Analysis and synthesis", 2<sup>nd</sup> Edition, Wiley India Pvt Ltd.
3. Behrouz Peikari, "Fundamentals of Network Analysis & synthesis", Jaico Publishing House, 2006.
4. M. E. Van Valkenberg, "Network Analysis", 2<sup>nd</sup> Edition, Prentice Hall of India Ltd. Oliver and Cage,

Sl. No	<b>THU-301</b>  <b>ENGINEERING ECONOMICS</b>	
1.	<b>Unit-I</b> <b>Time value of money</b> : Simple and compound interest, Time value equivalence, Compound interest factors, Cash flow diagrams, Calculation, Calculation of time –value equivalences. Present worth comparisons, Comparisons of assets with equal, unequal and infinite lives, comparison of deferred investments, Future worth comparison, payback period comparison.	(8)
2.	<b>Unit-II</b> Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Rate of return, Internal rate of return, comparison of IIR with other methods, IRR misconceptions.	(8)
3.	<b>Unit-III</b> <b>Analysis of public Projects:</b> Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost –effectiveness analysis.	(9)
4.	<b>Unit-IV</b> Depreciation, computing depreciation charges, after tax economic comparison, Break-even analysis; linear and non-linear models. Product and Process Costing, Standard Costing, cost estimation, Relevant Cost for decision making, Cost control and Cost reduction techniques.	(8)

**The following experiments must be performed on Bread Board**

- 1. Field Effect Transistors**-Single stage Common source FET amplifier –plot of gain in dB Vs frequency, measurement of bandwidth, input impedance, maximum signal handling capacity (MSHC) of an amplifier
- 2. Bipolar Transistors**- Design of single stage RC coupled amplifier –design of DC biasing circuit using Potential divider arrangement –Plot of frequency Vs gain in dB. Measurement of bandwidth of an amplifier , input impedance and Maximum Signal Handling Capacity of an amplifier.
- 3. Two stage Amplifier.** Plot of frequency Vs gain. Estimation of Q factor, bandwidth of an amplifier
- 4. Common Collector Configuration-Emitter Follower (using Darlington pair)**-Gain and input impedance Measurement of the circuit.
- 5. Study of Series and shunt feedback amplifier and determination of voltage and current gain, Plot of gain in dB Vs frequency, measurement of bandwidth**
- 6. Study of Wein bridge oscillator (b) phase shift oscillator**
- 7. Study of Hartely & Colpitts oscillator**
- 8. Study of Mono and astable multivibrator using transistor**
- 9. Fabrication of DC unregulated power supply**
- 10. PCB Lab:** (a) Artwork & printing of a simple PCB. (b) Etching & drilling of PCB. (c) Testing of power supply fabricated in Experiment No. 6 (d) Mini Project

1. Bread-board implementation of various flip-flops.
2. Bread-board implementation of counters & shift registers.
3. Determination of Delay time and NAND, NOR, Ex-OR, AND & OR Gates.
4. Experiments with clocked Flip-Flop.
5. Design of Counters.
6. Implementation of Arithmetic algorithms.
7. Bread Board implementation of Adder/Subtractor (Half, Full)
8. Transfer characteristics of TTL inverters & TTL Schmitt Trigger inverter.
9. Transfer characteristics of CMOS inverters series and CD40 series and
10. Estimation of Gate delay of CD40 series CMOS inverter.
11. Monoshot multivibrators using 74121 and 74123.
12. Clock circuit realization using 555 and CMOS inverter and quartz crystal.
13. Demultiplexer / Decoder operation using IC-74138.

1. Study of semiconductor diode voltmeter and its use as DC average responding AC voltmeter.
2. Study of L.C.R. Bridge and determination of the value of the given components.
3. Study of distortion factor meter and determination of the % distortion of the given oscillator.
4. Study of the transistor tester and determination of the parameters of the given transistors.
5. Study of the following transducer (i) PT-100 Transducer (ii) J- type Transducer (iii) K-type Transducer (IV) Pressure Transducer
6. Measurement of phase difference and frequency using CRO (Lissajous Pattern)
7. Measurement of low resistance Kelvin's double bridge.
8. Radio Receiver Measurements
9. Study of A to D convertor and its realization
10. Study of D to A convertor and its realization
11. Designing of some characters like A by alpha numeric Display.

Sl. No.	<b>TEC 303</b>  <b>ELECTROMAGNETIC FIELD THEORY</b>	3 1 0
1.	<b>Unit-I</b> <b>Coordinate systems and transformation:</b> Cartesian coordinates, circular cylindrical coordinates, spherical coordinates Vector calculus: Differential length, area and volume, line surface and volume integrals, del operator, gradient of a scalar, divergence of a vector and divergence theorem, curl of a vector and Stoke's theorem, Laplacian of a scalar.	9
2.	<b>Unit-II</b> <b>Electrostatics:</b> Electrostatic fields, Coulombs law and field intensity, Electric field due to charge distribution, Electric flux density, Gauss's Law – Maxwell's equation, Electric dipole and flux lines, energy density in electrostatic fields. <b>Electric field in material space:</b> Properties of materials, convection and conduction currents, conductors, polarization in dielectrics, dielectric constants, continuity equation and relaxation time, boundary condition. <b>Electrostatic boundary value problems:</b> Poisson's and Laplace's equations, general procedures for solving Poisson's or Laplace's equations, resistance and capacitance, method of images.	
3.	<b>Unit-III</b> <b>Magnetostatics:</b> Magneto-static fields, Biot-Savart's Law, Ampere's circuit law, Maxwell's equation, application of ampere's law, magnetic flux density, Maxwell's equation, Maxwell's equation for static fields, magnetic scalar and vector potential. Magnetic forces, materials and devices: Forces due to magnetic field, magnetic torque and moment, a magnetic dipole, magnetization in materials, magnetic boundary conditions, inductors and inductances, magnetic energy.	9
4.	<b>Unit-IV</b> <b>Waves and applications:</b> Maxwell's equation, Faraday's Law, transformer and motional electromotive forces, Displacement current, Maxwell's equation in final form. <b>Electromagnetic wave propagation:</b> Wave propagation in lossy dielectrics, plane waves in lossless dielectrics, plane wave in free space, plain waves in good conductors, power and the pointing vector, reflection of a plain wave in a normal incidence.	
5.	<b>Unit-V</b> <b>Transmission lines:</b> Transmission line parameters, Transmission line equations, input impedance, standing wave ratio and power, The Smith chart, Some applications of transmission lines.	

Sl. No.	TEC <b>ANALOG INTEGRATED CIRCUIT</b>	
1.	<b>Unit-I</b> Introduction of different fabrication steps, IC biasing-Current sources, Current Mirrors and Current steering circuits: The basic MOSFET current source, MOS Current steering circuits, BJT circuits. The cascade Amplifier: The MOS cascade, frequency response of the MOS cascade, the BJT cascade, a cascade current source, double cascading, the folded cascade, Bi-CMOS cascode.	9
2.	<b>Unit-II</b> <b>Power Amplifiers:</b> Introduction to power amplifiers (large signal amplifiers), classifications of power amplifiers, class A, B, AB, and C power amplifiers, push-pull and complementary push-pull amplifiers, power output, efficiency, cross-over distortions and harmonic distortions, specifications of power amplifiers, class B and class C-tuned amplifiers	
3.	<b>Unit-III</b> <b>The 741 OPAMP Circuit:</b> Bias circuit, short circuit protection, the input stage, the second stage, the output stage, the Device parameters <b>DC Analysis of 741:</b> Reference bias current, input stage bias, input bias and offset current, input offset voltage, input common range, second stage bias, output stage bias <b>Small Signal Analysis of 741:</b> The input stage, second stage, the output stage Gain, Frequency Response and Slew rate of 741: Small signal gain, frequency response, a simplified model, slew rate, relationship between Ft and SR.	9
4.	<b>Unit-IV</b> <b>Introduction to filtering:</b> Frequency response, characteristics and terminology, Active versus passive filter <b>Low Pass filter:</b> first order and second order active filter model, second order low pass filter characteristic, Sallen-Key unity gain filter, Sallen-Key equal component filter, high order filter, High pass filter <b>Band Pass Filter:</b> Single op-amp band pass filter, Multistage band pass filter.	
5.	<b>Unit-V</b> Generation of square and triangular waveform using OPAMP based astable multivibrator: Operation of astable multivibrator, generation of triangular waveform. <b>Generation of standardized pulse:</b> The OPAMP based monostable multivibrator <b>Integrated Circuit Timer:</b> The 555 Circuit, implementing monostable multivibrator using 555 IC, astable multivibrator using 555 IC	

Sl. No.	TCS-401 COMPUTER ORGANIZATION AND ARCHITECTURE	L T P 3 1 0
1.	<b>Unit-I</b> Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Micro operation, Arithmetic Logic Shift Unit, Design of Fast address, Arithmetic Algorithms (addition, subtraction, Booth Multiplication), IEEE standard for Floating point numbers.	
2.	<b>Unit-II</b> <b>Control Design:</b> Hardwired & Micro Programmed (Control Unit): Fundamental Concepts (Register Transfers, performing of arithmetic or logical operations, fetching a word from memory, Storing a word in memory), Execution of a complete instruction, Multiple-Bus organization, Hardwired Control, Micro programmed control(Microinstruction, Micro program sequencing, Wide-Branch addressing, Microinstruction with Next-address field, Pre-fetching Microinstruction).	
3.	<b>Unit-III</b> <b>Processor Design:</b> Processor Organization: General register organization, Stack organization, Addressing mode, Instruction format, Data transfer & manipulations, Program Control, Reduced Instruction Set Computer <b>Input-Output Organization:</b> I/O Interface, Modes of transfer, Interrupts & Interrupt handling, Direct Memory access, Input-Output processor, Serial Communication.	
4.	<b>Unit-IV</b> <b>Memory Organization:</b> Memory Hierarchy, Main Memory (RAM and ROM Chips), organization of Cache Memory, Auxiliary memory, Cache memory, Virtual Memory, Memory management hardware.	
5.	<b>Unit – V</b> <b>Parallel Processing &amp; Pipelining:</b> Arithmetic Pipelining, Instruction Pipelining, RISC Pipelining, Vector Processing, Array Processor. <b>Multiprocessor:</b> Characteristic of Multiprocessor, Interconnection Structure, Inter-processor Arbitration, Cache Coherence	



Sl. No.	TEC-402 <b>SIGNAL S AND SYSTEMS</b>	
1.	<b>Unit-I</b> <b>Signals and Systems:</b> Continuous-time and discrete-time Signals, Transformations of the Independent Variable, Exponential and Sinusoidal Signals, Continuous-Time and Discrete-Time LTI Systems and their properties, convolution sum and convolution integrals, LTI System described by differential and difference equation.	8
2.	<b>Unit-II</b> <b>Fourier series and Fourier Transformer:</b> The response of LTI Systems to Complex Exponentials, Fourier Series Representation of Continuous-time Periodic Signals and their Properties, Continuous time and discrete time Fourier Transforms and their properties, System Characterized by Linear Constant Coefficient Differential equations and Difference equation.	10
3.	<b>Unit-III</b> <b>Time and Frequency Characterization of Signals and Systems:</b> Magnitude Phase Representation of the Fourier Transform, Magnitude Phase Representation of the Frequency response of LTI systems, Time domain Properties of Ideal Frequency Selective filter, Time Domain and Frequency Domain aspects of Non ideal filters, First Order and Second Order Continuous Time and Discrete time Systems.	6
4.	<b>Unit-IV</b> <b>Sampling and Laplace Transform:</b> Signal representation by samples, sampling theorem, Impulse train sampling, sampling of discrete time signals, discrete time processing of continuous time signals. Laplace Transform, Region of convergence, inverse Laplace Transform, Analysis and characterization of LTI System, Block diagram representation, Unilateral Laplace transform.	8
5.	<b>Unit-V</b> <b>Z-Transform:</b> Z-Transform, Region of convergence, Inverse Z-transform, analysis and characterization of LTI system, Block diagram representation, Unilateral Z-transform.	8

Sl. No.	<b>TEC 303</b> <b>ANALOG COMMUNICATION</b>	3 1 0
1.	<b>Unit-I</b> <b>Introduction:</b> Overview of Communication system, Communication channels Need for modulation, Baseband and Pass band signals, Amplitude Modulation, Double side band with Carrier (DSB-C), Double side band without Carrier, Single Side Band Modulation, DSB-SC, DSB-C, SSB Modulators and Demodulators, Vestigial Side Band (VSB), Quadrature Amplitude Modulator	9
2.	<b>Unit-II</b> <b>Amplitude Modulation:</b> Frequency division and time division multiplexing suppressed carrier systems, single side band transmission, amplitude modulation with carrier, power, effect of frequency and phase errors in synchronous detection, comparison of various AM systems, vestigial band transmission.	
3.	<b>Unit-III</b> <b>Angle Modulation:</b> Angle Modulation, Tone Modulated FM Signal, Arbitrary Modulated FM Signal, FM Modulators and Demodulators, Approximately Compatible SSB Systems, Stereophonic FM Broadcasting, Examples Based on Mat Lab.	9
4.	<b>Unit-IV</b> <b>Pulse Modulation Digital Transmission of Analog Signals:</b> Sampling Theorem and its applications, Pulse Amplitude Modulation (PAM), Pulse Width Modulation, and Pulse Position Modulation. Their generation and Demodulation, Digital Representation of Analog Signals, Pulse Code Modulation (PCM), PCM System, Issues in digital transmission: Frequency Division Multiplexing, Time Division Multiplexing, Line Coding and their Power Spectral density, T1 Digital System, TDM Hierarchy	
5.	<b>Unit-V</b> <b>Transmission lines:</b> Transmission line parameters, Transmission line equations, input impedance, standing wave ratio and power, The Smith Chart, Some applications of transmission lines.	

Sl. No.	TEC <b>SOLID STATE DEVICES AND RELATED MATERIAL</b>	
1.	<b>UNIT-I</b> <b>Semiconductor Material:</b> Secondary, Ternary, Tetra compound semiconductor material, Their properties, Direct & indirect band gap material, K-selection rule, different transition mechanism of Carriers.	(5)
2.	<b>UNIT-II</b> <b>Opto-electronic Devices:</b> Photodiodes- Current and Voltage in illuminated Junction – Solar Cells – Photo detectors – Noise and bandwidth of Photo detectors – Light Emitting Diodes – Light Emitting Materials – Fiber Optic Communications Multilayer Hetro-junctions for LEDs – Lasers – Semiconductor lasers – Population Inversion at a Junction Emission spectra for p-n junction – Basic semiconductor lasers – Materials for Laser.	(10)
3.	<b>UNIT-III</b> <b>High Frequency and High Power Devices:</b> Schottkey diode, Varactor diode IMPATT Diode, operation of TRAPATT and BARITT Diodes, Gunn Diode – transferred – electron mechanism, formation and drift of space charge domains, p-n-p-n Diode, Semiconductor Controlled Rectifier, Insulated Gate Bipolar Transistor.	(10)

**Objective:** - To design and implement the circuits to gain knowledge on performance of the circuit and its application. These circuits should also be simulated on Pspice.

