CREDIT TABLE
FOR
104 – ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER – I

| Sl. No. | Course Code | Course Title | IA | ESE | TOTAL | L | T | P | Credit | Hours |
|---|---|---|---|---|---|---|---|---|---|---|
| **Theory** | | | | | | | | | | |
| 1 | BSC | Chemistry | 30 | 70 | 100 | 3 | 1 | 0 | 4 | 4 |
| 2 | BSC | Mathematics –I (Calculus and Differential Equations) | 30 | 70 | 100 | 3 | 1 | 0 | 4 | 4 |
| 3 | ESC | Programming for Problem Solving | 30 | 70 | 100 | 3 | 0 | 0 | 3 | 3 |
| 4 | ESC | Workshop Manufacturing Practices | 30 | 70 | 100 | 1 | 0 | 0 | 1 | 1 |
| 5 | HSMC | English | 30 | 70 | 100 | 2 | 0 | 0 | 2 | 2 |
| **Practical** | | | | | | | | | | |
| 1 | BSC | Chemistry | 20 | 30 | 50 | 0 | 0 | 3 | 1.5 | 3 |
| 2 | ESC | Programming for Problem Solving | 20 | 30 | 50 | 0 | 0 | 4 | 2 | 4 |
| 3 | ESC | Workshop Manufacturing Practices | 20 | 30 | 50 | 0 | 0 | 4 | 2 | 4 |
| 4 | HSMC | English | 20 | 30 | 50 | 0 | 0 | 2 | 1 | 2 |
| | Total | | | | 700 | | | | 20.5 | 27 |

TOTAL MARKS: 700 TOTAL CREDITS: 20.5 TOTAL HOURS: 27

| BSC | Mathematics –I (Calculus and Differential Equations) | L:3 | T:1 | P:0 | Credit:4 |
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## *CONTENTS*

**MODULE 1: CALCULUS (8 LECTURES)**

EVOLUTES AND INVOLUTES; EVALUATION OF DEFINITE AND IMPROPER INTEGRALS; BETA AND GAMMA FUNCTIONS AND THEIR PROPERTIES; APPLICATIONS OF DEFINITE INTEGRALS TO EVALUATE SURFACE AREAS AND VOLUMES OF REVOLUTIONS. ROLLE'S THEOREM, MEAN VALUE THEOREMS, TAYLOR'S AND MACLAURIN THEOREMS WITH REMAINDERS; INDETERMINATE FORMS AND L'HOSPITAL'S RULE; MAXIMA AND MINIMA.

**MODULE 2: SEQUENCES AND SERIES (7 LECTURES)**

CONVERGENCE OF SEQUENCE AND SERIES, TESTS FOR CONVERGENCE, POWER SERIES, TAYLOR'S SERIES. SERIES FOR EXPONENTIAL, TRIGONOMETRIC AND LOGARITHMIC FUNCTIONS; FOURIER SERIES: HALF RANGE SINE AND COSINE SERIES, PARSEVAL'S THEOREM.

**MODULE 3: MULTIVARIABLE CALCULUS: DIFFERENTIATION (6 LECTURES)**

LIMIT, CONTINUITY AND PARTIAL DERIVATIVES, DIRECTIONAL DERIVATIVES, TOTAL DERIVATIVE; TANGENT PLANE AND NORMAL LINE; MAXIMA, MINIMA AND SADDLE POINTS; METHOD OF LAGRANGE MULTIPLIERS; GRADIENT, CURL AND DIVERGENCE.

**MODULE 4: MULTIVARIABLE CALCULUS: INTEGRATION (7 LECTURES)**

MULTIPLE INTEGRATION: DOUBLE AND TRIPLE INTEGRALS (CARTESIAN AND POLAR), CHANGE OF ORDER OF INTEGRATION IN DOUBLE INTEGRALS, CHANGE OF VARIABLES (CARTESIAN TO POLAR), APPLICATIONS: AREAS AND VOLUMES BY (DOUBLE INTEGRATION) CENTER OF MASS AND GRAVITY (CONSTANT AND VARIABLE DENSITIES). THEOREMS OF GREEN, GAUSS AND STOKES, ORTHOGONAL CURVILINEAR COORDINATES, SIMPLE APPLICATIONS INVOLVING CUBES, SPHERE AND RECTANGULAR PARALLELEPIPEDS.

**MODULE 5: FIRST ORDER ORDINARY DIFFERENTIAL EQUATIONS (3 LECTURES)**

EXACT, LINEAR AND BERNOULLI'S EQUATIONS, EULER'S EQUATIONS, EQUATIONS NOT OF FIRST DEGREE: EQUATIONS SOLVABLE FOR P, EQUATIONS SOLVABLE FOR Y, EQUATIONS SOLVABLE FOR X AND CLAIRAUT'S TYPE.

**MODULE 6: ORDINARY DIFFERENTIAL EQUATIONS OF HIGHER ORDER (6 LECTURES)**

SECOND ORDER LINEAR DIFFERENTIAL EQUATIONS WITH VARIABLE COEFFICIENTS, METHOD OF VARIATION OF PARAMETERS, CAUCHY-EULER EQUATION; POWER SERIES SOLUTIONS; LEGENDRE POLYNOMIALS, BESSEL FUNCTIONS OF THE FIRST KIND AND THEIR PROPERTIES.

**MODULE 7: PARTIAL DIFFERENTIAL EQUATIONS: FIRST ORDER (3 LECTURES)**

FIRST ORDER PARTIAL DIFFERENTIAL EQUATIONS, SOLUTIONS OF FIRST ORDER LINEAR AND NON-LINEAR PDES.