1. Log and antilog amplifiers.
2. Voltage comparator and zero crossing detectors.
3. Second order filters using operational amplifier for–
  - a. Low pass filter of cutoff frequency 1 KHz.
  - b. High pass filter of frequency 12 KHz.
  - c. Band pass filter with unit gain of pass band from 1 KHz to 12 KHz.
4. Wien bridge oscillator using operational amplifier.
5. Determine capture range; lock in range and free running frequency of PLL.
6. Voltage regulator using operational amplifier to produce output of 12V with maximum load current of 50 mA.
7. Voltage to current and current to voltage convertors.
8. Function generator using operational amplifier (sine, triangular & square wave)
9. Astable and monostable multivibrator using IC 555

## **Circuit Designing on PCB**

### **The listed practical must be designed and tested on PCB**

1. Three stages RC coupled common emitter amplifier and its testing for various parameters.
2. Designing of Phase shift and Hartely Oscillators for variable frequency generation.
3. Testing and designing of Class A and Class B Push-pull amplifier.
4. Testing and designing of Tuned amplifier.
5. Testing and designing of A to D and D to A convertor.
6. Testing and designing of any Modulator and Demodulator Circuit

1. To study DSB/ SSB amplitude modulation & determine its modulation factor & power in side bands.
2. To study amplitude demodulation by linear diode detector
3. To study frequency modulation and determine its modulation factor
4. To study PLL 565 as frequency demodulator.
5. To study sampling and reconstruction of Pulse Amplitude modulation system.
6. To study the Sensitivity, Selectivity, and Fidelity characteristics of super heterodyne receiver.
7. To study Pulse Amplitude Modulation-
  - a. using switching method
  - b. by sample and hold circuit
8. To demodulate the obtained PAM signal by 2nd order LPF.
9. To study Pulse Width Modulation and Pulse Position Modulation.
10. To plot the radiation pattern of a Dipole, Yagi-uda and calculate its beam width.
11. To plot the radiation pattern of Horn, Parabolic & helical antenna. Also calculate beam width & element current.
12. Design and implement an FM radio receiver in 88-108 MHz..



## Program: B. Tech-ECE

Year: Session: 2011 – 2012

### Scheme and Evaluation Pattern

S.No	Course No.	Subject	Periods			Evaluation			External Exam	Total Marks
			L	T	P	Sessional				
						CT	TA	Total		
<b>Semester:5<sup>th</sup></b>										
<b>Theory</b>										
1.	TEC-501	Automatic Control Systems	3	1	0	30	20	50	100	150
2.	TEC – 502	Digital Signal Processing	3	1	0	30	20	50	100	150
3.	TEC – 503	VLSI Technology	3	1	0	30	20	50	100	150
4.	TEC – 504	Advanced Microprocessors	3	1	0	30	20	50	100	150
5.	TEC – 505	Antenna And Wave Propagation	3	1	0	30	20	50	100	150
6.	TCS – 507	Concepts of Programming and OOPs	2	1	0	15	10	25	50	75
<b>Practical/Design</b>										
1.	PEC -551	Advanced Microprocessors Lab.	0	0	2	0	0	25	25	50
2.	PCS-554	Concepts of Programming and OOPs (C++, Java) Lab.	0	0	2	0	0	0	25	25
3.	PEC-552	DSP Lab.	0	0	2	0	0	25	25	50
4.		Discipline	0	0	2	0	0	50	0	50
<b>Semester: 6<sup>th</sup></b>										
<b>Theory</b>										
S.No	Course No.	Subject	Periods			Evaluation			External Exam	Total Marks
			L	T	P	Sessional				
						CT	TA	Total		
1.	TEC – 601	Microwave Techniques	3	1	0	30	20	50	100	150
2.	TEC - 602	VLSI Circuit Design	3	1	0	30	20	50	100	150
3.	TEC – 603	Telecommunication Switching Systems	3	1	0	30	20	50	100	150
4.	TEC - 604	Digital Communication	3	1	0	30	20	50	100	150
5.	TCS – 607	Data Structures Using C++	3	1	0	30	20	50	100	150
6.	THU – 608	Principles of Management	2	1	0	15	10	25	50	75
<b>Practical/Design</b>										
1.	PEC-651	Digital Communication Lab.	0	0	2	0	0	25	25	50
2	PCS-654	Data Structure Lab.	0	0	2	0	0	0	25	25
3.	PEC-652	Microwave Lab.	0	0	2	0	0	25	25	50
4.		Discipline	0	0	2	0	0	50	0	50

## TEC- 501 AUTOMATIC CONTROL SYSTEMS

### UNIT 1

**INTRODUCTION TO OPEN LOOP AND CLOSED LOOP CONTROL SYSTEMS:** feedback characteristics of control systems, Mathematical Representation of physical systems Electrical, Mechanical, Hydraulic, Thermal systems, Block diagram algebra and signal flow graphs, Mason's gain formula. (5)

### UNIT 2

**TIME DOMAIN ANALYSIS:** Standard Test Signals, Time response of First, Second and Higher order systems, Performance Indices. (4)

**ERROR ANALYSIS:** Static and Dynamic Error Coefficients, Effect of adding poles and zeroes to the system, response of P, PI, and PID controllers. (7)

### UNIT 3

**CONCEPT OF STABILITY:** Concept of stability, Asymptotic and conditional stability, Routh-Hurwitz Criterion, Root Locus technique (Concept and construction) (7)

**FREQUENCY RESPONSE ANALYSIS:** Correlation between time and frequency response, polar and inverse polar plots, Nyquist stability criterion, Bode plots. All pass and minimum phase systems, M and N circle. (7)

### UNIT 4

**DESIGN THROUGH COMPENSATION TECHNIQUES:** Realization of lag, lead and lag-lead compensators, Design of closed loop control system using root locus and Bode plot Compensation (5)

**ROBUSTNESS.** Uncertainty and performance weights. Robust stability test. Robust performance test. Loop shaping necessary and sufficient conditions. (3)

### UNIT 5

**STABLE VARIABLE ANALYSIS:** Introduction, State space representation, State modes of linear systems, State equations, transfer matrices, diagonalization solution of state equations, controllability and observability, effect of pole zero cancellation in transfer function. (5)

**BASIC NON-LINEAR ANALYSIS:** Linearization, describing function and phase plane methods, stability concepts and Lyapunov functions. (3)

### SUGGESTED BOOKS:

1. B C Kuo, Automatic Control Systems; John Wiley (India)
2. Control System, N C Jagan, BSP, Hyderabad
3. I J Nagrath & M Gopal, Control System Engineering; New Age International publishers.
4. Dr D Ganesh Rao, Control System; Sanguine Technical Publisher, Bangalore
5. K Ogata, Modern Control Engineering; PHI.



# TEC-502 DIGITAL SIGNAL PROCESSING

## UNIT 1

**DISCRETE FOURIER TRANSFORM:** Frequency Domain Sampling: The Discrete Fourier Transform Frequency Domain Sampling and Reconstruction of Discrete-Time Signals. The Discrete Fourier Transform (DFT). The DFT as a linear Transformation. Relationship of the DFT to Other Transforms. Properties of the DFT: Periodicity, Linearity, and Symmetry Properties. Multiplication of two DFTs and Circular Convolution. Additional DFT Properties. Frequency analysis of signals using the DFT. Introduction to MATLAB. (Coding of Implementation of LTI using DFT)

## UNIT 2

**EFFICIENT COMPUTATION OF DFT:** Efficient Computation of the DFT: FFT Algorithms, Direct Computation of the DFT. Radix-2 FFT algorithms. Efficient computation of the DFT of two real sequences, computations, efficient computation of the DFT of  $2N$ -Point real sequences. (Coding of FFT algorithms)

## UNIT3

**FILTER STRUCTURES:** Direct form (I & II), LATTICE for FIR & IIR Filters.

## UNIT4

**DESIGN OF DIGITAL IIR FILTERS:** Impulse invariant and bilinear transformation techniques for Butterworth and chebyshev filters; cascade and parallel. (Coding of Butterworth and chebyshev filters)

**DESIGN OF FIR FILTERS:-** windowing, optimum approximation of FIR filters, multistage approach to sampling rate concession. Design of Hilbert transforms. (Coding of windowing for FIR Filters)

## UNIT5

**ADAPTIVE WIENER FILTER AND LMS ALGORITHM:** Application of adaptive filtering to echo cancellation and equalization.

**APPLICATION OF DSP AND CODING:** Audio and Video coding, MPEG coding standardization, DCT, Walsh and Hardmard Coding.

### SUGGESTED BOOKS:

1. Proakis, J.G. & Manolakis, D.G., "Digital Signal Processing: Principles Algorithms and Applications", Prentice Hall (India).
2. Apte, " Digital Signal Processing", 2<sup>nd</sup> Edition, John Wiley (India),2009.
3. Rabiner, L.R. and Gold B., "Theory and applications of DSP", PHI.
4. Thomas J, Cavichhhi, "Digital Signal Processing", John Wiley & Sons
5. Roman KUC, Digital Signal Processing, BSP HYderabad

## TEC-503 VLSI TECHNOLOGY

### UNIT 1.

**Introductin to VLSI Technology:** Classification if ICs, Scale of integration, semiconductor and hybrid ICs Features of ICs,

**CRYSTAL GROWTH:** monolithic and hybrid ICs, crystal growth, Czochralski technique of crystal growth, wafer preparation and specifications, testing, measurements of parameters of crystals, Fabrication steps,

**OXIDATION:** Theory of growth of Silicon di oxide layer, calculation of SiO<sub>2</sub> thickness and oxidation kinetics, Dry wet and high pressure oxidation, plasma oxidation, properties of oxidation, defects induced due to oxidation.

### UNIT 2.

**EPITAXIAL PROCESS:** Epitaxy and its concept, Growth kinetics of epitaxy, epitaxial growth, Low-temperature epitaxy, Si-epitaxy- growth chemistry of Si epitaxial layer, autodoping apparatus for epitaxial layer, apparatus for epitaxy, MBE system

**DIFFUSION PROCESS:** Diffusion models of solid, Ficks theory of diffusion, Solution of Fick's law, diffusion parameters measurements schemes, Ion implantation- Scattering phenomenon, range theory, channeling, implantation damage, ion-implantation systems, Annealing

### UNIT 3

**LITHOGRAPHY:** photolithography and pattern transfer, Optical and non optical lithigraphy, electron, X-ray and ion-beam lithography, contact/proximity and projection printers, alignment.

**Photoresist and ETCHING:**Types of photoresist, polymer and materials, Etching- Dry & Wet etching, basic regimes of plasma etching, reactive ion etching and its damages, lift-off, and sputter etching.

### UNIT 4

**METALLIZATION:** Applications and choices, physical vapor deposition, patterning, problem areas.

**VLSI PROCESS INTEGRATION:** PMOS,NMOS and CMOS IC technology, MOS memory IC technology, bipolar IC fabrication.

### UNIT 5

**ASSEMBLY TECHNIQUE AND PACKAGING:** Package types, packaging design consideration, VLSI assembly technologies.

**YIELD AND RELIABILITY:** Yield loss in VLSI, yield loss modeling, reliability requirements, accelerated testing.

#### **SUGGESTED BOOKS:**

1. S.M. Sze (Ed.) / VLSI Technology / M Hill. 1988.
2. R. K. SINGH /VLSI (Technology, Design & Basic Of Micro Elec.), Kataria & Sons
3. S.A. Campbell / The Science and Engineering of Microelectronic Fabrication / Oxford University Press
4. Microelectronic Circuits International Student Edition by Sedra / Smith

## TEC -504 MICROPROCESSORS & CONTROLLERS

### UNIT 1

**8-BIT MICROPROCESSOR (8085\*):** Architecture, addressing modes, Assembly Language Programming.

**\* Programming should be covered in Labs**

**16-bit Microprocessors (8086\*):** Architecture, Physical address, segmentation, memory, difference between 8085 & 8086, Assembler Directives.

**\* Programming should be covered in Labs**

### UNIT 2

**DATA TRANSFER SCHEMES:** Introduction, Types of transmission, 8257 (DMA), 8255 (PPI), Serial Data transfer (USART) 8251, Keyboard-Display controller (8279), Programmable Priority Controller (8259), 8253 Timer.

### UNIT 3

**ADVANCE MICROPROCESSORS:** Introduction to 80186, 80286, 80486, Pentium Microprocessors, Introduction to Dual core, core to Duo.

### UNIT 4

**8051 MICRO CONTROLLER-** Architecture I/O ports, memory organization in 8051, timer, serial comm.-Addressing mode, Instruction sets, Assembly Language programming.

### UNIT 5

**INTERFACING OF 8051 AND ITS APPLICATIONS:** LEDs:, push buttons, latch connection, keyboards, 7-segment display, LCD interfacing. Different waves generation.

### SUGGESTED BOOKS:

1. R.S Gaonkar: Microprocessor Architecture, Programming and Applications with 8085/8080, Penram Publication
2. Y.C. Liu and G.A. Gibson: Microcomputer Systems: The 8086/8088 Family Architecture Programming and Design, PHI 2nd Edition

# TEC-505 ANTENNA AND WAVE PROPAGATION

## UNIT 1

**ANTENNA PRINCIPLES:** Potential Functions & Electromagnetic Field, Current Elements, Radiation from Monopole & Half Wave Dipole, power radiated by current element, Radiation Pattern, radiation resistance. Directional properties of Dipole Antenna. Antenna gain, Effective Area, Antenna terminal Impedance, In Practical Antennas and Methods of Excitation, Antenna temperature and signal to noise ratio. Radiation Patten

## UNIT 2

**ANTENNA ARRAYS:** Two point element antenna array, Horizontal patterns in broadcast arrays, Linear arrays, Multiplication of patterns, effect of the earth on vertical patterns, Binomial array, Chebyshev array.

## UNIT 3

**PRACTICAL ANTENNAS:** Effect of antenna height, Polarization, Directivity, Aperture, Yagi-Uda, Parabolic, Horn, Log periodic antenna, loop antenna. Introduction to phase measurement; Gain measurement: Comparison Method, Near field method, Introduction to current distribution measurement, Microstrip Antenna.

## UNIT 4

**ANTENNA MEASUREMENT:** Measurements of antenna efficiency, Measurement of noise figure and noise temperature of an antenna polarization measurement.

## UNIT 5

**WAVE PROPAGATION:** Modes of Propagation, Plane Earth Reflection, Space wave and Surface Wave, Reflection and Refraction waves by the Ionosphere Troposphere wave. Ionosphere Wave Propagation in the Ionosphere in the ionosphere, Virtual Height, MUF, Critical Frequency, Skip Distance, Duct propagation, Space wave.  
Introduction to planar (Rectangular) waveguides- Derivation of TE and TM modes, TEM mode.

## SUGGESTED BOOKS:

1. Balanis," Antenna Theory: Analysis & Design" 3<sup>rd</sup> Edition, 2010, John Wiley (India).
2. Prasad, K.D./"Antenna and Wave Propagation"/ Khanna Publications.
3. Jordan Edwards C. and Balman Keith G./" Electromagnetic Waves and Radiating Systems"/PHI
4. Hayt Jr. William H./" Engineering Electromagnetics"/TMH

# TCS-507 CONCEPTS OF PROGRAMMING AND OOPS

## UNIT 1

**UTILIZATION:** Developer fundamentals such as editor, integrated programming environment, UNIX shell, modules, libraries.

**PROGRAMMING FEATURES:** Machine representation, primitive types, arrays and records, objects, expressions, control statements, iteration, procedures, functions, and basic I/O.

**APPLICATIONS:** Sample problems in engineering, science, text processing, and numerical methods.

## UNIT 2

**PROBLEM SOLVING WITH ALGORITHMS-** Programming styles – Coding Standards and Best practices - Introduction to C Programming, Testing and Debugging. Code reviews, System Development Methodologies – Software development Models, User interface Design – introduction – The process – Elements of UI design & reports.

## UNIT 3

**OBJECTED ORIENTED CONCEPTS** – object oriented programming, UML Class Diagrams– relationship – Inheritance – Abstract classes – polymorphism, Object Oriented Design methodology - Common Base class, Alice Tool – Application of OOC using Alice tool.

## UNIT 4

**RDBMS- DATA PROCESSING** – the database technology – data models, ER modeling concept – notations – Extended ER features, Logical database design – normalization, SQL – DDL statements – DML statements – DCL statements, Writing Simple queries – SQL Tuning techniques – Embedded SQL – OLTP

## SUGGESTED BOOKS:

1. Object oriented to C++, Shukla, Wiley India
2. Object oriented programming in C++ , Kamthane, Pearson
3. G. Dromey, How to Solve It by Computer, Prentice-Hall, Inc., Upper Saddle River, NJ, 1982.
4. Polya, G., How to Solve \_It (2nd ed.), Doubleday and co. (1957).
5. Let Us C. Yashwant Kanetkar. Allied Publishers, 1998.
6. An introduction to object oriented Programming in C++, Graham Seed, BSP, Hyderabad

## PEC-551 MICROPROCESSOR & CONTROLLERS LAB

1. To perform Addition/ Multiplication of two 8 bit numbers
2. To Find the maximum value in an array
3. To perform BCD to Hex conversion & Hex to BCD conversion
4. To Design Counter using timer
- 5.1. Programming with 8086 –16-bit, 32 bit multiplication/division
6. Interfacing with 8085/8086/8051 – 8255, 8253
7. Interfacing with 8085/8086/8051 – 8279,8251
8. Stepper motor interfacing, Seven Segment display interfacing using 8051

NOTE: The institution may add 2 more practical in above prescribed list.