**TEXT / REFERENCES:**


- *G.B. THOMAS AND R.L. FINNEY, "CALCULUS AND ANALYTIC GEOMETRY", PEARSON, 2002.*
- *T. VEERARAJAN, "ENGINEERING MATHEMATICS", MCGRAW-HILL, NEW DELHI, 2008.*
- *B. V. RAMANA, "HIGHER ENGINEERING MATHEMATICS", MCGRAW HILL, NEW DELHI, 2010.*
- *N.P. BALI AND M. GOYAL, "A TEXT BOOK OF ENGINEERING MATHEMATICS", LAXMI PUBLICATIONS, 2010.*
- *B.S. GREWAL, "HIGHER ENGINEERING MATHEMATICS", KHANNA PUBLISHERS, 2000.*
- *E. KREYSZIG, "ADVANCED ENGINEERING MATHEMATICS", JOHN WILEY & SONS, 2006.*
- *W. E. BOYCE AND R. C. DIPRIMA, "ELEMENTARY DIFFERENTIAL EQUATIONS AND BOUNDARY VALUE PROBLEMS", WILEY INDIA, 2009.*
- *S. L. ROSS, "DIFFERENTIAL EQUATIONS", WILEY INDIA, 1984.*
- *E. A. CODDINGTON, "AN INTRODUCTION TO ORDINARY DIFFERENTIAL EQUATIONS", PRENTICE HALL INDIA, 1995.*
- *E. L. INCE, "ORDINARY DIFFERENTIAL EQUATIONS", DOVER PUBLICATIONS, 1958.*
- *G.F. SIMMONS AND S.G. KRANTZ, "DIFFERENTIAL EQUATIONS", MCGRAW HILL, 2007.*

| BSC | Chemistry | L:3 | T:1 | P:3 | Credit 5.5 |
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**MODULE 1: ATOMIC AND MOLECULAR STRUCTURE (10 LECTURES)**

FAILURE OF CLASSICAL NEWTONIAN AND MAXWELL WAVE MECHANICS TO EXPLAIN PROPERTIES OF PARTICLES AT ATOMIC AND SUB-ATOMIC LEVEL; ELECTROMAGNETIC RADIATION, DUAL NATURE OF ELECTRON AND ELECTROMAGNETIC RADIATION, PLANK'S THEORY, PHOTOELECTRIC EFFECT AND HEISENBERG UNCERTAINTY PRINCIPLE. FAILURE OF EARLIER THEORIES TO EXPLAIN CERTAIN PROPERTIES OF MOLECULES LIKE PARAMAGNETIC PROPERTIES. PRINCIPLES FOR COMBINATION OF ATOMIC ORBITALS TO FORM MOLECULAR ORBITALS. FORMATION OF HOMO AND HETERO DIATOMIC MOLECULES AND PLOTS OF ENERGY LEVEL DIAGRAM OF MOLECULAR ORBITALS. COORDINATION NUMBERS AND GEOMETRIES, ISOMERISM IN TRANSITIONAL METAL COMPOUNDS, CRYSTAL FIELD THEORY AND THE ENERGY LEVEL DIAGRAMS FOR TRANSITION METAL IONS AND THEIR MAGNETIC PROPERTIES.

**MODULE 2: SPECTROSCOPIC TECHNIQUES AND APPLICATIONS (8 LECTURES)**

PRINCIPLES OF VIBRATIONAL AND ROTATIONAL SPECTROSCOPY AND SELECTION RULES FOR APPLICATION IN DIATOMIC MOLECULES. ELEMENTARY IDEA OF ELECTRONIC SPECTROSCOPY. UV-VIS SPECTROSCOPY WITH RELATED RULES AND ITS APPLICATIONS. FLUORESCENCE AND ITS APPLICATIONS IN MEDICINE. BASIC PRINCIPLE OF NUCLEAR MAGNETIC RESONANCE AND ITS APPLICATION. BASICS OF MAGNETIC RESONANCE IMAGING.

**MODULE 3: INTERMOLECULAR FORCES AND PROPERTIES OF GASES (4 LECTURES)**

IONIC, DIPOLAR AND VAN DER WAALS INTERACTIONS. EQUATIONS OF STATE OF IDEAL AND REAL GASES, DEVIATION FROM IDEAL BEHAVIOUR. VANDER WAAL GAS EQUATION.

**MODULE 4: USE OF FREE ENERGY IN CHEMICAL EQUILIBRIA & WATER CHEMISTRY (8 LECTURES)**

THERMODYNAMIC FUNCTIONS: ENERGY, ENTHALPY ENTROPY AND FREE ENERGY. EQUATIONS TO INTERRELATE THERMODYNAMIC PROPERTIES. FREE ENERGY, EMF. AND CELL POTENTIALS, THE NERNST EQUATION AND APPLICATIONS. CORROSION. USE OF FREE ENERGY CONSIDERATIONS IN METALLURGY THROUGH ELLINGHAM DIAGRAMS. SOLUBILITY EQUILIBRIA.

WATER CHEMISTRY, HARD AND SOFT WATER. PARAMETERS OF QUALITY OF WATER TO BE USED IN DIFFERENT INDUSTRIES AS FOR DRINKING WATER. CALCULATION OF HARDNESS OF WATER IN ALL UNITS. ESTIMATION OF HARDNESS USING EDTA AND ALKALINITY METHOD. REMOVAL OF HARDNESS BY SODA LIME AND ION EXCHANGE METHOD INCLUDING ZEOLITE METHOD

**MODULE 5: PERIODIC PROPERTIES (4 LECTURES)**

EFFECTIVE NUCLEAR CHARGE, PENETRATION OF ORBITALS, VARIATIONS OF S, P, D AND F ORBITAL ENERGIES OF ATOMS IN THE PERIODIC TABLE, ELECTRONIC CONFIGURATIONS, ATOMIC AND IONIC SIZES, IONIZATION ENERGIES, ELECTRON AFFINITY AND ELECTRONEGATIVITY, POLARIZABILITY, ACID, BASE, PRINCIPLE OF HSAB THEORY, OXIDATION STATES, HYBRIDIZATION AND MOLECULAR GEOMETRIES.