## PCS-557 CONCEPT OF PROGRAMMING & OOPs LAB.

Students should implement the following during Practical hours: (illustrative only)

1. Programs using C & OOPs Language
2. Queries using MY-SQL
3. Using Alice Tool :
  - a. Write a method for an Alice object
  - b. Condition Construct
  - c. Repetition Construct
4. Group Project

Sl. No	Course	S/W on Students Machine	Remarks
1.	Programming Fundamentals	Visual Studio .NET (2003), Turbo C	Alternate: Visual Studio 6
2.	RDBMS	My-SQL	Alternate: Oracle 9i Client

The purpose of 1hour(s) tutorial per week is to help slow learning students bring upto speed all the students. The assignments for CHSSC, Programming Fundamentals, and Relational Data base Management System will be given by the instructor which is to be completed as a part of Tutorial.

## **PEC-552 DIGITAL SIGNAL PROCESSING LAB**

1. Sampling & Waveform Generation, Quantization
2. PCM Encoding
3. Delta Modulation
4. Digital Modulation Schemes (ASK, PSK, FSK)
5. DFT Computation.
6. Fast Fourier Transform.
7. FIR Filter implementation, IIR Filter implementation.
8. Computational Experiments with Digital bank of Filters
9. Echo Cancellation generation and Filters implementation

NOTE: The institution may add 2 more practical in above prescribed list.

## TEC-601 MICROWAVE TECHNIQUES

### UNIT 1

**ELEMENTS OF MICROWAVE/MILLIMETER WAVE INTEGRATED CIRCUITS:** classification of Transmission lines: Planar, quasi-planar and 3D structure and their properties, field distribution and range of application, Transverse transmission the techniques for multi-dielectric planar structure, Analysis of discontinuities in planar and non-planar transition line.

### UNIT 2

**PROPAGATION THROUGH WAVEGUIDES:** Rectangular and circular waveguides solution of wave equation for TE & TM modes, degenerate and dominant modes, power transmission power loss, Excitation of wave guides, Non existence of TEM mode in waveguide, Introduction to stripline and Microstrip-line.

### UNIT 3

**MICROWAVE CAVITY RESONATORS:** Rectangular and cylindrical cavities, Quality factor and Excitation of cavities. Microwave Components: Waveguide couplings, bends and tourists, Design and circuit realization of filters, couplers, phase shifters, E-plane, H-plane and hybrid Tees, Hybrid ring wave meters: Isolators and circulators, tunable detectors, slotted line carriage, VSWR meter.

### UNIT 4

**MICROWAVE MEASUREMENTS:** measurement of frequency, wave length, VSWR, impedance, Attenuation Low and high power radiation patterns. Limitation of Conventional active devices at microwave frequency.

### UNIT 5

**MICROWAVE TUBES:** Klystron, Reflex klystron, magnetron, TWT, BWO: principle of operation and its performance characteristic and application.

### SUGGESTED BOOKS:

1. Pozar « Microwave Engineering » 3rd edition, John Wiley (India).
2. Microwave Engg. , Radhakrishna, BSP Publication
3. Collin, R.E. Foundations for Microwave Engineering; TMH 2nd Ed.
4. Rizzi, Microwave Engineering: Passive Circuits; PHI.



## TEC-602 VLSI CIRCUIT DESIGN

### UNIT 1

**REVIEW:** Current conduction in MOSFET, Electrical Properties of MOS and BiCMOS, The Pass Transistor, CMOS.

### UNIT 2

**CMOS Inverter:** Static CMOS inverter, layout, switching threshold and noise margin concepts and their evaluation, dynamic behavior, power consumption.

NMOS MOS pass transistor inverter.

**COMBINATIONAL LOGIC:** Static CMOS design, ratiomed logic, pass transistor logic, dynamic logic, cascading dynamic gates, CMOS transmission gate logic.

### UNIT 3

**SEQUENTIAL LOGIC:** Static latches and registers, bi-stability principle, MUX based latches, static SR flip-flops, master-slave edge-triggered register, dynamic latches and registers, concept of pipelining, Timing issues.

### UNIT 4

**MEMORY AND ARRAY STRUCTURE:** ROM, RAM, peripheral circuitry, memory reliability and yield, SRAM and DRAM design, flash memory, PLA,PAL, FPGA.

### UNIT 5

**DESIGN FOR TESTABILITY:** Logic Testing, sequential Logic Testing, Guidelines to be adopted in Design for Test, Scan Designing Techniques, Built-In self Test (BIST)Techniques.

### SUGGESTED BOOKS:

1. Basic VLSI Design by D.A. Pucknell & Eshraeghian (PHI)
2. Modern VLSI Design Systems on Silicon by Wayne Wolf (Pearson Pub.)
3. R. K. Singh « VLSI DESIGN (With VHDL), Kataria & Sons » , 2<sup>nd</sup> Edition, 2010.

# TEC-603 TELECOMMUNICATION SWITCHING SYSTEMS

## UNIT 1

**INTRODUCTION:** Message switching, circuits switching, functions of a switching system, register-translator-senders, distribution frames, crossbar switch, a general trunking.

Transmission Systems, FDM Multiplexing and modulation, Time Division Multiplexing, Digital Transmission and Multiplexing: Pulse Transmission, Line Coding, Binary N-Zero Substitution, Digital Bi-phase, Differential Encoding, Time Division Multiplexing (T1 carrier system CCIT and DS lines) Time Division Multiplex Loops and Rings.

## UNIT 2

**DIGITAL SWITCHING:** Switching functions, space division switching, multiple stage switching, non-blocking switches, blocking Probabilities DCS hierarchy, integrated cross connect equipment, digital switching in environment, zero loss switching.

## UNIT 3

**TELECOM TRAFFIC ENGINEERING:** Network traffic load and parameters, grade of service and blocking probability, Traffic Characterization: Arrival Distributions, Holding Time Distributions, Loss Systems, Network Blocking Probabilities: End-to-End Blocking Probabilities, Overflow Traffic, Delay Systems: Exponential service Times, Constant Service Times, Finite Queues.

## UNIT 4

**NETWORK SYNCHRONIZATION CONTROL AND MANAGEMENT:** Timing Recovery, Phase-Locked Loop, Clock Instability, Jitter Measurements, Systematic Jitter. Timing Inaccuracies: Slips, Asynchronous Multiplexing, Network Synchronization, U.S. Network Synchronization, Network Control, Network Management.

## UNIT 5

**DIGITAL SUBSCRIBER ACCESS:** ISDN Basic Rate Access Architecture, ISDN U Interface, ISDN D Channel Protocol. HD-Rate Digital Subscriber Loops: Asymmetric Digital Subscriber Line, VDSL. Digital Loop Carrier Systems: Universal Digital Loop Carrier Systems, Integrated Digital Loop Carrier Systems, Next-Generation Digital Loop Carrier, Fiber in the Loop, Hybrid Fiber Coax Systems, Voice band Modems: PCM Modems, Local Microwave Distribution Service, Digital Satellite Services.

DSL Technology: ADSL, Cable Modem, Traditional Cable Networks, HFC Networks, Sharing, CM & CMTS and DOCSIS. SONET: Devices, Frame, Frame Transmission, Synchronous Transport Signals, STS I, Virtual Tributaries and Higher rate of service.

## SUGGESTED BOOKS:

1. Tele communication switching system and networks - Thyagarajan Viswanath, PHI, 2000.
2. Digital telephony - J. Bellamy, John Wiley, 2nd edition, 2001.
3. Data Communications & Networks - Achyut. S.Godbole, TMH, 2004.
4. Principles of Communication Systems – H. Taub & D. Schilling , TMH, 2nd Edition, 2003.
5. Telecommunication switching, Traffic and Networks - J E Flood, Pearson Education, 2002

## TEC-604 DIGITAL COMMUNICATION

### UNIT 1

**ELEMENTS OF DIGITAL COMMUNICATION AND INFORMATION THEORY:** Model of a Digital Communication, System, Probability Theory, Entropy and Information Rate, Conditional Entropy and Redundancy, Source Coding, Fixed and Variable Length Code Words, Source Coding Theorem, Prefix free code and, Kraft Inequality, Shannon-Fano and Huffman Coding.

### UNIT 2

#### DIGITAL BASE BAND TRANSMISSION

PCM Coding, DM, DPCM, ADPCM, Data Transfer Rate, Line Coding and Its Properties, NRZ & RZ Types, Signalling Format For Unipolar, Polar, Bipolar(AMI) & Manchester Coding Matched Filter Receiver, Derivation of Its Impulse Response and Peak Pulse Signal to noise ratio, ISI, Rectangular, sync & Raised cosine pulse comparison

### UNIT 3

#### DIGITAL MODULATION TECHNIQUES

Gram-Schmidt Orthogonalization Procedure, Hilbert transform, Types of Digital Modulation, correlation receiver, Waveforms for Amplitude, Frequency and Phase Shift Keying, Method of Generation and Detection of Coherent & Non-Coherent Binary ASK, FSK & PSK & PSD derivation for Coherent & Non-Coherent Binary ASK, FSK & PSK. Differential Phase Shift Keying, bit error rate comparison of Digital modulation techniques

### UNIT 4

#### ADVANCED MODULATION TECHNIQUES

Introduction to M-ary modulation techniques 16 PSK, QPSK , QAM , Continuous phase shift keying , MSK, GMSK. Direct sequence spread spectrum, processing gain Frequency hop Spread spectrum.

### UNIT 5

#### ERROR CONTROL CODING

Error Free Communication Over a Noise Channel, Hamming code, Relation Between Minimum Distance and Minimum Distance Error Correcting & detection Capability, Linear Block Codes, Encoding and Syndrome Decoding, Cyclic Codes, , Encoder and Decoder For Cyclic Codes, Convolution Coding & Viterbi decoding, introduction to burst error correction codes

#### SUGGESTED BOOKS:

1. Haykin, Simon / "Communication Systems" / John Wiley / 5th Ed., 2010.
2. Taub & Schilling / "Principles of Communication Systems" / Tata McGraw-Hill /
3. Prokis J.J / "Digital Communications" / Pearson /
4. Charkrabarti, P. / "Analog Communication Systems" / Dhanpat Rai & Co.
5. Communication System, B P Lathi, BSP, Hyderabad

## TCS-607 DATA STRUCTURES USING C++

### UNIT 1

**COMPLEXITY ANALYSIS:** Time and Space complexity of algorithms, asymptotic analysis, big O and other notations, importance of efficient algorithms, program performance measurement, data structures and algorithms.

**LINEAR LISTS:** Abstract data type, sequential and linked representations, comparison of insertion, deletion and search operations for sequential and linked lists, list and chain classes, exception and iterator classes for lists, doubly linked lists, circular lists, linked lists through simulated pointers, lists in STL, skip lists, applications of lists in bin sort, radix sort, sparse tables.

### UNIT 2

**STACKS AND QUEUES:** Abstract data types, sequential and linked implementations, exception handling in classes, representative applications such as parenthesis matching, towers of Hanoi, wire routing in a circuit, finding path in a maze, simulation of queuing systems, equivalence problem.

### UNIT 3

**HASHING:** Search efficiency in lists and skip lists, hashing as a search structure, hash table, collision avoidance, linear open addressing, chains, uses of hash tables in text compression, LZW algorithm.

### UNIT 4

**TREES:** Binary trees and their properties, terminology, sequential and linked implementations, tree traversal methods and algorithms, heaps as priority queues, heap implementation, insertion and deletion operations, heapsort, heaps in Huffman coding, leftist trees, tournament trees, use of winner trees in mergesort as an external sorting algorithm, bin packing.

### UNIT 5

**GRAPHS:** Definition, terminology, directed and undirected graphs, properties, connectivity in graphs, applications, implementation – adjacency matrix and linked adjacency chains, graph traversal – breadth first and depth first, spanning trees.

### SUGGESTED BOOKS:

1. M. T. Goodrich and R. Tamassia, *Algorithm Design: Foundations, Analysis and Internet Examples*, John Wiley & Sons, 2001.
2. Drozdek, A., "Data Structures and Algorithms in C++", Vikas Publishing House. 2002
3. Wirth, N., "Algorithms and Data Structures", Prentice-Hall of India. 1985
4. Lafore, R., "Data Structures and Algorithms in Java", 2nd Ed., Dorling Kindersley. 2007
5. Datastructure using C, Bandopadhyaya, "Data Structures, Algorithms, and Applications in Java", WCB/McGraw-Hill. 2001
6. C and datastructure, Padnabham, BSP, Hyderabad

# THU-608 PRINCIPLES OF MANAGEMENT

## UNIT 1

**INTRODUCTION TO MANAGEMENT:** Theories of management: Traditional behavioral, contingency and systems approach. Organization as a system.

## UNIT 2

**MANAGEMENT INFORMATION:** Interaction with external environment. Managerial decision making and MIS.

## UNIT 3

**PLANNING APPROACH TO ORGANIZATIONAL ANALYSIS:** design of organization structure; job design and enrichment; job evaluation and merit rating.

## UNIT 4

**MOTIVATION AND PRODUCTIVITY:** Theories of motivation, leadership styles and managerial grid. Co-ordination, monitoring and control in organizations. Techniques of control. Japanese management techniques.

- Minor Project: submission of 15 pages of Case studies on above.

## SUGGESTED BOOKS

1. Peter Drucker, Harper and Row: The Practice of Management.
2. Scherhorn" introduction to Management" 10<sup>th</sup> edition, John Wiley (India).
3. Staner: Management, PHI Learning.
4. Daft: Principles of Management, Cengage Learning.

## PEC-651 DIGITAL COMMUNICATION LAB

To perform following experiments based on Digital communication Trainer and Using Communication Simulink:

1. To study sampling and reconstruction of the sampled signal
2. To study Delta Modulation and Adaptive Delta Modulation.
- 3 To study ASK, PSK,FSK, -modulation system.
4. To Study TDM/PCM Transmitter /Receiver.
5. To Study DHSS, FHSS.
6. To Study Error Control Coding using Simulink.
7. To Study different Line Coding Techniques.

- NOTE: The institution may add 3 more practical in above prescribed list.

## PCS-604 DATA STRUCTURE LAB.

Problems in " C / C++/JAVA" using **Data Structures** involving arrays, stacks, queues, strings, linked lists, trees, graphs.

- 1) Using STACK to check matching left and right characters such as parantheses, curly braces and square brackets in a given string.
- 2) Single server queuing system and gathering statistics.
- 3) Operations on Stacks.
- 4) Sparse Matrices
- 5) Linear linked list implementation
- 6) Operations on Doubly Linked List and Circular List with a test application
- 7) Operations on Ordered Binary Trees.
- 8) Graph Traversal Techniques
- 9) Implementation of Quicksort, Mergesort and Heapsort
- 10) Operations on Binary Trees
- 11) Shortest Path Problem

## PEC-652 MICROWAVE LAB.

1. Study of various microwave components and instruments like frequency meter, attenuator, detector & VSWR meter.
2. Draw V-I characteristics of microwave source like Gunn diode/ Reflex Klystron.
3. Measurement of frequency and wavelength in a rectangular waveguide.
4. Measurement of VSWR (small as well as large values) & reflection coefficient.
5. Measure unknown impedance with smith chart.
6. Draw the following characteristics of Gunn Diode
  - (i) Output power and frequency as a function of voltage
  - (ii) Square wave modulation by PIN diode.
7. Drawing polar pattern of Horn antenna.
8. To observe the action of directional coupler and its use in separating incident & reflected wave.

- NOTE: The institution may add 2 more practical in above prescribed list.



# Program: B. Tech-ECE

Year: Session: 2012 – 2013

## Scheme and Evaluation Pattern

S.No	Course No.	Subject	Periods			Evaluation			External Exam	Total Marks
			L	T	P	Sessional				
						CT	TA	Total		
<b>Semester: 7<sup>th</sup></b>										
<b>Theory</b>										
1.	TEC-701	Optical Fibre Communication Systems	3	1	0	30	20	50	100	150
2.	TEC – 702	Wireless Communication Systems	3	1	0	30	20	50	100	150
3.	TEC – 703	Satellite Communication	3	1	0	30	20	50	100	150
4.	TEC-01X	ELECTIVE-I	3	1	0	30	20	50	100	150
5.	TOE-XX	Open Elective	3	1	0	30	20	50	100	150
<b>Practical/Design</b>										
1.	PEC -751	Project	0	0	4	0	0	50	50	100
2.	PEC-752	Industrial Interaction	0	0	2	0	0	25	25	50
3.	PEC-753	OFC & VLSI Simulation Lab.	0	0	2	0	0	25	25	50
4.		Seminar	0	0	2	0	0	50	0	50
<b>Semester: 8<sup>th</sup></b>										
<b>Theory</b>										
S.No	Course No.	Subject	Periods			Evaluation			External Exam	Total Marks
			L	T	P	Sessional				
						CT	TA	Total		
1.	TEC - 801	Radar & Navigation	3	1	0	30	20	50	100	150
2.	TEC-802	Data Communication Networks	3	1	0	30	20	50	100	150
3.	TEC-02X	ELECTIVE-II	3	1	0	30	20	50	100	150
4.	TEC-03X	ELECTIVE-III	3	1	0	30	20	50	100	150
<b>Practical/Design</b>										
1.	PEC-851	Project	0	0	6	0	0	100	200	300
2	PCS-854	CAD of Electronics Lab.	0	0	2	0	0	25	25	50
3.		Discipline	0	0	2	0	0	50	0	50



### **ELECTIVE-I**

- TEC 011      Digital System Design Using VHDL**
- TEC 012      Artificial Neural Networks and Fuzzy Logic**
- TEC 013      Principles of Secure Communication**
- TEC 014      Mobile Computing**

### **ELECTIVE-II**

- TEC 021      Spread Spectrum Systems**
- TEC 022      Reliability Engineering**
- TEC 023      Selected Topics in Communication**
- TEC 024      Digital Image Processing**

### **ELECTIVE-III**

- TEC 031      Random Signal Theory**
- TEC 032      Optical Networks**
- TEC 033      Adaptive Signal Processing**
- TEC 034      Embedded Systems**

# TEC-701 OPTICAL FIBRE COMMUNICATION SYSTEMS

## UNIT 1

**INTRODUCTION:** Demand of Information Age, Block Diagram of Optical fiber Communication System, Technology used in OFC System, Structure and types of Fiber, modes and Configuration, mode theory for circular guide modal equation, modes in optical fiber, linearly polarized modes, attenuation factors, pulse broadening in optical fiber, single mode fiber, mode field diameter, single distortion in single mode fiber, Derivation of material dispersion and waveguide dispersion. Attenuation, Signal Degradation in Optical Waveguides, Pulse Broadening in Graded index fiber Waveguides, Mode Coupling.

## UNIT 2

### **OPTICAL SOURCES:**

**LED:** Visible LED, Infrared LED, LED structure and configuration, Loss mechanism, Application of LED, operating Characteristics materials for Visible LED.

**LASER:** Principle of LASER Action, Efficiency of LASER Diode, principles and structures, index guided and gains guided lasers, mode separation, quantum well laser, laser modulation.

## UNIT 3

**OPTICAL DETECTORS:** Optical Absorption in semiconductors, Types of Photo Diodes, Principle of photo detection, working and structures of p-i-n and APD photo detectors, noises in photo detectors, SNR, detector response time effects, comparison of various photo detectors.

## UNIT 4

**ANALYSIS AND PERFORMANCE OF OPTICAL RECEIVER:** Receiver Sensitivity, Photodiode for optical receiver, Optical Receiver Design, recent receiver circuits, System configuration and power budget.

## UNIT 5

**OPTICAL NETWORKS:** WDM concepts and principles, passive components, SONET/SDH networks, performance of WDM.

## SUGGESTED BOOKS

1. Optical Fiber Communications – Gerd Keiser, Mc Graw-Hill International edition, 3rd Edition, 2000.
2. Optical Communication System- R. K. Singh, Wiley India, Delhi
3. Optical Fiber Communications – John M. Senior, PHI, 2nd Edition, 2002.

**UNIT 1**

**SERVICES AND TECHNICAL CHALLENGES:** Types of Services, Requirements for the services, Multipath propagation, Spectrum Limitations, Noise and Interference limited systems, Principles of Cellular networks, Multiple Access Schemes.

**UNIT 2**

**WIRELESS PROPAGATION CHANNELS :** Propagation Mechanisms (Qualitative treatment), Propagation effects with mobile radio, Channel Classification, Link calculations, Narrowband and Wideband models, propagation models, Path loss components.

**UNIT 3**

**WIRELESS TRANSCEIVERS:** Structure of a wireless communication link, Modulation and demodulation – Quadrature/4-Differential Quadrature Phase Shift Keying, Offset-Quadrature Phase Shift Keying, Phase Shift Keying, Binary Frequency Shift Keying, Minimum Shift Keying, Gaussian Minimum Shift Keying, Power spectrum and Error performance in fading channels.

**UNIT 4**

**SIGNAL PROCESSING IN WIRELESS SYSTEMS :** Principle of Diversity, Macro-diversity, Micro-diversity, Signal Combining Techniques, Transmit diversity, Equalizers- Linear and Decision Feedback equalizers, Review of Channel coding and Speech coding techniques.

**UNIT 5**

**ADVANCED TRANSCEIVER SCHEMES**

Spread Spectrum Systems- Cellular Code Division Multiple Access Systems- Principle, Power control, Effects of multipath propagation on Code Division Multiple Access, application of Orthogonal Frequency Division Multiplexing in GSM, IS-95, IS-2000 and Third Generation Wireless Networks and Standards

**SUGGESTED BOOKS:**

1. Andreas.F. Molisch, "Wireless Communications", John Wiley – India, 2006.
2. Simon Haykin & Michael Moher, "Modern Wireless Communications", Pearson Education, 2007.
3. Rappaport. T.S., "Wireless communications", Pearson Education, 2003.
4. Gordon L. Stuber, "Principles of Mobile Communication", Springer International Ltd., 2001.
5. Andrea Goldsmith, Wireless Communications, Cambridge University Press, 2007.

## UNIT 1

**OVERVIEW OF SATELLITE SYSTEMS, ORBITS AND LAUNCHING METHODS:** Frequency Allocations, Intelsat, U.S. Domsats, Polar Orbiting Satellites, Problems, Kepler's Law, Definitions of Terms for Earth-orbiting Satellites, Orbital Elements, Effects of a Nonspherical Earth, Atmospheric Drag, Inclined Orbits ,Calendars , Universal , Sidereal Time, Julian Dates , The Orbital Plane – The Geocentric-, Topcentric-Horizon , The Sub-satellite Point – Predicting Satellite Position.

## UNIT 2

**GEOSTATIONARY ORBIT & SPACE SEGMENT:** Antenna Look Angels, The Polar Mount Antenna, Limits of Visibility, Near Geostationary Orbits, Earth Eclipse of Satellite, Launching Orbits ,Problems ,Power Supply, Attitude Control, Spinning Satellite Stabilization Momentum Wheel Stabilization, Station Keeping, Thermal Control, Transponders, Wideband Receiver, , Power Amplifier, Antenna Subsystem, Morelos, Advanced Spacecraft.

## UNIT 3

**EARTH SEGMENT & SPACE LINK:** Equivalent Isotropic Radiated Power, Transmission Losses, Free-Space Transmission, Feeder Losses, Antenna Misalignment Losses, Fixed Atmospheric and Ionospheric Losses, Link Power Budget Equation, System Noise, Antenna Noise, Amplifier Noise Temperature, Amplifiers in Cascade , Noise Factor, Noise Temperature, Overall System Noise Temperature, Carrier-to-Noise Ratio, Uplink, Saturation Flux Density, The Earth Station HPA, Downlink, Output Back off, Effects of Rain, Uplink rain-fade margin, fade margin, Combined Uplink and Downlink C/N Ratio, Intermodulation Noise.

## UNIT 4

**SATELLITE ACCESS:** Single Access – Preassigned FDMA, Demand-Assigned FDMA, SPADE System. Bandwidth-limited a Power-limited TWT amplifier operation, FDMA downlink analysis. TDMA : Reference Burst; Traffic Date, Frame Efficiency and Channel capacity, preassigned TDMA, Demand assigned TDMA, Speech Interpolation and Prediction, Downlink analysis for Digital transmission. Companion of uplink Power requirements for FDMA & TDMA.

## UNIT 5

**DIRECT BROADCAST SATELLITE SERVICES:** Introduction – Orbital Spacings – Power Rating and Number of Transponders – Frequencies and Polarization – Transponder Capacity –Home Receiver Outdoor Unit (ODU) – Home Receiver Indoor Unit (IDU) – Downlink Analysis – Uplink -Problems - Satellite Mobile Services – VSATs – Radarsat – Global Positioning Satellite System – Orbcomm.

### SUGGESTED BOOKS:

1. Dennis Roddy, Satellite Communications, McGraw-Hill Publication Third edition 2001
2. Timothy Pratt – Charles Bostian & Jeremy Allmuti, Satellite Communications, John Willy & Sons
3. Wilbur L. Pritchards Henri G.Snyder Hond Robert A.Nelson, Satellite Communication Systems Engineering, Pearson Education Ltd., Second edition 2003.

## PEC-753 OFC & VLSI SIMULATION LAB

Design of following ckt using appropriate software like VHDL/ FPGA and OFC kits.

- 1) 3-input NAND gate.
- 2) Half adder, Full Adder
- 3) D-Latch, T Flip Flop
- 4) Serial in-serial out shift register, Bidirectional shift Register
- 5) 3 Bit synchronous counter
- 6) To set up Fiber Optic Analog link.
- 7) To set up fiber Optic Digital link.
- 8) Measurement of Propagation loss and numerical aperture.
- 9) Characterization of laser diode and light emitting diode.

- NOTE: The institution may add 2 more practical in above prescribed list.

### UNIT 1

**INTRODUCTION TO VHDL:** VHDL description, combinational networks, modeling flip-flop using VHDL, VHDL model for multiplexer, compliance and simulation of VHDL, codes, modeling a sequential machine, variables, signals and constants, arrays VHDL operators, VHDL functions, VHDL procedures, packages and libraries, VHDL model for a counter. Attributes, transport and inertial delays, operator over loading, multi valued logic and signal resolution, IEEE-1164, standard logic, generic, generates statements, synthesis of VHDL codes.

### UNIT 2

**DESIGN OF NETWORKS FOR ARITHMETIC OPERATIONS:** Design of serial adder with accumulator, state graph for control networks design of binary multiplier, multiplication of signed binary numbers, design of binary divider.

**DIGITAL DESIGN WITH SM CHART:** state machine charts, derivation of SM charts, realization of SM charts, implementation of dice game, alternative realization of SM charts using microprogramming.

### UNIT 3

**FLOATING POINT ARITHMETIC:** Representation of floating point numbers, floating point multiplication, and other floating point operations.

**DESIGNING WITH PROGRAMMABLE GATE ARRAYS AND COMPLEX PROGRAMMABLE LOGIC DEVICES:** Xilinx 3000 series FPGAs, Xilinx 4000 series FPGAs, using one hot state assignment.

### UNIT 4

**MEMORY MODELS FOR MEMORIES AND BUSES:** Static RAM, a simplified 486 bus model, interfacing memory to microprocessor bus

### UNIT 5

**DESIGN EXAMPLES:** UART design, description of MC68HC05 microcontroller, design of microcontroller CPU, and complete microcontroller design.

### SUGGESTED BOOKS:

1. Charles H Roth Jr, "Digital System Design using VHDL", Thomson Learning, 02.
2. Stephen Brown & Zvonko Vranesic, "Fundamentals of digital logic design with VHDL", TMH, 2nd Ed., 2007.
3. Jhon F Wakerly, "Digital design", PHI, 4th Ed.

**Unit-I**

**Neural Networks-1(Introduction & Architecture):** Neuron, Nerve structure and synapse, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory

**Unit-II**

**Neural Networks-II (Back propagation networks):** Architecture: perceptron model, solution, single layer artificial neural network, multilayer perceptron model; back propagation learning methods, effect of learning rule co-efficient ;back propagation algorithm, factors affecting back propagation training, applications.

**Unit-III**

**Fuzzy Logic-I (Introduction) :** Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory versus probability theory, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion.

**Unit-IV**

**Fuzzy Logic –II (Fuzzy Membership, Rules) :** Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzifications, Fuzzy Controller,

**Unit-V**

**Application of Neural Network and Fuzzy logic:** Application of neural network, case study, Inverted pendulum, Image processing. Introduction to neuro & fuzzy logic controller.

**SUGGESTED BOOKS:**

1. Jacek M. Zurada, 'Introduction to Artificial Neural Systems', Jaico Publishing home, 2002.
- 2 . Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', 2<sup>nd</sup> John Wiley (India), 1997.

### UNIT 1

**Direct Sequence Spread Spectrum Systems:** Model of SS digital communication system, direct sequence spread spectrum signal, error rate performance of the decoder, processing gain and jamming margin, uncoded DSSS signals, applications of DSSS signals in anti-jamming, low detectability signal transmission, code division multiple access and multipath channels, effect of pulsed interference on DSSS systems, Generation of PN sequences using m sequence and Gold sequences, excision of narrowband interference in DSSS systems, acquisition and tracking of DSSS system.

### UNIT 2

**Frequency Hopped Spread Spectrum Systems:** Basic concepts, slow and fast frequency hopping, performance of FHSS in AWGN and partial band interference, FHSS in CDMA system, Time hopping and hybrid SS system, acquisition and tracking of FH SS systems.

### UNIT 3

**Cryptographic Techniques:** Classical encryption technique, Symmetric cipher model, cryptography and cryptanalysts, Substitution techniques, transposition techniques

### UNIT 4

**Block Cipher and Data Encryption Standard :** Block cipher principle, data encryption standard (DES) strength of DES, differential and linear cryptanalysts, block cipher design principles, simplified advanced encryption standard (S-AES), multiple encryption and triple DES, Block cipher modes of operation, stream ciphers and RC4 algorithm

### UNIT 5

**Public Key Cryptography:** Prime numbers, Fermat and Euler's theorem, Chinese remainder theorem, discrete algorithms, principles of public key cryptosystems, RSA algorithm, key management Diffie-Hellman key exchange, message authentication requirements and functions.

### SUGGESTED BOOKS:

1. Digital Communication by J.G. Proakis McGraw Hill 2nd Ed.
2. Cryptography and Network Security by W. Stallivgs 4th Ed., PHI
3. Digital Communication by Simon Haykin, Wiley.
4. Principle of Communication systems by Taub & Schilling TMH.
5. Cryptography and secure Communications by M.Y. Rhee, Mc Graw Hill



**UNIT 1****INTRODUCTION TO NETWORK TECHNOLOGIES AND CELLULAR COMMUNICATIONS: WLAN:**

Infrared vs. radio transmission, Infrastructure and ad hoc networks, IEEE 802.11. Bluetooth- User scenarios, Physical layer, MAC layer, Networking, Security. Link management GSM-Mobile services, System architecture, Radio interface, Protocols, Localization and calling, Handover, Security, and New data services.

**MOBILE COMPUTING (MC):** Introduction to MC, novel applications, limitations, and architecture

**UNIT 2**

**(WIRELESS) MEDIUM ACCESS CONTROL:** Motivation for a specialized MAC (Hidden and exposed terminals, Near and far terminals) , SDMA, FDMA, TDMA, CDMA.