**MODULE 6: STEREOCHEMISTRY (4 LECTURES)**

REPRESENTATIONS OF 3-D STRUCTURES, STRUCTURAL ISOMERS AND STEREOISOMERS, CONFIGURATIONS AND SYMMETRY AND CHIRALITY, ENANTIOMERS, DIASTEREOMERS, OPTICAL ACTIVITY, ABSOLUTE CONFIGURATIONS AND CONFORMATIONAL ANALYSIS.

**MODULE 7: ORGANIC REACTIONS AND SYNTHESIS OF A DRUG MOLECULE (4 LECTURES)**

INTRODUCTION TO INTERMEDIATES AND REACTIONS INVOLVING SUBSTITUTION, ADDITION, ELIMINATION, OXIDATION- REDUCTION, DIELS ELDER CYCLIZATION AND EPOXIDE RING OPENINGS REACTIONS. SYNTHESIS OF A COMMONLY USED DRUG MOLECULE LIKE ASPIRIN.

**SUGGESTED TEXT BOOKS**


- *UNIVERSITY CHEMISTRY, BY B. H. MAHAN*
- *CHEMISTRY: PRINCIPLES AND APPLICATIONS, BY M. J. SIENKO AND R. A. PLANE*
- *FUNDAMENTALS OF MOLECULAR SPECTROSCOPY, BY C. N. BANWELL*
- *ENGINEERING CHEMISTRY (NPTEL WEB-BOOK), BY B. L. TEMBE, KAMALUDDIN AND M. S. KRISHNAN*
- *PHYSICAL CHEMISTRY, BY P. W. ATKINS*
- *ORGANIC CHEMISTRY: STRUCTURE AND FUNCTION BY K. P. C. VOLHARDT AND N. E. SCHORE, 5TH EDITION*
- *HTTP://BCS.WHFREEMAN.COM/VOLLHARDTSCHORE5E/DEFAULT.ASP*


**COURSE OUTCOMES**

THE CONCEPTS DEVELOPED IN THIS COURSE WILL AID IN

QUANTIFICATION OF SEVERAL CONCEPTS IN CHEMISTRY THAT HAVE BEEN INTRODUCED AT THE 10+2 LEVELS IN SCHOOLS. TECHNOLOGY IS BEING INCREASINGLY BASED ON THE ELECTRONIC, ATOMIC AND MOLECULAR LEVEL MODIFICATIONS.

QUANTUM THEORY IS MORE THAN 100 YEARS OLD AND TO UNDERSTAND PHENOMENA AT NANOMETER LEVELS, ONE HAS TO BASE THE DESCRIPTION OF ALL CHEMICAL PROCESSES AT MOLECULAR LEVELS. THE COURSE WILL ENABLE THE STUDENT TO: ANALYSE MICROSCOPIC CHEMISTRY IN TERMS OF ATOMIC AND MOLECULAR ORBITALS AND INTERMOLECULAR FORCES. RATIONALISE BULK PROPERTIES AND PROCESSES USING THERMODYNAMIC CONSIDERATIONS. DISTINGUISH THE RANGES OF THE ELECTROMAGNETIC SPECTRUM USED FOR EXCITING DIFFERENT MOLECULAR ENERGY LEVELS IN VARIOUS SPECTROSCOPIC TECHNIQUES RATIONALISE PERIODIC PROPERTIES SUCH AS IONIZATION POTENTIAL, ELECTRONEGATIVITY, OXIDATION STATES AND ELECTRONEGATIVITY.LIST MAJOR CHEMICAL REACTIONS THAT ARE USED IN THE SYNTHESIS OF MOLECULES.

## *CHEMISTRY LABORATORY*

*CHOICE OF 10-12 EXPERIMENTS FROM THE FOLLOWING*

- DETERMINATION OF SURFACE TENSION AND VISCOSITY
- THIN LAYER CHROMATOGRAPHY
- ION EXCHANGE COLUMN FOR REMOVAL OF HARDNESS OF WATER
- DETERMINATION OF CHLORIDE CONTENT OF WATER
- COLLIGATIVE PROPERTIES USING FREEZING POINT DEPRESSION
- DETERMINATION OF THE RATE CONSTANT OF A REACTION
- DETERMINATION OF CELL CONSTANT AND CONDUCTANCE OF SOLUTIONS
- POTENTIOMETRY - DETERMINATION OF REDOX POTENTIALS AND EMFS
- SYNTHESIS OF A POLYMER/DRUG
- SAPONIFICATION/ACID VALUE OF AN OIL
- CHEMICAL ANALYSIS OF A SALT
- LATTICE STRUCTURES AND PACKING OF SPHERES
- MODELS OF POTENTIAL ENERGY SURFACES
- CHEMICAL OSCILLATIONS- IODINE CLOCK REACTION
- DETERMINATION OF THE PARTITION COEFFICIENT OF A SUBSTANCE BETWEEN TWO IMMISCIBLE LIQUIDS
- ADSORPTION OF ACETIC ACID BY CHARCOAL
- USE OF THE CAPILLARY VISCOSIMETERS TO THE DEMONSTRATE OF THE ISOELECTRIC POINT AS THE PH OF MINIMUM VISCOSITY FOR GELATIN SOLS AND/OR COAGULATION OF THE WHITE PART OF EGG.

**LABORATORY OUTCOMES**

THE CHEMISTRY LABORATORY COURSE WILL CONSIST OF EXPERIMENTS ILLUSTRATING THE PRINCIPLES OF CHEMISTRY RELEVANT TO THE STUDY OF SCIENCE AND ENGINEERING. THE STUDENTS WILL LEARN TO: ESTIMATE RATE CONSTANTS OF REACTIONS FROM CONCENTRATION OF REACTANTS/PRODUCTS AS A FUNCTION OF TIME MEASURE

MOLECULAR/SYSTEM PROPERTIES SUCH AS SURFACE TENSION, VISCOSITY, CONDUCTANCE OF SOLUTIONS, REDOX POTENTIALS, CHLORIDE CONTENT OF WATER, ETC SYNTHESIZE A SMALL DRUG MOLECULE AND ANALYSE A SALT SAMPLE

| ESC | Programming for Problem Solving | L:3 | T:0 | P:4 | Credit:5 |
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**MODULE 1: INTRODUCTION TO PROGRAMMING (6 LECTURES)**