**MOBILE NETWORK LAYER:** Mobile IP (Goals, assumptions, entities and terminology, IP packet delivery, agent advertisement and discovery, registration, tunneling and encapsulation, optimizations), Dynamic Host Configuration Protocol (DHCP).

**UNIT 3**

**MOBILE TRANSPORT LAYER:** Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Fast retransmit/fast recovery, Transmission /time-out freezing, Selective retransmission, Transaction oriented TCP.

**DATABASE ISSUES:** Hoarding techniques, caching invalidation mechanisms, client server computing with adaptation, power-aware and context-aware computing, transactional models, query processing, recovery, and quality of service issues.

**UNIT 4**

**DATA DISSEMINATION:** Communications asymmetry, classification of new data delivery mechanisms, push-based mechanisms, pull-based mechanisms, hybrid mechanisms, selective tuning (indexing) techniques.

**Mobile Ad hoc Networks (MANETs):** Overview, Properties of a MANET, spectrum of MANET applications, routing and various routing algorithms, security in MANETs.

**UNIT 5**

**PROTOCOLS AND TOOLS:** Wireless Application Protocol-WAP. (Introduction, protocol architecture, and treatment of protocols of all layers), Bluetooth (User scenarios, physical layer, MAC layer, networking, security, link management) and J2ME.

**SUGGESTED BOOKS:**

1. Stojmenovic and Cacute, "Handbook of Wireless Networks and Mobile Computing", Wiley, 2002, ISBN 0471419028.
2. Jochen Schiller, "Mobile Communications", Addison-Wesley. second edition, 2004.
3. Reza Behravanfar, "Mobile Computing Principles: Designing and Developing Mobile Applications with UML and XML", ISBN: 0521817331, Cambridge University Press, October 2004.

**UNIT 1**

**RADAR SIGNAL MODELS:** Amplitude models, distributed target forms of range equation, radar cross section, statistical description of radar cross section, Swerling model, Clutter, signal to clutter ratio, temporal and spatial correlation of clutter, noise model and signal to noise ratio, frequency models, Doppler shift, simplifies approach to Doppler shift, stop and hop assumption, spatial model, variation with angle, variation with range, projections, multipath, spectral models.

**UNIT 2**

**RADAR WAVE FORMS:** Waveform matched filter of moving targets, ambiguity function, ambiguity function of the simple matched pulse filter for the pulse burst, pulse by pulse processing, range ambiguity, Doppler response and ambiguity function of the pulse burst. Introduction to Synthetic Aperture Radar (SAR)

**UNIT 3**

**DETECTION FUNDAMENTALS:** Radar detection as hypothesis testing, Neyman-Pearson detection rule, likelihood ratio test, threshold detection of radar signals, non-coherent integration of non-fluctuating targets, Albersheim and Shnidaman equations, Binary integration

**UNIT 4**

**RADIO DIRECTION FINDING:** loop direction finder, goniometer, errors in direction finding, **RADIO RANGES:** LF/MF four course radio ranges, VOR, ground equipment & receiver, VOR errors.

**HYPERBOLIC SYSTEM OF NAVIGATION:** LORAN & Decca DME & TECAN

**UNIT 5**

**AIDS TO APPROACH AND LANDING:** ILS & GCA & MLS **DOPPLER NAVIGATION:** Doppler frequency, Doppler radar equipment, CW & FMCW Doppler radar, frequency trackers, Doppler range equation.

**SATALLITE NAVIGATION SYSTEM:** transit system, NAVSTAR, GPS, basic principles of operation, signal structure of NAVSTAR broadcasts, data message, velocity determination, accuracy of GPS & differential navigation, NAVSTAR receiver.

**SUGGESTED BOOKS:**

1. Fundamentals of radar signal processing, Mark A Richards, TMH.
2. Elements of Electronics Navigation, N. S. Nagraja, TMH.
3. Radar principles, Peebles Jr. P. Z., Wiley, NY.

## TEC-802 DATA COMMUNICATION NETWORKS

### UNIT 1

**INTRODUCTION:** Switching systems, network hardware and software, Layering, design issues for layering, reference models and their comparison, example networks

**PHYSICAL LAYER:** Transmission media and channel impairments, modulation, multiplexing, digital channels, mobile telephone systems

### UNIT 2

**DATA LINK LAYER:** Design issues, framing, error control, elementary data link protocols and sliding window protocols, HDLC, data link layer in internet.

**MEDIUM ACCESS CONTROL:** Channel allocation problem, MAC protocols- Aloha, CSMA, collision free protocols, limited contention protocol. Ethernet, IEEE 802.3 standard. Repeaters, bridges, routers and gateways.

### UNIT 3

**NETWORK LAYER:** Design issues, VC and datagram subnets, routing algorithms for wired and wireless hosts, congestion prevention policies, load shedding. Connectivity of networks, connectionless internetworking, internetwork routing, fragmentation.

IP protocols, IP addressing, OSPF, IPv6.

### UNIT 4

**TRANSPORT LAYER:** Transport service and primitives, Addressing, connection establishment and release, flow control, buffering, multiplexing and crash recovery. Introduction of UDP. Modeling TCP connection management, TCP congestion control. Performance issues

### UNIT 5

DNS name space and DNS server, overview of www, http. Introduction of cryptography, substitution cipher and transposition cipher, DES, cipher methods, public key algorithms. Social issues- privacy, freedom of speech, copy right

### SUGGESTED BOOKS:

1. Forouzan, B.A., "Data Communication and Networking", 4th Ed., Tata McGraw-Hill.
2. Tanenbaum, A.S., "Computer Networks", 4th Ed., Pearson Education.
3. Stallings W., "Data and Computer Communication", 8th Ed., Prentice-Hall.
4. Kurose, J.F. and Ross, K.W., "Computer Networking: A Top-Down Approach Featuring the Internet", 3rd Ed., Addison Wesley.

## **PCS-854 CAD OF ELECTRONICS LAB.**

1. Design, simulation and analysis of two input NAND and NOR gate.
2. Design, simulation and analysis of Push Pull Amplifier.
3. Design, simulation and analysis of NMOS and CMOS inverter.
4. Design, simulation and analysis of Differential amplifier.
5. Design, simulation and analysis of Full Adder, Sub-tractors circuit.
6. Design, simulation and analysis of Up/ Down, Mod-m counter.
7. Design, simulation and analysis of 512X8 ROM.
8. Design, simulation and analysis of Static/ Dynamic hazards removal circuits.

NOTE: The institution may add 5 more practical in above prescribed list.

**UNIT 1**

**INTRODUCTION:** Introduction to spread spectrum, spread spectrum techniques, Direct sequence system, frequency hopping systems, pulse FM(chirp) system, hybrid systems

**UNIT 2**

**CODING FOR COMMUNICATION AND RANGING-** Property of codes for spread spectrum, Autocorrelation and cross correlation of codes, composite codes, code selection and signal spectra, error detection and correlation codes.

**UNIT 3**

**MODULATION AND DEMODULATION –** Balance modulator, quadric-phase modulator, frequency synthesis for spread spectrum modulation, in line and heterodyne correlation, base band recovery, phase lock loop, COSTAS loop, FM feedback, PDM and FH demodulators.

**UNIT 4**

**NEED FOR SYNCHRONIZATION:** types of synchronizers, RF link- Noise figure, co-channel users, dynamic range and AGC, propagation medium, overall transmitter and receiver design.

**UNIT 5**

**TEST AND EVALUATION OF SPREAD SPECTRUM SYSTEM-** selectivity, sensitivity, jamming margin, synch acquisition, processing gain. Transmitter measurements.

**SUGGESTED BOOKS:**

1. R. C. Dixon, "Spread spectrum systems with commercial application", John Wiley, 3rd Ed.
2. H. Taube and D. L. Schilling, "Principles of Communication systems", Tata Mc-Graw Hill, 2nd Ed. Reprint 2007.

**UNIT 1**

**INTRODUCTION:** Definition of reliability, quality, availability, maintainability, types of failures, various parameters of system effectiveness, concept of failure modes, difference between MTTR and MTTF.

**UNIT 2**

**RELIABILITY MATHEMATICS:** Classical set theory, Boolean algebra, sample space, definition of probability, basic properties of probability, conditional probability, and random variables.

**PROBABILITY DISTRIBUTION:** Exponential distribution, gamma distribution, binomial distribution, normal distribution and weibull distribution.

**UNIT 3**

**RELIABILITY DATA ANALYSIS:** The reliability function, bathtub curve, data collection, storage & recovery of data, component reliability from test data, linear hazard model & exponential hazard model.

**UNIT 4**

**SYSTEM RELIABILITY:** Systems with components in series, systems with components in parallel, series –parallel systems, Fault tree techniques, K-out of m systems.

**UNIT 5**

**ELECTRONICS SYSTEM RELIABILITY:** Reliability of electronic components, component types and failure mechanics, circuit and system aspects, reliability of electronic system design, parameter variation and tolerance.

**SUGGESTED BOOKS:**

1. Practical Reliability Engineering/ *Patrick D. T., O'Connor* / John Wiley & Sons 4th edition.
2. Reliability Engineering/ *E. Balagurusamy* / Tata McGraw- Hill.

## **TEC-023 SELECTED TOPICS IN COMMUNICATION**

### **UNIT 1**

Software defined radio; Cognitive radio: Definition, spectrum management, computational intelligence, architecture and radio resource management.

### **UNIT 2**

Review of third generation cellular systems and standards, multicarrier modulation and multiple access techniques; Broadband wireless access, OFDMA and mobile WiMAX.

### **UNIT 3**

Space-time wireless communications, linear diversity techniques, space-time coding; MIMO detection and channel estimation, iterative detection and decoding, MIMO-OFDM; Smart antennas; Ultra wideband communication.

### **UNIT 4**

Advanced physical and MAC layer alternatives for wireless PAN, LAN, MAN and cellular networks; Mobile ad hoc and wireless sensor networks, adaptive link, MAC and network layer, energy efficiency and cross-layer design.

### **UNIT 5**

Wireless capacity and channel state estimation, network capacity, information theory and network architecture, capacity of ad hoc networks; Wireline and wireless cooperation strategies, multi-antenna relaying, cooperative diversity, cooperative physical layer architecture.

### **SUGGESTED BOOKS:**

1. Fette, B., "Cognitive Radio Technology", Elsevier. 2006
2. Mitola III, J., "Cognitive Radio Architecture: The Engineering Foundation of Radio XML", Wiley-Interscience. 2006
3. Giannakis, G.B., Hua, Y., Stoica, P. and Tong, L., "Signal Processing Advances in Wireless and Mobile Communications", Vol.1 and Vol. 2, Prentice- Hall. 2001
4. Pietrzyk, S., "OFDMA for Broadband Wireless Access", Artech House. 2006
5. Siwiak, K. and McKeown, D., "Ultra-wideband Radio", John Wiley & Sons. 2004
6. Paulraj, A., Nabar, R. and Gore, G., "Introduction to Space-Time Wireless Communications", Cambridge University Press. 2003
7. Gilsic, S.G., "Advanced Wireless Networks: 4G Technology", John Wiley & Sons. 2006

**UNIT 1**

**INTRODUCTION:** Fundamental steps in DIP, elements of DIP, Simple image model, Sampling & quantization, basic relationships between Pixels, Color image model.

**UNIT 2**

**IMAGE TRANSFORMS:** One-dimensional & Two-dimensional DFT, Cosine, Sine, Hadamard, Haar, and Slant & KL transforms.

**IMAGE ENHANCEMENT:** Introduction, Point operations, Histogram modeling, spatial operations, Transform operations

**UNIT 3**

**IMAGE RESTORATION:** Introduction, Image observation models, Inverse & Wiener filtering, difference between enhancement & restoration Restoration-spatial filtering, Noise reduction in frequency domain.

**UNIT 4**

**IMAGE COMPRESSION:** Introduction, Pixel coding, Predictive coding, Transform coding, Inter-frame coding.

**UNIT 5**

**IMAGE SEGMENTATION:** Introduction, Spatial feature extraction, Transforms features, Edge detection, Boundary extraction, Segmentation techniques.

- **Minor Project:** submission of 15 pages of MATLAB Program on above.

**SUGGESTED BOOKS:**

1. Digital Image Processing, Rafael C. Gonzales Richard E Woods, 2nd Ed. TMH
2. Pratt " Digital Image Processing" 4<sup>th</sup> Edition, John Wiley(India)
3. Fundamentals of Digital Image Processing, Anil K Jain.



**UNIT 1**

**THEORY OF PROBABILITY:** Axioms of probability: set theory, probability space, conditional, probability Repeated Trials: Combined experiments, Bernoulli trials, Bernoulli's Theorem.

**UNIT 2**

**CONCEPT OF RANDOM VARIABLE:** Introduction, distribution and density functions, specific random variables, conditional distributions.

**FUNCTIONS OF ONE RANDOM VARIABLE:** function and distribution of random variable, mean and variance, moments, characteristic functions.

**UNIT 3**

**TWO RANDOM VARIABLES:** Bivariate distributions, one function of two random variables, two functions of two random variables, joint moments, joint characteristic functions, conditional distributions Multiple random variables, sequences of random variables

**UNIT 4**

**CONCEPT OF STOCHASTIC PROCESSES:** Definition, systems with stochastic inputs, power spectrum, discrete-time processes.

**RANDOM WALKS AND OTHER APPLICATIONS:** random walks, Poisson points and shot noise, cyclostationary Processes, band-limited processes and sampling theory, deterministic signals in noise.

**SPECTRAL REPRESENTATION AND ESTIMATION:** factorization and innovations, finite-order systems and state variables, spectral representation of random processes, ergodicity, spectrum estimation

**UNIT 5**

**MEAN SQUARE ESTIMATION:** prediction, filtering and prediction, Kalman filters. Entropy: Basic concepts, random variables and stochastic processes, MEM.

**MARKOV CHAIN:** introduction, higher transition probabilities and the Chapman-Kolmogorov equation, classification of states, stationary distributions and limiting probabilities, transient states and absorption probabilities, branching processes. Markov processes and Queueing theory: introduction, Markov processes, queueing theory.

**SUGGESTED BOOKS:**

1. Probability, Random Variables and Stochastic Processes/A. Papoulis & S. U. Pillai/4<sup>th</sup> ed./TMH
2. Probability, Random Variables & Random Signal Principles/Peyton Z. Peebles, Jr./TMH

## TEC 032 OPTICAL NETWORKS

### UNIT 1

**INTRODUCTION:** Introduction to Optical Networks Characteristics of Optical Fiber (Emphasis on Non Linear Characteristics) , Timing & Synchronization.

### UNIT 2

**COMPONENTS:** Couplers, Isolators & Circulators, Multiplexers & Filters, Optical Amplifiers, Tunable Lasers, Switches, Wavelength Converters

### UNIT 3

**NETWORKS:** SONET/SDH- Multiplexing, SONET/ SDH Layers, Frame Structure, Frame Structure, Physical Layer, Elements of a SONET/SDH Infrastructure. ATM - Functions of ATM, Adaptation Layers, Quality of Service, Flow Control, Signaling and Routing . WDM Network Elements, Optical Line Terminals, Optical Line Amplifiers, Optical Add/ Drop Multiplexers, Optical Cross Connects.

### UNIT 4

**WDM NETWORK DESIGN:** Cost Trade-offs, Light path Topology Design, and Routing and wavelength assignment problems, Dimensioning Wavelength Routing Networks, Network Survivability Basic Concepts, Protection in SONET/SDH, Protection in IP networks, Optical Layer Protection, Different Schemes, Interworking between Layers Access Networks, Network Architecture Overview, Enhanced HFC, FTTC.

### UNIT 5

**OPTICAL SWITCHING:** OTDM, Synchronization, Header Processing, Buffering, Burst Switching. Deployment Considerations

### SUGGESTED BOOKS:

1. Ramaswami, Rajiv & Sivarajan, Kumar N. / "Optical Networks a Practical perspective"/ Morgan Kaufmann Publishers / 2nd Ed.
2. Black, Uyles / "Optical Networks Third Generation Transport Systems"/ Pearson Educations

**UNIT 1**

**INTRODUCTION:** Definition and characteristics, general properties open and closed loop adaptation.

**UNIT 2**

**ADAPTIVE LINEAR COMBINER:** General description, input signal and Weight vectors, desired response and error performance function, gradient and minimum mean square, alternative definition of gradient, decorrelation of error and input components.

**UNIT 3**

**THEORY OF ADAPTATION WITH STATIONARY SIGNALS:** Input correlation matrix, Eigen values and eigenvectors of the correlation matrix, and their geometrical significance. Basic ideas of gradient search methods, gradient search by Newton's method and method of steepest descent, gradient component estimation by derivative measurement, effects of gradient noise, on weight vector solution, excess MSE, time constant and mis-adjustment, performance comparison of Newton and S.D. methods.

**UNIT 4**

**ADAPTIVE ALGORITHMS:** Least mean square algorithm, convergence, learning curve noise in Weight vector misadjustment and performances of LMS algorithms, sequential regression algorithm, adaptive recursive LMS algorithm, random search algorithm.

**RECURSIVE LEAST SQUARE ALGORITHM:** Preliminaries, matrix inversion lemma, exponentially weighted RLS algorithm, update recursion for the sum of weighted error squares, convergence analysis of RLS algorithm

**UNIT 5**

**ADAPTIVE FILTER STRUCTURES:** Lattice structures, all poles and all zeroes versions, adaptive lattice predictor. Lattice LMS algorithms, and lattice SER algorithms, adaptive filters with orthogonal signals, DFT and lattice preprocessors.

**ADAPTIVE FILTER APPLICATIONS:** (i) Adaptive modeling and systems identification. (ii) Inverse adaptive modeling, equalization and deconvolution

**SUGGESTED BOOKS:**

1. Adaptive Signal Processing, Widrow and Stearns, Pearson Education
2. Adaptive Filter Theory, Simon Haykin, Pearson Education

### UNIT 1

**INTRODUCTION:** Embedded systems and its applications, Embedded Operating system, Design parameters of an embedded system and its significance, design life cycle, tools introduction, hardware and software partitioning and co-design.

### UNIT 2

**HARDWARE FUNDAMENTALS FOR THE EMBEDDED DEVELOPERS :** Digital circuit parameters- Open collector outputs Tristate outputs I/O sinking and Sourcing, PLD's, Watchdog Timers, Hardware design and development.

**CUSTOM SINGLE PURPOSE PROCESSORS:** Optimizing program, FSM, Data path & FSM.

**GENERAL PURPOSE PROCESSORS AND ASIP'S** (Application Specific Instruction set Programming): Software and operation of general purpose processors-Programmers View Development Environment-ASIPs Microcontrollers-DSP Chips.

### UNIT 3

**INTRODUCTION TO MICROCONTROLLERS AND MICOPROCESSORS:** Embedded versus external memory devices, CISC and RISC processors, Harvard and Von Neumann Architectures.

**RTOS** -Tasks, states, Data, Semaphores and shared data, Operating system services, Message queues, Mailboxes.

### UNIT 4

**ADVANCED PROCESSOR**-(only architectures) 80386, 80486, ARM and DUAL CORE, Core to DUO, i3, i5, i7 (References)

**COMMUNICATION BASICS:** Microprocessor Interfacing I/O Addressing, Direct memory access, Arbitration, multilevel bus architecture, Serial protocols, Parallel protocols and wireless protocols.

### UNIT 5

**REAL WORLD INTERFACING:** LCD, Stepping Motor, ADC, DAC, LED, Push Buttons, Key board, Latch Interconnection, PPI.

### SUGGESTED BOOKS:

1. Embedded System Design-Frank Vahid/Tony Givargis, John Willey@2005.
2. Microcontroller (Theory and Applications) Ajay V Deshmukh, Tata McGraw-Hill@2005.
3. An Embedded Software Primer-David E.Simon, Pearson Education @ 1999.

### REFERENCES:

1. The 8051 Microcontroller and embedded systems-Muhammad Ali Mazidi and Janice Gillispie.
2. Microcontrollers (Architecture, Implementation & Programming) Kenneth Hintz, Daniel Tabak, Tata McGraw-Hill@2005.
3. 8051 Microcontrollers & Embedded Systems 2nd Edition-Sampath Kr, Katson Books2006.



UTTRAKHAND TECHNICAL UNIVERSITY, DEHRADUN

LIST OF OPEN ELECTIVES

Effective from the session – 20010-11

[List of Open Elective of 7th Semester for B.Tech. Civil/Electrical/Electrical and Electronics/Mechanical & Allied Courses/Manufacturing Technology/Electronics and Communications & Allied Courses/ Instrumentation and Control & Allied Courses/Computer Science and Engineering & Allied Courses/ Information Technology & Allied Courses/ Agriculture (Old)/ Biotechnology/Marine Engg./Biomedical Engg. Courses.]

S.No.	P.Code	Subject	Dept.
1.	TOE 01	Non-conventional Energy Resources	Electrical
2.	TOE 02	Reliability Engineering	Electrical
3.	TOE 03	Environment & Ecology	Civil
4.	TOE 04	Geographic Inf. System (GIS) Technology & its Applications	Civil
5.	TOE 05	Entrepreneurship Development Programme	Humanities
6.	TOE 06	Ancient Indian Culture	Humanities
7.	TOE 07	Human Values	Humanities
8.	TOE 08	Quality System & Management	Mechanical
8.	TOE 09	Condition Monitoring & Diagnostics	Mechanical
10.	TOE 10	Value Engineering	Mechanical
11.	TOE 11	Nanotechnology	Mechanical
12.	TOE 12	Solar Energy	Mechanical
13.	TOE 13	Human Resource Management	Mechanical
14.	TOE 14	Advance Material Science	Mechanical
15.	TOE 15	Industrial Instrumentation	Instrumentation & Control
16.	TOE 16	Biomedical Engineering	Instrumentation & Control
17.	TOE 17	Fundamentals of Coding Theory	Electronics & Communication
18.	TOE 18	Consumer Electronics	Electronics & Communication

20.	TOE 20 Human Computer Interaction	Electronics & Communication
21.	TOE 21 I T in Business	Computer Science
22.	TOE 22 Artificial Intelligence in Manufacturing	Information Technology
23.	TOE 23 Health, Hospital and Equipment Management	Manufacturing Technology
24.	TOE 24 Introduction to Medical Physics	Biomedical Engineering
25.	TOE 25 Modern Control System	Biomedical Engineering
26.	TOE 26 Mechatronics	Electrical
27.	TOE 27 SCADA & Energy Management System	Electrical
		Electrical

**Note:** The students will choose any one subject of the course of other than their Engineering

Branch.

## **TOE-01 NON-CONVENTIONAL ENERGY RESOURCES**

### **1. INTRODUCTION**

Various non-conventional energy resources- Introduction, availability, Classification, relative merits and demerits.

### **2. SOLAR CELLS:**

Theory of solar cells. solar cell materials, solar cell power plant, limitations.

### **3. SOLAR THERMAL ENERGY:**

Solar radiation flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

### **4. GEOTHERMAL ENERGY:**

Resources of geothermal energy, thermodynamics of geo-thermal energy Conversion-electrical conversion, non-electrical conversion, environmental Considerations.

### **5. MAGNETO-HYDRODYNAMICS (MHD):**

Principle of working of MHD Power plant, performance and limitations.

### **6. FUEL CELLS:**

Principle of working of various types of fuel cells and their working, performance and limitations.

### **7. THERMO-ELECTRICAL AND THERMIONIC CONVERSIONS:**

Principle of working, performance and limitations.

### **8. WIND ENERGY:**

Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.

### **9. BIO-MASS:**



Availability of bio-mass and its conversion theory.

**10. OCEAN THERMAL ENERGY CONVERSION (OTEC):**

Availability, theory and working principle, performance and limitations.

**11. WAVE AND TIDAL WAVE:**

Principle of working, performance and limitations. **Waste Recycling Plants**

**References:**

1. Andra Gabdel, "A Handbook for Engineers and Economists".
2. A. Mani , "Handbook of Solar radiation Data for India".
3. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.
4. F.R. the MITTRE, "Wind Machines" by Energy Resources and Environmental Series.
5. Frank Kreith, "Solar Energy Hand Book".

6. N. Chermisinog and Thomes, C. Regin, "Principles and Application of Solar Energy".
7. N.G. Calvert, " Wind Power Principles".
8. W. Palz., P. Chartier and D.O. Hall, " Energy from Biomass".

## **TOE – 02**

### **RELIABILITY ENGINEERING**

#### **1. Introduction:**

Definition of reliability, types of failures, definition and factors influencing system effectiveness, various parameters of system effectiveness.

#### **2. Reliability Mathematics :**

Definition of probability, laws of probability , conditional probability, Bay's theorem; various distributions; data collection, recovery of data, data analysis procedures, empirical reliability calculations.

#### **Reliability:**

#### **3.**

Types of system- series, parallel, series parallel, stand by and complex; development of logic diagram, methods of reliability evaluation; cut set and tie-set methods, matrix methods event trees and fault trees methods, reliability evaluation using probability distributions, Markov method, frequency and duration method.

#### **Reliability Improvements:**

#### **4.**

Methods of reliability improvement, component redundancy, system redundancy, types of redundancies-series, parallel, series - parallel, stand by and hybrid, effect of maintenance.

#### **Reliability Testing:**

#### **5.**

Life testing, requirements, methods, test planning, data reporting system, data reduction and analysis, reliability test standards.

1. R.Billintan & R.N. Allan, "Reliability Evaluation of Engineering and Systems", Plenum Press.
2. K.C. Kapoor & L.R. Lamberson, "Reliability in Engineering and Design", John Wiley and Sons.
3. S.K. Sinha & B.K. Kale, "Life Testing and Reliability Estimation", Wiley Eastern Ltd.
4. M.L. Shooman, "Probabilistic Reliability, An Engineering Approach", McGraw Hill.
5. G.H.Sandler, "System Reliability Engineering", Prentice Hall.

### TOE-03

#### ENVIRONMENT AND ECOLOGY

##### 1. Environment:

Environment and its components, pollution of environment by human activity, kinds of pollution.

##### **Water Quality:**

Measure of water quality, water quality standards, water treatment; waste water transport and treatment, sludge treatment and disposal.

**Air Quality:**

Sources and effects of air pollution, major air pollutants, air quality control, treatment of emissions, dispersion of air pollutants.

**Solid waste:**

Collection of refuse, removal and transport, disposal of refuse.

**Noise Pollution:**

Effect of noise on human health and its control.

**2. Ecology:**

Ecology and Ecosystems, concept of ecological imbalances, physical and climate factors, biotic components, energy and material flows in ecosystems, human influence on ecosystems.

**Conservation of Natural Resources:** water resources, mineral resources, agricultural and forestry resources, agriculture soil and need of nutrients, fertilizers and pesticides.

Brief introduction about environmental legislation and environmental audit.

**References:**

1. Vesilind, " Introduction to Environmental Engineering," Thomson Asia Pvt. Ltd. Singapore.

## **UNIT – 1**

Definition of GIS, Cartography and GIS, GIS database: spatial and attribute data; Spatial models: Semantics, spatial information, temporal information, conceptual models of spatial information, representation of geographic information: point, line and area features, topology,

## **UNIT - 2**

Raster and vector data, raster to vector data conversion, map projection, analytical transformation, rubber sheet transformation, manual digitizing and semi-automatic line following digitizer; Remote sensing data as an input to GIS data;

## **UNIT - 3**

Attribute database: scale and source of inaccuracy; GIS functionality; data storage and data retrieval through query, generalization, classification, containment search within a spatial region;

## **UNIT - 4**

Overlay: arithmetical, logical and conditional overlay, buffers, inter visibility, aggregation; Network analysis;

## **UNIT - 5**

Applications of GIS in planning and management of utility lines and in the field of environmental engineering, geotechnical engineering, transportation engineering and water resources engineering.

**References:**

1. Geographic Information Systems: A Management Perspective, by Stan Arnoff, WDL Publications.
2. Fundamentals of Spatial Information Systems by Robert Laurini and Derek Thompson, Academic Press.
3. Geographical Information Systems, Vo. I and II edited by Paul Longley, M.F. Goodchild, et.al, John Wiley and Sons, Inc. 1999.

**TOE-05 ENTREPRENEURSHIP DEVELOPMENT PROGRAMME**

Entrepreneur-definition. Growth of small scale industries in developing countries and their positions vis-a-vis large industries; role of small scale industries in the national economy; characteristics and types of small scale industries; demand based and resources based ancillaries and sub-control type.

Government policy for small scale industry; stages in starting a small scale industry.

Project identification- assessment of viability, formulation, Evaluation, financing, field-study and collection of information, preparation of project report, demand analysis, material balance and output methods, benefit cost analysis, discounted cash flow, internal rate of return and net present value methods.

Accountancy- Preparation of balance sheets and assessment of economic viability, decision making, expected costs, planning and production control. quality control. marketing, industrial relations. sales and purchases, advertisement, wages and incentive, inventory control, preparation of financial reports, accounts and stores studies.

The financial functions, cost of capital approach in project planning and control. Economic evaluation, risk analysis, capital expenditures, policies and practices in public enterprises. profit planning and programming, planning cash flow, capital expenditure and operations. control of financial flows, control and communication.

Laws concerning entrepreneur viz, partnership laws, business ownership, sales and income taxes and workman compensation act.

Role of various national and state agencies which render assistance to small scale industries.

**Reference:**

1. Joseph, L. Massod, " Essential of Management", Prentice Hall of India.

**TOE-06 ANCIENT INDIAN CULTURE**

**UNIT – 1**

Main features of Indian Culture

- (a) The orient list view
- (b) The nationalist view

- (c) The Marxist view
- (d) Analysis and formulations

Principal Components – historical and archeo-ethic perspective

- (a) Indian Civilization
- (b) Vedic culture
- (c) Tribal and folk culture
- (d) Foreign elements

## **UNIT - 2**

Impact of integrating, disintegrating and proliferating forces of History.

- (a) Eras of political unification
- (b) Foreign invasions
- (c) Regional conflicts
- (d) Religious movements
- (e) Trade and Dissemination

## **UNIT - 3**

Ideas and Institution

- a. Political
- b. Social
- c. Economic
- d. Religious

## **UNIT - 4**

Achievements in Arts, Science and Technology

- (a) Literature
- (b) Art and Architecture
- (c) Music and Dance
- (d) Astronomy and Mathematics



## **UNIT - 5**

Values and disvalues

- a. Humanism and spiritualism
- b. Ashinsa
- c. Altmism
- d. Caste
- e. Unsociability
- f. Religious suicide and superstition
- g. Degradation of women and prostitution.

### **References:**

1. Ghose Aurobindo, Foundations of Indian culture.
2. Pande, G.C., Foundations of Indian culture, 2 Vols.
3. Coomarswami, dance of Siva
4. Thapar Ramila, Ancient Indian Social History

5. R.s. Sharma, (ed.), Indian Society Historical Probing, People's Publishing House, New Delhi, 1977.
6. Kossambi, Introduction to Indian History.
7. Altekar, A.S., State and Government in Ancient India.
8. Altekar, A.S., Position of Women in Hindu Civilization
9. Prakash, Om, conceptualization and History.
10. Bartam, A.I., Wonder that was India.

## **TOE 07 HUMAN VALUES**

### **Introduction**

- 1. Nature of value crisis in the contemporary Indian society and the larger human community.**
2. Meaning and nature of values; holistic view of life and its value.
3. Conceptualizing 'good' life and its value dimensions.