INTRODUCTION TO COMPONENTS OF A COMPUTER SYSTEM (DISKS, MEMORY, PROCESSOR, WHERE A PROGRAM IS STORED AND EXECUTED, OPERATING SYSTEM, COMPILERS ETC). IDEA OF ALGORITHM: STEPS TO SOLVE LOGICAL AND NUMERICAL PROBLEMS. REPRESENTATION OF ALGORITHM: FLOWCHART/PSEUDO CODE WITH EXAMPLES. FROM ALGORITHMS TO PROGRAMS; SOURCE CODE, VARIABLES (WITH DATA TYPES) VARIABLES AND MEMORY LOCATIONS, TYPE CASTING/TYPE CONVERSION, RUN TIME ENVIRONMENT (STATIC, DYNAMIC LOCATION), STORAGE CLASSES (AUTO, REGISTER, STATIC, EXTERN), SYNTAX AND LOGICAL ERRORS IN COMPILATION, OBJECT AND EXECUTABLE CODE.

**MODULE 2: OPERATORS (3 LECTURES)**

ARITHMETIC EXPRESSIONS/ARITHMETIC OPERATORS/RELATIONAL OPERATORS/LOGICAL OPERATORS/BITWISE OPERATORS AND PRECEDENCE

**MODULE 3: CONDITIONAL BRANCHING AND LOOPS (5 LECTURES)**

WRITING AND EVALUATION OF CONDITIONALS AND CONSEQUENT BRANCHING, ITERATION AND LOOPS

**MODULE 4: ARRAYS (4 LECTURES)**

ARRAY DECLARATION & INITIALIZATION, BOUND CHECKING ARRAYS (1-D, 2-D), CHARACTER ARRAYS AND STRINGS.

**MODULE 5: BASIC ALGORITHMS (6 LECTURES)**

SEARCHING (LINEAR SEARCH, BINARY SEARCH ETC.), BASIC SORTING ALGORITHMS (BUBBLE, INSERTION AND SELECTION), FINDING ROOTS OF EQUATIONS, NOTION OF ORDER OF COMPLEXITY THROUGH EXAMPLE PROGRAMS (NO FORMAL DEFINITION REQUIRED)

**MODULE 6: FUNCTION (4 LECTURES)**

INTRODUCTION & WRITING FUNCTIONS, SCOPE OF VARIABLES FUNCTIONS (INCLUDING USING BUILT IN LIBRARIES), PARAMETER PASSING IN FUNCTIONS, CALL BY VALUE, PASSING ARRAYS TO FUNCTIONS: IDEA OF CALL BY REFERENCE

**MODULE 7: RECURSION (5 LECTURES)**

RECURSION, AS A DIFFERENT WAY OF SOLVING PROBLEMS. EXAMPLE PROGRAMS, SUCH AS FINDING FACTORIAL, FIBONACCI SERIES, REVERSE A STRING USING RECURSION, AND GCD OF TWO NUMBERS, ACKERMAN FUNCTION ETC. QUICK SORT OR MERGE SORT.

**MODULE 8: STRUCTURE/UNION (3 LECTURES)**

STRUCTURES, ACCESSING STRUCTURE ELEMENTS, WAY OF STORAGE OF STRUCTURE ELEMENT, DEFINING STRUCTURES AND ARRAY OF STRUCTURES, BASIC DEFINITION OF UNION, COMPARISON B/W STRUCTURE & UNION WITH EXAMPLE

**MODULE 9: POINTERS (5 LECTURES)**

IDEA OF POINTERS, DEFINING POINTERS, USE OF POINTERS IN SELF-REFERENTIAL STRUCTURES, NOTION OF LINKED LIST (NO IMPLEMENTATION), POINTER TO POINTER, POINTER TO ARRAY, POINTER TO STRINGS, ARRAY OF POINTER, POINTER TO FUNCTION, POINTER TO STRUCTURE.

**MODULE 10: FILE HANDLING**

(ONLY IF TIME IS AVAILABLE, OTHERWISE SHOULD BE DONE AS PART OF THE LAB)

**SUGGESTED TEXT BOOKS**

- *BYRON GOTTFRIED, SCHAUM'S OUTLINE OF PROGRAMMING WITH C, MCGRAW-HILL*
- *E. BALAGURUSWAMY, PROGRAMMING IN ANSI C, TATA MCGRAW-HILL*

**SUGGESTED REFERENCE BOOKS**

- *BRIAN W. KERNIGHAN AND DENNIS M. RITCHIE, THE C PROGRAMMING LANGUAGE, PRENTICE HALL OF INDIA*
- *YASHWANT KANETKAR, LET US C, BPB PUBLICATION*

**THE STUDENT WILL LEARN**

- TO FORMULATE SIMPLE ALGORITHMS FOR ARITHMETIC AND LOGICAL PROBLEMS.
- TO TRANSLATE THE ALGORITHMS TO PROGRAMS (IN C LANGUAGE).
- TO TEST AND EXECUTE THE PROGRAMS AND CORRECT SYNTAX AND LOGICAL ERRORS.
- TO IMPLEMENT CONDITIONAL BRANCHING, ITERATION AND RECURSION.
- TO DECOMPOSE A PROBLEM INTO FUNCTIONS AND SYNTHESIZE A COMPLETE PROGRAM USING DIVIDE AND CONQUER APPROACH.
- TO USE ARRAYS, POINTERS AND STRUCTURES TO FORMULATE ALGORITHMS AND PROGRAMS.
- TO APPLY PROGRAMMING TO SOLVE MATRIX ADDITION AND MULTIPLICATION PROBLEMS AND SEARCHING AND SORTING PROBLEMS.

- TO APPLY PROGRAMMING TO SOLVE SIMPLE NUMERICAL METHOD PROBLEMS, NAMELY ROT FINDING OF FUNCTION, DIFFERENTIATION OF FUNCTION AND SIMPLE INTEGRATION.

## *LABORATORY PROGRAMMING FOR PROBLEM SOLVING*

**[THE LABORATORY SHOULD BE PRECEDED OR FOLLOWED BY A TUTORIAL TO EXPLAIN THE APPROACH OR ALGORITHM TO BE IMPLEMENTED FOR THE PROBLEM GIVEN.]**

TUTORIAL 1: PROBLEM SOLVING USING COMPUTERS:
LAB1: FAMILIARIZATION WITH PROGRAMMING ENVIRONMENT

TUTORIAL 2: VARIABLE TYPES AND TYPE CONVERSIONS:
LAB 2: SIMPLE COMPUTATIONAL PROBLEMS USING ARITHMETIC EXPRESSIONS

TUTORIAL 3: BRANCHING AND LOGICAL EXPRESSIONS: LAB 3: PROBLEMS INVOLVING IF-THEN-ELSE STRUCTURES

TUTORIAL 4: LOOPS, WHILE AND FOR LOOPS:
LAB 4: ITERATIVE PROBLEMS E.G., SUM OF SERIES

TUTORIAL 5: 1D ARRAYS: SEARCHING, SORTING: LAB 5: 1D ARRAY MANIPULATION

TUTORIAL 6: 2D ARRAYS AND STRINGS
LAB 6: MATRIX PROBLEMS, STRING OPERATIONS

TUTORIAL 7: FUNCTIONS, CALL BY VALUE:
LAB 7: SIMPLE FUNCTIONS

TUTORIAL 8: NUMERICAL METHODS (ROOT FINDING, NUMERICAL DIFFERENTIATION, NUMERICAL INTEGRATION):
LAB 8: PROGRAMMING FOR SOLVING NUMERICAL METHODS PROBLEMS

TUTORIAL 9: RECURSION, STRUCTURE OF RECURSIVE CALLS LAB 9: RECURSIVE FUNCTIONS

TUTORIAL 10: POINTERS, STRUCTURES AND DYNAMIC MEMORY ALLOCATION LAB 10: POINTERS AND STRUCTURES

TUTORIAL 11: FILE HANDLING:
LAB 11: FILE OPERATIONS

**LABORATORY OUTCOMES**

- ❖ TO FORMULATE THE ALGORITHMS FOR SIMPLE PROBLEMS
- ❖ TO TRANSLATE GIVEN ALGORITHMS TO A WORKING AND CORRECT PROGRAM
- ❖ TO BE ABLE TO CORRECT SYNTAX ERRORS AS REPORTED BY THE COMPILERS
- ❖ TO BE ABLE TO IDENTIFY AND CORRECT LOGICAL ERRORS

ENCOUNTERED AT RUN TIME

- TO BE ABLE TO WRITE ITERATIVE AS WELL AS RECURSIVE PROGRAMS
- TO BE ABLE TO REPRESENT DATA IN ARRAYS, STRINGS AND STRUCTURES AND MANIPULATE THEM THROUGH A PROGRAM
- TO BE ABLE TO DECLARE POINTERS OF DIFFERENT TYPES AND USE THEM IN DEFINING SELF- REFERENTIAL STRUCTURES.
- TO BE ABLE TO CREATE, READ AND WRITE TO AND FROM SIMPLE TEXT FILES.

| ESC | Workshop Manufacturing Practices | L:1 | T:0 | P:4 | Credit:3 |
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***LECTURES & VIDEOS: (10 HOURS) [L: 1; T: 0; P: 0 (1 CREDIT)]***

**DETAILED CONTENTS:**

1. MANUFACTURING METHODS-CASTING, FORMING, MACHINING, JOINING, ADVANCED MANUFACTURING METHODS (3 LECTURES)
2. CNC MACHINING, ADDITIVE MANUFACTURING (1 LECTURE)
3. FITTING OPERATIONS & POWER TOOLS (1 LECTURE)
4. CARPENTRY (1 LECTURE)
5. PLASTIC MOULDING, GLASS CUTTING (1 LECTURE)
6. METAL CASTING (1 LECTURE)
7. WELDING (ARC WELDING & GAS WELDING), BRAZING, SOLDERING (2 LECTURE)

**SUGGESTED TEXT/REFERENCE BOOKS:**


- *HAJRA CHOUDHURY S.K., HAJRA CHOUDHURY A.K. AND NIRJHAR ROY S.K., "ELEMENTS OF WORKSHOP TECHNOLOGY", VOL. I 2008 AND VOL. II 2010, MEDIA PROMOTERS AND PUBLISHERS PRIVATE LIMITED, MUMBAI.*
- *KALPAKJIAN S. AND STEVEN S. SCHMID, "MANUFACTURING ENGINEERING AND TECHNOLOGY", 4TH EDITION, PEARSON EDUCATION INDIA EDITION, 2002.*
- *GOWRI P. HARIHARAN AND A. SURESH BABU,"MANUFACTURING TECHNOLOGY – I" PEARSON EDUCATION, 2008.*
- *ROY A. LINDBERG, "PROCESSES AND MATERIALS OF MANUFACTURE", 4TH EDITION, PRENTICE HALL INDIA, 1998.*
- *RAO P.N., "MANUFACTURING TECHNOLOGY", VOL. I AND VOL. II, TATA MCGRAWHILL HOUSE, 2017.*


***COURSE OUTCOMES:***

- *UPON COMPLETION OF THIS COURSE, THE STUDENTS WILL GAIN KNOWLEDGE OF THE DIFFERENT MANUFACTURING PROCESSES WHICH ARE COMMONLY EMPLOYED IN THE INDUSTRY, TO FABRICATE COMPONENTS USING DIFFERENT MATERIALS.*

***WORKSHOP PRACTICE: (60 HOURS) [L: 0; T: 0; P: 4 (2 CREDITS)]***

1. MACHINE SHOP (10 HOURS) AND FITTING SHOP (8 HOURS)
2. CARPENTRY (6 HOURS)
3. WELDING SHOP (8 HOURS) (ARC WELDING 4 HRS + GAS WELDING 4 HRS)
4. CASTING (8 HOURS) AND SMITHY (6 HOURS)
5. PLASTIC MOULDING & GLASS CUTTING (6 HOURS)
6. 3-D PRINTING OF DIFFERENT MODELS (8 HOURS)