### **Unit-I : Material and Societal value**

- 1. Role of material values in promoting human wellbeing.**
2. Role of Science and technology; problems of material development.
3. Socio-political ideologies for promoting material wellbeing
4. Conceptualizing 'good' society and 'social goods'
5. Justice as a societal value.
6. Democracy and rule of law.
7. Values in the Indian Constitution.
8. Gandhian concepts of good society; gram swaraj, sarvodaya, antyodaya

### **Unit-II : Psychological and Aesthetic Values**

1. Humanistic psychology; meaning of 'personhood'

3. Mental health
4. Psycho-spiritual Indian concepts.
5. Areas and nature of aesthetic experiences.
6. Nature of beauty; aesthetic sensibilities.

### **Unit-III : Ethical and Spiritual Values**

#### **1. Bases for moral judgments : customary morality, religious morality, reflective morality.**

2. Some principles of ethics; ethical canons and their significance in modern life.
3. Virtue ethics; personal virtues for the modern times.
4. Ethics of duty and ethics of responsibility.
5. Factors to be considered in making ethical judgements: motives, means and consequences.
6. Spirituality and spiritual values : spiritual wisdom of the Upanishads; Buddha's view.
7. Science, materialism and spirituality.
8. Spirituality in the modern times.



**QUALITY SYSTEM & MANAGEMENT**

**1. Introduction:**

Definition, need of quality systems, role of quality standards, stages of quality assurance systems. quality charts, control charts for variables and attributes, acceptance sampling.

**2. Quality Systems:**

Overall responsibility for progress of quality systems. quality manuals, procedures and role of auditing, auditing for conformance versus quality for effectiveness, auditing a tool for quality improvement.

ISO 9000 quality systems, British Standards BS5750/ISO 9000 origin of standards, requirements, issues associated with implementation.

Registration and accreditation in quality system-certification, approval, registration of leading accessors.

**References:**

1. Mohamod Isiri, " Total Quality Management for Engineers".
2. Juran, J., " Quality Planning and Analysis, Mc-Graw Hill.
3. James R. Evans,& J.W. Dean," Total Quality-management, Organisation and Strategy," Thomson Asia Pvt. Ltd., Singapore.

**TOE – 09****CONDITION MONITORING & DIAGNOSTICS****Unit-I**

Productivity, Quality circle in Maintenance, Reliability, Reliability assurance, Maintainability vs. Reliability.  
Failure analysis, Equipment downtime analysis, breakdown analysis.

**Unit-II**

Maintenance type, Breakdown maintenance, Corrective maintenance, Opportunity maintenance, Routine maintenance, Preventive and predictive maintenance, Condition based maintenance systems, Design-out maintenance.

**Unit-III**

Equipment health monitoring, Signals, Online & off-line monitoring, Visual & temp. Monitoring, Leakage monitoring, Lubricant monitoring.

**Unit-IV**

Ferrography, Spectroscopy, Crack monitoring, Corrosion monitoring, thickness monitoring. Noise/sound monitoring, Smell/Odour monitoring, Thermography.

**Unit-V**

Vibration-characteristics, Vibration monitoring-causes, identification, measurement of machine vibration.

C.M.of lubes and hydraulic systems, C.M. of pipe lines, Selection of C.M. techniques Advantages.

# VALUE ENGINEERING

## **An Overview**

Definition, value engineering recommendations, programmes, advantages.

## **Approach of function**

Evaluation of function, determining function, classifying function, evaluation of costs, evaluation of worth, determining worth, evaluation of value.

## **VE Job Plan**

Introduction, orientation, information phase, speculation phase, analysis phase.

## **Selection of Evaluation of VE Projects**

Projects selection, Methods selection, value standards, application of VE methodology.

## **Versatility of VE**

VE operation in maintenance and repair activities, value engineering in non hardware projects.

## **Initiating A VE Programme**

Introduction, training plan, career development for VE specialities.

## **Fast Diagramming**

Cost models, life cycle costs.

## **VE level of Effort**

VE team, Co-ordinator, designer, different services, definitions, construction management contracts, value engineering case studies.

**References:**

1. Tufty Herald, G., "Compendium on Value Engineering" The Indo American Society, First Edition, 1983.
2. Miles, L.D., "Techniques of Value Engineering and Analysis:", McGraw Hill second Edition, 1972.
3. Khanna, O.P., "Industrial Engineering and Management", Dhanpat Rai & Sons, 1993.

**TOE-11**

**NANOTECHNOLOGY**

**A. Introduction to Physics of Solid State:**

1. **Structure:**Size dependence of properties; crystal structures, face centered cubic nanoparticles; Tetrahedrally bounded semiconductor structures; lattice vibrations.
2. **Energy bounds:** Insulators, semiconductor and conductors; Reciprocal space; Energy bounds and gaps of semiconductors; effective masses; Fermi Surfaces.
3. **Localized Particles:** Acceptors and deep traps; mobility; Excitons.

**B. Methods of Measuring Properties:**

1. Structure : Atomic Structures; Crystallography; Particle size determination, surface structure.
2. Microscopy : Transmission electron Microscopy; field ion microscopy Scanning Microscopy.
3. spectroscopy: Infrared and Raman Spectroscopy; Photoemission and X-ray Spectroscopy; Magnetic resonance, optical and vibrational Spectroscopy,



### C. Properties of Individual Nano particles

1. Metal Nano clusters: Magic Numbers; Theoretical Modelling of Nanoparticles; Geometric Structure; Electronic Structure; Reactivity; Fluctuations Magnetic Clusters; Bullets to Nano structure.
2. Semi conducting Nanoparticles: Optical Properties; Photofragmentation; Coulombic Explosion.
3. Rare Gas & Molecular Clusters: Inert Gas Clusters; Superfluid Clusters molecular clusters.
4. Method of Synthesis: RF Plasma; Chemical methods; thermolysis; pulsed laser methods.

### D. Carbon Nanoparticles:

1. **Carbon Molecule:** Nature of carbon bond; New carbon structures.
2. **Carbon Clusters:** Small carbon clusters; Discovery of  $C_{60}$ ; Structures of  $C_{60}$ , Alkali doped  $C_{60}$ ; superconductivity in  $C_{60}$ ; Large and smaller fullerenes; other buckyballs.
3. **Carbon Nano tubes:** Fabrication; structure, Electrical Properties; Vibrational properties, Mechanical Properties.
4. **Appls:** Field emission & Shielding; Computers; Fuel cells, chemicals sensors; catalysis, Mechanical reinforcement.

#### **E. Balle Nanostructured materials:**

1. Solid Disordered Nanostructure.
2. Nanostructured Crystals

#### **F. Nanostructured Ferromagnetism**

Basics of Ferromagnetism; Effect of structuring of Magnetic properties, Dynamics of Nanomagnets; Nanopore containment of magnetic particles, Nanocarbon Ferromagnets, Giant & colossal magnetoresistance; Ferrofluids.

#### **G. Quantum Wells, Wires and Dots**

Preparation of Quantum Nanostructure; Size and Dimensionality effect, Fermigas; Potential wells; Partial confinement; Excitons; Single electron Tunneling, Infrared detectors; Quantum dot laser Superconductivity.

#### **H. Nano-machines & Nano-device**

Microelectromechanical systems (MEMS) Nanoelectromechanical systems (NEMS), Fabrication, Nanodevices and Nanomachines.

Molecular & Supermolecular switches Applications areas of Nanotechnology in Engineering .

#### **Books**

1. Introduction to Nanotechnology – C.P.Poole Jr F.J. Owens
2. Introduction to S.S. Physics - (7th Edn.) Wiley 1996.
3. Microcluster Physics – S. Sugano & H. Koizuoni Springer 1998
4. Handboole of Nanostructured Materials & Nanotechnology vol.-5. Academic Press 2000

**TOE 12**

**SOLAR ENERGY**

#### **UNIT-1**

Introduction, Energy alternative, Devices for thermal collection and storage,

on, Solar radiation

geometry, Empirical equations for prediction the availability of solar radiation,  
Solar radiation on tilted surfaces.

## **UNIT-2**

Liquid flat- Plate Collectors: General performance analysis, Transmissivity-  
absorptivity product and overall loss coefficient and heat transfer correlations,  
Collector efficiency factor, Numericals,  
Analysis of collectors similar to the conventional collector. Testing procedures,  
Alternatives to the conventional collector, Numericals.

## **UNIT-3**

Solar Air Heaters: Performance analysis of a conventional air heater, Other types  
of air heaters.  
Concentrating Collectors: Flat plate collectors with plane reflectors, Cylindrical  
parabolic collector, Compound parabolic dish collector ,Central receiver  
collector, Numericals.

## **UNIT-4**

Thermal energy storage: Sensible heat storage, Latent heat Storage, Thermo-  
chemical storage .

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Solar distillation: Introduction, working principal of solar distillation, Thermal efficiency of distiller unit, External heat transfer, Top loss coefficient, Bottom and side loss coefficient, Internal heat transfer, Radioactive loss coefficient, connective loss coefficient, Evaporative loss coefficient, Overall heat Evaluation of distillation output, Passive solar stills, Conventional solar still, Basin construction, Thermal analysis of conventional solar still.

**UNIT-5**

8

Photovoltaic Systems: Introduction doping Fermi level, P-N junction characteristics, Photovoltaic effect, Photovoltaic material, Module, Cell temperature, Numericals.

Economic analysis: Introduction, cost analysis.

8

**BOOKS:**

1. Solar Energy: Thermal Processes, by Duffie John A, and Beckman W.A, John Wiley and Sons.
2. Solar Energy, by S.P Sukhatme, Tata Mc Graw Hill.
3. Treatise on Solar Energy, by H.P Garg, John Wiley and Sons.

**TOE-13**

**HUMAN RESOURCE MANAGEMENT**

**Unit-I**

Scope and Importance of Human Resource management, Historical background of Evolution of HRM and HRD in 20th century, Outlining the contemporary role for HRM in organization. Goals of HRM. (Why behavioural approach?)

8

**Unit-II**

Manpower as a resource in job related behaviour and individual motivation in a work setting. Various theories of human motivation, Maslow's hierarchy of needs. Needs for achievement, power and affiliation, other theories, group

**Unit-III**

Manpower planning and recruitment, Testing procedures and their limitations.

Reservations in jobs, pre induction training.

5

**Unit-IV**

Wage and salary administration-pay roll and compensation. Job analysis and job specification, other pay plans, employment contracts, special compensation plans for example personnel, effect of Financial rewards on individuals performance.

5

Goal setting and performance evaluation, promotion policy, employee satisfaction, turnover.

4

**Unit-V**

Assessment of training needs, forces promoting investment in HRD, Human resource development through individual and group efforts. Training analyses and training methods guidelines for individual development, job enlargement and job enrichment, job rotation, special assignment, Sponsored courses cost benefit exercise.

7

Importance of unions, industrial petitions and conflict analysis and resolution .

Relevant labour laws.

**ADVANCED MATERIAL SCIENCE**

**UNIT I**

**Introduction**

**Solid Solution**

Properties of solid solutions and alloys, types binary alloys, Thermal Equilibrium Diagrams, Cooling curves, Eutectic and peritectic alloys, Intermetallic compounds.

**Heat Treatment**

Heat treatment principles and processes for Ferrous and non-ferrous metals and alloys, Effect on structures and Properties.

**Fatigue & Creep**

Fatigue loading, Mechanisms of fatigue, fatigue curve, Fatigue tests. Design criteria in fatigue, Corrosion fatigue.

**UNIT II**

**Corrosion and its prevention**

Mechanism of corrosion, Chemical Corrosion, Electro chemical corrosion, Anodic and Cathodic protection, Forms of metallic coatings. Anodising, Phosphating.

**UNIT III**

**Selection of materials for hazardous/ saline environment**

Selection of materials of saline/ hazardous environment - Boilers, Steam and Gas turbine and Diesel engine components, Pumping, Machinery, Piping, Engine seating, Propellers and Rudders, Composition strength value and other requirements for materials used. Material Standards.

## **UNIT IV**

### **Electrical and Electronics materials**

Science and engineering of electrical and electronics materials such as semi-conductor, super conductor, its devices and applications.

## **TOE-15**

### **INDUSTRIAL INSTRUMENTATION**

#### **Unit-1**

1. Basic Measurement principles & Source of Errors.
2. Units of pressure and vacuum, different type of manometer, diaphragm gauges, bellows and force balance type sensors, Bourdon gauge, and piezoelectric, capacitive and inductive pressure pickups.

Vacuum pressure measurements: McLeod gauge, Pirani gauge, thermocouple gauge, Knudsen gauge ionization calibration procedures,

#### **Unit-2**

3. Temperature Measurements: Standards and calibration, Thermal expansion methods, bimetallic thermometer, Liquid-in-gas (thermocouples) common thermocouples, Resistance thermometers, Bulk semiconductor sensors, Radiation



thermometers, automatic null balance radiation thermometers. Optical parameters, Case studies of temperature controllers.

### **Unit- 3**

4. Differential pressure flow meters: Bernoulli's theorem, pitot tube orifice, venturi, and flow nozzle. Hot wire and hot film anemometers, constant pressure drop, variable area meters (rotameter), Turbine meters. Electromagnetic flow meters, Ultrasonic flow meter. Measurement of level. Float type gauge, purge method, differential pressure method, conductive and capacitive method, and electromechanical method, use of radio scope for level measurement.

### **Unit-4**

5. Measurement of weight: Load cell method, strain gauge, LVDT, piezoelectric, pneumatic and hydraulic load cell, null balance method.
6. Density, Viscosity, pH and conductivity measurement.

### **Unit-5**

7. Measurement of moisture: Thermal drying method, Distillation Method, Chemical reaction Method, Electrical Method
8. Recorders: Graphic Recorders, Strip Chart Recorders, Circular-chart recorders, Multipoint Recorders and X-Y Recorders.

### **Text Books: --**

1. Doebelin / Measurements systems: Application and Design, 4th edition / Tata Mc Graw Hill.
2. S.K Singh, / Industrial instrumentation and control / TMH 2nd edition
3. Eckman / Industrial Instrumentation / Wiley Eastern Ltd.

### **Reference Books: -**

4. Beckwith & Beck / Mechanical Measurements / Narosa Publishers, 1988
5. Nakara / Instrumentation: measurements & Analysis / Tata Mc Graw Hill.
6. Douglas, D. Considine / Handbook of Instrumentation Measurement and Control / Mc Graw Hill.

**BIOMEDICAL ENGINEERING**

**Unit -1**

1. Introduction: Specifications of bio-medical instrumentation system, Man-Instrumentation system Components, Problems encountered in measuring a living system. Basics of Anatomy and Physiology of the body.
2. Bioelectric potentials: Resting and action potentials, propagation of action potential, The Physiological potentials – ECG, EEG, EMG, ERG, EOG and Evoked responses.
3. Electrodes and Transducers: Electrode theory, Biopotential Electrodes – Surface electrodes, Needle electrodes, Microelectrodes. Biomedical Transducers.

**Unit-2**

4. Cardiovascular Measurements: Electrocardiography –ECG amplifiers, Electrodes and Leads, ECG recorders –Single channel, Three channel, Vector Cardiographs, ECG System for Stresses testing, Holter recording, Blood pressure measurement, Heart sound measurement. Pacemakers and Defibrillators.
5. Patient Care & Monitoring: Elements of intensive care monitoring, displays, diagnosis, Calibration & Reparability of patient monitoring equipment.

### Unit-3

6. Respiratory system Measurements: Physiology of Respiratory system  
.Measurement of breathing mechanism – Spirometer. Respiratory Therapy equipments: Inhalators, Ventilators &Respirators, Humidifiers, and Nebulizers & Aspirators.
7. Nervous System Measurements: Physiology of nervous system, Neuronal Communication, Neuronal firing measurements.

### Unit-4

8. Ophthalmology Instruments: Electroretinogram, Electro-oculogram, Ophthalmoscope, Tonometer for eye pressure measurement.
9. Diagnostic techniques: Ultrasonic diagnosis, Eco-cardiography, Eco-encephalography, Ophthalmic scans, X-ray &Radio-isotope diagnosis and therapy, CAT-Scan, Emission computerized tomography, MRI.