*EXAMINATIONS COULD INVOLVE THE ACTUAL FABRICATION OF SIMPLE COMPONENTS, UTILIZING ONE OR MORE OF THE TECHNIQUES COVERED ABOVE.*

**LABORATORY OUTCOMES**

- UPON COMPLETION OF THIS LABORATORY COURSE, STUDENTS WILL BE ABLE TO FABRICATE COMPONENTS WITH THEIR OWN HANDS.
- THEY WILL ALSO GET PRACTICAL KNOWLEDGE OF THE DIMENSIONAL

ACCURACIES AND DIMENSIONAL TOLERANCES POSSIBLE WITH DIFFERENT MANUFACTURING PROCESSES.

- BY ASSEMBLING DIFFERENT COMPONENTS, THEY WILL BE ABLE TO PRODUCE SMALL DEVICES OF THEIR INTEREST. BY ASSEMBLING DIFFERENT COMPONENTS, THEY WILL BE ABLE TO PRODUCE SMALL DEVICES OF THEIR INTEREST.

| HSMC | English | L:2 | T:0 | P:2 | Credit:3 |
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## *DETAILED CONTENTS*

1. **VOCABULARY BUILDING**
   - A. THE CONCEPT OF WORD FORMATION
   - B. ROOT WORDS FROM FOREIGN LANGUAGES AND THEIR USE IN ENGLISH
   - C. ACQUAINTANCE WITH PREFIXES AND SUFFIXES FROM FOREIGN LANGUAGES IN ENGLISH TO FORM DERIVATIVES.
   - D. SYNONYMS, ANTONYMS, AND STANDARD ABBREVIATIONS.
   - E. AFFIXES, ACRONYMS

2. **BASIC WRITING SKILLS**
   - A. SENTENCE STRUCTURES
   - B. USE OF PHRASES AND CLAUSES IN SENTENCES
   - C. IMPORTANCE OF PROPER PUNCTUATION
   - D. KINDS OF SENTENCES
   - E. USE OF TENSE, USE IN CONTEXT AND COHERENCE OF TENSE IN WRITING
   - F. USE OF VOICE – ACTIVE/PASSIVE IN SENTENCES
   - G. USE OF SPEECH – DIRECT AND INDIRECT SPEECH
   - H. FRAMING QUESTIONS- DIRECT, USING MODAL VERBS

3. **IDENTIFYING COMMON ERRORS IN WRITING**
   - A. SUBJECT-VERB AGREEMENT
   - B. NOUN-PRONOUN AGREEMENT
   - C. MISPLACED MODIFIERS
   - D. ARTICLES
   - E. PREPOSITIONS
   - F. REDUNDANCIES
   - G. CLICHÉS
   - H. COMMON ENGLISH ERRORS

4. **NATURE AND STYLE OF SENSIBLE WRITING**
   - A. DESCRIBING
   - B. DEFINING
   - C. CLASSIFYING
   - D. PROVIDING EXAMPLES OR EVIDENCE
   - E. WRITING INTRODUCTION AND CONCLUSION
   - F. ORGANISING PRINCIPLE OF PARAGRAPHS IN DOCUMENTS
   - G. ARGUMENT, DESCRIBING/ NARRATING/ PLANNING, DEFINING,CLASSIFYING
   - H. LEXICAL RESOURCES, USING SUITABLE LANGUAGE REGISTER
   - I. COHERENCE, WRITING INTRODUCTION, BODY AND CONCLUSION, TECHNIQUES FOR WRITING PRECISELY,GRAMMAR AND ACCURACY

5. **WRITING PRACTICES**
   - A. COMPREHENSION
   - B. FORMAL LETTER WRITING/ APPLICATION/ REPORT WRITING/ WRITING MINUTES OF MEETINGS
   - C. ESSAY WRITING
   - D. FORMAL EMAIL WRITING

E. RESUME/ CV WRITING, COVER LETTER,
F. STATEMENT OF PURPOSE

**6. ORAL COMMUNICATION**

***(THIS UNIT INVOLVES INTERACTIVE PRACTICE SESSIONS IN LANGUAGE LAB)***

LISTENING COMPREHENSION

A. PRONUNCIATION, INTONATION, STRESS AND RHYTHM
B. COMMON EVERYDAY SITUATIONS: CONVERSATIONS AND DIALOGUES
C. COMMUNICATION AT WORKPLACE
D. INTERVIEWS
E. FORMAL PRESENTATIONS
F. ACQUAINTING STUDENTS WITH IPA SYMBOLS
G. PHONETICS (BASIC)
H. SOUNDS – VOWELS, CONSONANTS
I. CLEARING MOTHER TONGUE INFLUENCE
J. CLEARING REDUNDANCIES AND COMMON ERRORS RELATED TO INDIANISMS
K. GROUP DISCUSSION
L. EXPRESSING OPINIONS
M. COHERENCE AND FLUENCY IN SPEECH

**7. READING SKILLS**

A. READING COMPREHENSION,
B. PARAGRAPH READING BASED ON PHONETIC SOUNDS/ INTONATION

**8. PROFESSIONAL SKILLS**

A. TEAM BUILDING
B. SOFT SKILLS AND ETIQUETTES

**9. ACQUAINTANCE WITH TECHNOLOGY-AIDED LANGUAGE LEARNING**

A. USE OF COMPUTER SOFTWARE (GRAMMARLY, GINGER…)
B. USE OF SMARTPHONE APPLICATIONS (DUOLINGO, BUSUU…)

**10. ACTIVITIES**

A. NARRATIVE CHAIN
B. DESCRIBING/ NARRATING
C. WRITING ESSAYS IN RELAY
D. PEER/ GROUP ACTIVITIES
E. BRAINSTORMING VOCABULARY
F. CUE / FLASH CARDS FOR VOCABULARY
G. DEBATES

**SUGGESTED READINGS:**


- PRACTICAL ENGLISH USAGE. MICHAEL SWAN. OUP. 1995.
- REMEDIAL ENGLISH GRAMMAR. F.T. WOOD. MACMILLAN.2007
- ON WRITING WELL. WILLIAM ZINSSER. HARPER RESOURCE BOOK. 2001
- STUDY WRITING. LIZ HAMP-LYONS AND BEN HEASLY. CAMBRIDGE UNIVERSITY PRESS. 2006.
- COMMUNICATION SKILLS. SANJAY KUMAR AND PUSHPLATA. OXFORD UNIVERSITY PRESS. 2011.
- EXERCISES IN SPOKEN ENGLISH. PARTS. I-III. CIEFL, HYDERABAD. OXFORD UNIVERSITY PRESS


**COURSE OUTCOMES**

THE STUDENT WILL ACQUIRE BASIC PROFICIENCY IN ENGLISH INCLUDING READING AND LISTENING COMPREHENSION, WRITING AND SPEAKING SKILLS.

CREDIT TABLE
FOR
104–ELECTRONICS AND COMMUNICATION ENGINEERING

SEMESTER–II

| Sl. No. | Course Code | Course Title | IA | ESE | TOTAL | L | T | P | Credit | Hours |
|---|---|---|---|---|---|---|---|---|---|---|
| **Theory** | | | | | | | | | | |
| 1 | BSC | Physics(WaveandOptics and Introduction to Quantum Mechanics) | 30 | 70 | 100 | 3 | 1 | 0 | 4 | 4 |
| 2 | BSC | Mathematics –II (Linear Algebra,TransformCalculus and Numerical Methods) | 30 | 70 | 100 | 3 | 1 | 0 | 4 | 4 |
| 3 | ESC | BasicElectricalEngineering | 30 | 70 | 100 | 3 | 1 | 0 | 4 | 4 |
| 4 | ESC | EngineeringGraphics&Design | 30 | 70 | 100 | 1 | 0 | 0 | 1 | 1 |
| **Practical** | | | | | | | | | | |
| 1 | BSC | Physics(WaveandOptics and Introduction to QuantumMechanics) | 20 | 30 | 50 | 0 | 0 | 3 | 1.5 | 3 |
| 2 | ESC | BasicElectricalEngineering | 20 | 30 | 50 | 0 | 0 | 2 | 1 | 2 |
| 3 | ESC | EngineeringGraphics&Design | 20 | 30 | 50 | 0 | 0 | 4 | 2 | 4 |
| | Total | | | | 550 | | | | 17.5 | 22 |

TOTAL MARKS: 550 TOTAL CREDITS: 17.5

TOTALHOURS:22 IA (INTERNAL ASSESMENT), ESE (END SEMESTER EXAMINATION)

| | | | | | |
|---|---|---|---|---|---|
| **BSC** | **Physics(Waves and Optics, and Introduction To Quantum Mechanics)** | **L:3** | **T:1** | **P:3** | **Credit:5.5** |

***CONTENTS***

**MODULE1:WAVES(3LECTURES)**

MECHANICAL AND ELECTRICAL SIMPLE HARMONIC OSCILLATORS, DAMPED HARMONIC OSCILLATOR, FORCED MECHANICAL AND ELECTRICAL OSCILLATORS, IMPEDANCE, STEADY STATE MOTION OF FORCED DAMPED HARMONIC OSCILLATOR

**MODULE2:NON-DISPERSIVETRANSVERSEANDLONGITUDINALWAVES(4LECTURES)**

TRANSVERSE WAVE ON A STRING, THE WAVE EQUATION ON A STRING, HARMONIC WAVES,REFLECTIONANDTRANSMISSIONOFWAVESATABOUNDARY,IMPEDANCEMATCHING, STANDING WAVES AND THEIR EIGEN FREQUENCIES, LONGITUDINAL WAVES AND THE WAVE EQUATION FOR THEM, ACOUSTICS WAVES

**MODULE3:LIGHTANDOPTICS(3LECTURES)**

LIGHT AS AN ELECTROMAGNETIC WAVE AND FRESNEL EQUATIONS, REFLECTANCE AND TRANSMITTANCE,BREWSTER'SANGLE,TOTALINTERNALREFLECTION,ANDEVANESCENT WAVE. MIRRORS AND LENSES AND OPTICAL INSTRUMENTS BASED ON THEM

**MODULE4:WAVEOPTICS(5LECTURES)**

HUYGENS' PRINCIPLE, SUPERPOSITION OF WAVES AND INTERFERENCE OF LIGHT BY WAVEFRONT SPLITTING AND AMPLITUDE SPLITTING; YOUNG'S DOUBLE SLIT EXPERIMENT, NEWTON'S RINGS, MICHELSON INTERFEROMETER, MACH ZEHNDER INTERFEROMETER. FARUNHOFERDIFFRACTIONFROMASINGLESLITANDACIRCULARAPERTURE,THERAYLEIGH CRITERION FOR LIMIT OF RESOLUTION AND ITS APPLICATION TO VISION; DIFFRACTION GRATINGS AND THEIR RESOLVING POWER

**MODULE5:LASERS(5LECTURES)**

EINSTEIN'S THEORY OF MATTER RADIATION INTERACTION AND A AND B COEFFICIENTS; AMPLIFICATION OF LIGHT BY POPULATION INVERSION,

DIFFERENT TYPES OF LASERS: GAS LASERS (HE-NE, CO2), SOLID-STATE LASERS (RUBY, NEODYMIUM), DYE LASERS; PROPERTIES OF LASER BEAMS: MONO-CHROMATICITY

**MODULE6:INTRODUCTIONTOQUANTUMMECHANICS(5LECTURES)**

WAVENATUREOFPARTICLES,TIME-DEPENDENTANDTIME-INDEPENDENTSCHRODINGER EQUATION FOR WAVE FUNCTION, BORN INTERPRETATION, PROBABILITY CURRENT, EXPECTATIONVALUES,FREE-PARTICLEWAVEFUNCTIONANDWAVE-PACKETS,UNCERTAINTY PRINCIPLE.