### Unit-5

- 10 Bio-telemetry: The components of a Bio-telemetry system, Implantable units, Telemetry for ECG measurements during exercise, for Emergency patient monitoring.
- 11 Prosthetic Devices and Therapies: Hearing Aides, Myoelectric Arm, Dia-thermy, Laser applications in medicine.

### TEXT BOOKS:

1. Khandpur R.S.- Biomedical Instrumentation- TMH
2. Venkata Ram,S.K.-Bio-Medical Electronics&Instrumentation (Revised)- Galgotia.

### REFERENCE BOOKS:

- 3.
- 4.
- 5.
- 6.
- 7.

Cromwell- Book of Medical Instruments-2005-New Age International  
Biomedical  
Instrumentation and Carr&Brown –Introduction to Biomedical Equipment Technology – Pearson  
Measurements- PHI  
Pandey & Kumar-Biomedical Electronics and Instrumentation. - Kataria

Webster,j.g. –Bio-  
Instrumentation  
,Wiley (2004)

## TOE-17

### FUNDAMENTALS OF CODING THEORY

Ananthi,S. –A Text

Purpose of encoding, separable binary codes, Shannon-fano encoding, noiseless coding. Shannon binary encoding, Huffman encoding, discrete coding in presence of noise.

#### Unit-II

Error detecting and error correcting codes, Hamming single error correcting code, Elias's iteration technique for coding.

#### Unit-III

Block codes, encoders and decoders for block codes, syndrome and syndrome decoding.

#### Unit-IV

Cyclic codes. Encoders and decoders for cyclic code, Golay code, BCH code, Reed soloman code.

#### Unit-V

Convolution coding, code generation, decoding of convolution code, sequential decoding, state and trellis diagram.

**Text Book:**

1. F. M. Reza, "An introduction to Information theory", Dover Publication Inc.
2. H. Taub and D. L. Schilling, "Principles of communication system" TMH 2nd Ed.

**TOE-18****CONSUMER ELECTRONICS****UNIT 1**

Audio Systems: Microphones, Loudspeakers, Speaker baffle and enclosure, Acoustics, Mono, Stereo, Quad, Amplifying Systems, Equalisers and Mixers, Electronic Music Synthesisers, Commercial Sound, Theater Sound System

**UNIT 2**

Video Systems and Displays: Monochrome TV, Colour TV standards and systems, TFT, Plasma, HDTV, Digital TV, Video Telephone and Video Conferencing

**UNIT 3**

Domestic Appliances: Washing machines, Microwave ovens, Air- conditioners and Refrigerators, In car computers  
Office Systems: FAX, Xerox, Telephone Switching System, Mobile Radio System

**UNIT 4**

Recording and Reproduction Systems: Disc recording and reproduction, Magnetic recording and reproduction, Video tape recording and reproduction, Video disc recording and play back, Distortion and Noise reduction in Audio and Video System

**UNIT 5**

Power Supplies and other systems: SMPS, UPS and Preventive Maintenance, Set

**Text Books:**

1. Consumer Electronics S P Bali Pearson ed 2005

**TOE-19 WIRELESS & MOBILE COMMUNICATION****UNIT I**

**EVOLUTION OF MOBILE RADIO COMMUNICATION FUNDAMENTALS.** Large scale path loss: propagation models, reflection, diffraction, scattering, practical link budget design using path loss model. Small scale fading & multipath propagation and measurements, impulse response model and parameters of multipath channels, types of fading, theory of multi-path shape factor for fading wireless channels

**UNIT II**

**SPREAD SPECTRUM MODULATION TECHNIQUES:** Pseudo-noise sequence, direct sequence spread spectrum (DS-SS), frequency hopped spread spectrum(FHSS),performance of DS-SS, performance of FH-SS, modulation performance in fading and multipath channels, fundamentals of equalization, equalizer in communication receiver, survey of equalization techniques, linear equalizer, linear equalizer, non-linear equalization, diversity techniques, RAKE receiver.

**UNIT III**

**INTRODUCTION TO MOBILE COMMUNICATION:** Evolution of mobile communications, mobile radio systems- Examples, trends in cellular radio and personal communications.

**Cellular Concept:** Frequency reuse, channel assignment, hand off, Interference and system capacity, tracking and grade of service, Improving Coverage and capacity in Cellular systems.

**UNIT IV**

of Speech Coders for Mobile Communication, GSM Codec, RS codes for CDPD. **Multiple Access Techniques:**

FDMA, TDMA, CDMA, SDMA, Capacity of Cellular CDMA and SDMA.

## **UNIT V**

**WIRELESS SYSTEMS AND STANDARDS:** Second Generation and Third Generation Wireless Networks and Standards, WLL, Blue tooth. AMPS, GSM, IS-95 and DECT

## **TEXT BOOK**

1. T.S.Rappaport, "Wireless Communications: Principles and Practice, Second Edition, Pearson Education/ Prentice Hall of India, Third Indian Reprint 2003.

## **REFERENCES**

1. R. Blake, " Wireless Communication Technology", Thomson Delmar, 2003
2. W.C.Y.Lee, "Mobile Communications Engineering: Theory and applications, Second Edition, McGraw-Hill International, 1998.
3. Stephen G. Wilson, " Digital Modulation and Coding", Pearson Education, 2003.

**TOE- 20**

## **HUMAN COMPUTER INTERACTION**

### **Unit –I**

User centered design of system & interfaces, anatomy and rationale of WIMP

(Window, Icon, Menus & Pointing Devices ) interfaces.

Dialogue design, Presentation design, user documentation, evaluation / usability testing of user interface.

### **Unit –III**

Ergonomics and Cognitive issues, hypertext and the World Wide Web.1



#### **Unit –IV**

User centered design, human factors in user-centered design, development & evaluation, Interactive design –rapid prototyping.

#### **Unit –V**

Designing for usability –effectiveness, learnability, flexibility, attitude and usability goals, criteria for acceptability.

#### **References:**

1. Sudifte AG , “Human Computer Interface Design” , 2nd ed, Macmillan ,1995
2. Sheiderman B Designing the user interface, “Strategies for Effective Human Computer Interaction”, 2nd ed. Addison Wesley, 1992

### **TOE –21**

#### **IT IN BUSINESS**

#### **Unit - I**

Business Drivers IT's Competitive Potential  
Strategic Alignment  
Strategic Management and Competitive Strategy

#### **UNIT – II**

Rethinking Business Through IT Developing a Competitive Strategy  
Interorganization Information Systems Business-To-Business Systems  
Electronic Commerce and Market Systems

#### **Unit - III**

Forming a Corporate IT Strategy  
Developing an Information Architecture

#### **Unit - IV**

Incorporating Business Innovation Into the Corporate IT Strategy  
The Changing Role of IT In International business  
The Changing Global IT Practices

#### **Unit - V**

Changing the Focus of Strategy

Trends: Beyond 2000

**References:**

1. Callon, Jack D., "Competitive Advantage Through Information Technology", McGraw - Hill, 1996 [CALL]
2. Tapscott, Don, "The Digital Economy", McGraw-Hill, 1996. [DIGI]

**TOE –22**

**ARTIFICIAL INTELLIGENCE IN MANUFACTURING**

**UNIT I**

Artificial Intelligence - Definition - Components - Scope - Application Areas;  
Knowledge - Based Systems (Expert Systems) - Definition - Justification -  
Structure – Characterization

**UNIT II**

Knowledge Sources - Expert - Knowledge Acquisition - Knowledge  
Representation - Knowledge Base - Inference Strategies - Forward and  
Backward Chaining

### **UNIT III**

Expert System Languages - ES Building Tools or Shells; Typical examples of Shells. Expert System software for manufacturing applications in CAD, CAPP, MRP , Adaptive control,

### **UNIT IV**

Robotics, Process control, Fault diagnosis, Failure Analysis; Process Selection, GT etc. Linking expert systems to other software such as DBMS, MIS, MDB.

### **UNIT V**

Process control and Office automation. Case studies of typical applications in tool selection, Process selection, Part classification, inventory control, Process Planning etc.

### **References**

1. Artificial Intelligent Hand book, Jhon & Andrew Kusiak.
2. Artificial Intelligent, T. Barnold.
3. Introduction to Artificial Manufacturing Export system, Dan.W. Patterson

## **TOE 23**

### **HEALTH, HOSPITAL AND EQUIPMENT MANAGEMENT**

#### **UNIT - I**

##### **HEALTH SYSTEM**

Health organisation of the country, the state, the cities and the region, Health Financing System, Organisation of Technical Section.

## **HOSPITAL ORGANIZATION AND MANAGEMENT**

Management of Hospital organisation, Nursing section Medical Sector, Central Services, Technical Department, Definition and Practice of Management by Objective, Transaction Analysis Human relation in Hospital, Importance to Team Work, Legal aspect in Hospital Management.

### **UNIT III**

#### **REGULATORY REQUIREMENT AND HEALTH CARE CODES**

FDA Regulation, joint commission of Accreditation for Hospitals, National Fire Protection Association Standard, IRPC.

### **UNIT IV**

#### **EQUIPMENT MAINTENANCE MANAGEMENT**

Organizing Maintenance Operations, Paper Work Control, Maintenance Job, Planning Maintenance Work Measurement and Standards, Preventive Maintenance, Maintenance Budgeting and Forecasting, Maintenance Training, Contract Mainframe.

## UNIT V

### TRAINED TECHNICAL PERSONNEL

Function of Clinical Engineer, Role to be performed in Hospital, Man power Market, Professional Registration, Structure in hospital.

### REFERENCES BOOKS

1. Cesar A. Caceres and Albert Zara, The practice of Clinical Engineering, Academic Press, 1977.
2. Webster, J.G. and Albert M. Cook, Clinical Engineering Principles and Practices, Prentice Hall Inc. Englewood Cliffs, 1979.
3. Anatomy Kelly, Maintenance planning and control, Butterworths London, 1984.
4. Hans Pfeiff, Vera Dammann (Ed.) Hospital Engineering in Developing Countries, Z report Eschborn, 1986.
5. Jacob Kline, Handbook of Bio Medical Engineering, Academic Press, San Diego 1988.
6. R.C. Goyal, Handbook of Hospital Personal Management, Prentice Hall of India, 1993.

## TOE 24

### INTRODUCTION TO MEDICAL PHYSICS

## UNIT - I

### ATOMIC

Traditional definition of atom, periodic system of elements, mechanical properties of atom, emission of light and its frequencies. Electromagnetic spectra.

**Principles of Nuclear Physics** — Natural radioactivity, Decay series, type of radiation and their applications, artificially produced isotopes and its application, accelerator principles; Radionuclides used in Medicine and

## **UNIT - II**

### **INTERACTION WITH LIVING CELLS**

Target theory, single hit and multi target theory, cellular effects of radiation, DNA damage, depression of Macro molecular synthesis, Chromosomal damage.

## **UNIT - III**

### **SOMATIC EFFECT OF RADIATION**

Radio sensitivity protocol of different tissues in human, LD 50/30 effect of radiation on skin, blood forming organs, lenses of eye, embryo and Endocrinal glands.

## **UNIT - IV**

### **GENETIC EFFECT OF RADIATION**

Threshold of linear dose effect, relationship, factors affecting frequency of radiation induced mutation, Gene controlled hereditary disease, biological effect of microwave and RF wave. Variation in dielectric constant and specific conductivity of tissues. Penetration and propagation of signals effects in various vital organs, Protection standards.

## **UNIT - V**

### **PHOTO MEDICINE**

Synthesis of Vitamin D in early and late cutaneous effects, Phototherapy, Photochemotherapy, exposure level, hazards and maximum permissible exposure.

**LASER PHYSICS** — Characteristics of Laser radiation, Laser speckle, biological effects, laser safety

### **REFERENCE BOOKS**

1. Mosely, Non Ionising Radiation Adam Hilgar Bristol 1988.
2. Branski. S and Cherski. P 'Biological Effects of Microwave' -Hutchinson & ROSS Inc.

## **TOE - 25**

### **MODERN CONTROL SYSTEM**

#### **1. Design of Control System in State Space:**

Review of controllability and observability, controller design by pole placement, Ackermann's formula, design of full order and minimum order state observers, steady state error design via integral control.

#### **2. Robust Control Systems:**

Robust control. Quadratic Performance Index, state regulator and output regulator problems. control configurations, state regulator design through the Lyapunov equation, optimal state regulator through the matrix Riccati equation, model reference control

### **3. Optimal Control:**

Basic mathematical concepts, conditions for optimality, variational calculus approach, Pontryagin's maximum principle and Hamilton Jacobi-Bellman theory, structures and properties of optimal systems.

### **4. Variable Structure System:**

Concept of variable structure system (VSS), switching of structure in **sliding** region, VSS for control of second order system, applications of VSS in power system.

### **References:**

1. K. Ogata, "Modern Control Engineering", Prentice Hall of India.
2. M. Gopal, "Modern Control System", Wiley Eastern.
3. B.D.O. Anderson and IB. Moore, " Optimal Control System: Linear Quadratic Methods", Prentice Hall International.
4. U. Itkis, "Control System of Variable Structure", John Wiley and Sons.
5. H. Kwakemaok and R. Sivan, "Linear Optimal Control System", Wiley Interscience.



## TOE 26

### MECHATRONICS

#### 1. Mechatronics and its scope:

**Sensors and transducers- Displacement, position & proximity, velocity, force, pressure and level.**

Signal conditioning amplification, filtering & data acquisition.

#### 2. Pneumatic and Hydraulic actuation systems:

Directional control valves, pressure control valves and cylinders. process control valves. Mechanical actuation system-kinematic chains, cams, geartrains. Ratchet & Pawl, dampers, bearings. Electrical actuation system. Mechanical switches- solenoid operated solid state switches, DC, AC & stepper motors.

Building blocks of Mechanical spring, mass and damper. Drives- Electrical Drives, Fluid systems, hydraulic, servo, closedloop controllers.

#### 3. Elements of Microprocessors & Microcontrollers, Programmable **logic controllers &** Communication interface.

#### 4. Case Studies of Mechatronic Systems:

Industrial Robot and its control

Electromechanical disc-control.

5. **Vehicle suspension Control:**

Micro mechanical systems. Computer Printer, VCR, Fax Machine, NC Machine.

**References:**

1. Rolf Isenmann, " Mechatronics Systems", Springer, 2005.
2. W. Bolten, "Mechatronics", Pearson Education 2003.
3. HMT Ltd, "Mechatronics;", Tata McGraw Hill 1998.

**TOE 27**

**SCADA & ENERGY MANAGEMENT  
SYSTEM**

**1. SCADA:**

Purpose and necessity, general structure, data acquisition, transmission & monitoring. general power system hierachial Structure.

Overview of the methods of data acquisition systems, commonly acquired data, transducers, RTUs, data concentrators, various communication channels- cables, telephone lines, power line carrier, microwaves, fiber optical channels and satellites.

## **2. Supervisory and Control Functions:**

Data acquisitions, status indications, majored values, energy values, monitoring alarm and event application processing. Control Function: ON/ OFF control of lines, transformers, capacitors and applications in process in industry - valve, opening, closing etc.

Regulatory functions: Set points and feed back loops, time tagged data, disturbance data collection and analysis. Calculation and report preparation.

## **3. MAN- Machine Communication:**

Operator consoles and VDUs, displays, operator dialogues, alarm and event loggers, mimic diagrams, report and printing facilities.

## **4. Data basis- SCADA, EMS and network data basis.**

SCADA system structure - local system, communication system and central system. Configuration- NON-redundant- single processor, redundant dual processor. multicontrol centers, system configuration.

Performance considerations: real time operation system requirements, modularization of software programming languages.

## **5. Energy Management Center:**

Functions performed at a centralized management center, production control and load management economic dispatch, distributed centers and power pool management.

1. Torsten Cergrell, " Power System Control Technology", Prentice Hall International.
2. George L Kusic "Computer Aided Power System Analysis", Prentice Hall of India,
3. A. J. Wood and B. Woolenberg, "Power Generation Operation and Control", John Wiley & Sons.
4. Sunil S Rao, "Switehgear Protection & Control System" Khanna Publishers 11th Edition.