**MODULE7:SOLUTIONOFWAVEEQUATION(6LECTURES)**

SOLUTION OF STATIONARY-STATE SCHRODINGER EQUATION FOR ONE DIMENSIONAL PROBLEMS–PARTICLE IN A BOX, PARTICLE IN ATTRACTIVE DELTA-FUNCTION POTENTIAL, SQUARE-WELLPOTENTIAL,LINEARHARMONICOSCILLATOR.SCATTERINGFROMAPOTENTIAL BARRIERANDTUNNELING;RELATEDEXAMPLESLIKEALPHA-DECAY,FIELD-IONIZATIONAND SCANNING TUNNELING MICROSCOPE, TUNNELING IN SEMICONDUCTOR STRUCTURES. THREE- DIMENSIONAL PROBLEMS: PARTICLE IN THREE DIMENSIONAL BOX AND RELATED EXAMPLES.

**MODULE8:INTRODUCTIONTOSOLIDSANDSEMICONDUCTORS(9LECTURES)**

FREE ELECTRON THEORY OF METALS, FERMI LEVEL, DENSITY OF STATES IN 1, 2 AND3DIMENSIONS,BLOCH'STHEOREMFORPARTICLESINAPERIODICPOTENTIAL,KRONIG- PENNEY MODEL AND ORIGIN OF ENERGY BANDS.

**TYPES OF ELECTRONIC MATERIALS:** METALS, SEMICONDUCTORS, AND INSULATORS. INTRINSIC AND EXTRINSIC SEMICONDUCTORS, DEPENDENCE OF FERMI LEVEL ON CARRIER- CONCENTRATION AND TEMPERATURE (EQUILIBRIUM CARRIER STATISTICS), CARRIER GENERATION AND RECOMBINATION, CARRIER TRANSPORT: DIFFUSION AND DRIFT, P -N JUNCTION.

**TEXT/REFERENCES:**


- *G. MAIN, "VIBRATIONS AND WAVES IN PHYSICS", CAMBRIDGE UNIVERSITY PRESS, 1993.*
- *H.J.PAIN,"THEPHYSICSOFVIBRATIONSANDWAVES",WILEY,2006.*
- *E.HECHT,"OPTICS",PEARSONEDUCATION,2008.*
- *A.GHATAK,"OPTICS",MCGRAWHILLEDUCATION,2012.*
- *O.SVELTO,"PRINCIPLESOFLASERS",SPRINGERSCIENCE&BUSINESSMEDIA, 2010.*

- *D.J.GRIFFITHS,"QUANTUMMECHANICS",PEARSONEDUCATION,2014.*
- *R.ROBINETT,"QUANTUMMECHANICS",OUPOXFORD,2006.*
- *D.MCQUARRIE,"UANTUMCHEMISTRY",UNIVERSITYSCIENCEBOOKS,2007.*
- *D.A.NEAMEN,"SEMICONDUCTORPHYSICSANDDEVICES",TIMESMIRRORHIGH EDUCATION GROUP, CHICAGO, 1997.*
- *E.S.YANG,"MICROELECTRONICDEVICES",MCGRAWHILL,SINGAPORE,1988.*
- *B.G.STREETMAN,"SOLIDSTATEELECTRONICDEVICES",PRENTICEHALLOFINDIA, 1995*

| BSC | Mathematics–II(LinearAlgebra,Transform CalculusandNumericalMethods) | L:3 | T:1 | P:0 | Credit:4 |
|---|---|---|---|---|---|

**MODULE1:MATRICES(10LECTURES)**

ALGEBRAOFMATRICES,INVERSEANDRANKOFAMATRIX,RANK-NULLITYTHEOREM; SYSTEMOFLINEAREQUATIONS;SYMMETRIC,SKEW-SYMMETRICANDORTHOGONALMATRICES; DETERMINANTS; EIGENVALUES AND EIGENVECTORS; DIAGONALIZATION OF MATRICES; CAYLEY-HAMILTON THEOREM, ORTHOGONAL TRANSFORMATION AND QUADRATIC TO CANONICAL FORMS.

**MODULE2:NUMERICALMETHODS-I(10LECTURES)**

SOLUTION OF POLYNOMIAL AND TRANSCENDENTAL EQUATIONS – BISECTION METHOD, NEWTON-RAPHSON METHOD AND REGULA-FALSI METHOD. FINITE DIFFERENCES, INTERPOLATIONUSINGNEWTON'SFORWARDANDBACKWARDDIFFERENCEFORMULAE.CENTRAL DIFFERENCE INTERPOLATION: GAUSS'S FORWARD AND BACKWARD FORMULAE. NUMERICAL INTEGRATION: TRAPEZOIDAL RULE AND SIMPSON'S 1/3RD AND 3/8 RULES.

**MODULE3:NUMERICALMETHODS-II(10LECTURES)**

ORDINARY DIFFERENTIAL EQUATIONS: TAYLOR'S SERIES, EULER AND MODIFIED EULER'S METHODS. RUNGE- KUTTA METHOD OF FOURTH ORDER FOR SOLVING FIRST AND SECOND ORDER EQUATIONS.MILNE'S AND ADAM'S PREDICATOR-CORRECTOR METHODS. PARTIAL DIFFERENTIAL EQUATIONS: FINITE DIFFERENCE SOLUTION TWO DIMENSIONAL LAPLACE EQUATION AND POISSON EQUATION, IMPLICIT AND EXPLICIT METHODS FOR ONE DIMENSIONALHEATEQUATION(BENDER-SCHMIDTANDCRANK-NICHOLSONMETHODS),FINITE DIFFERENCE EXPLICIT METHOD FOR WAVE EQUATION.

**MODULE4:TRANSFORMCALCULUS(10LECTURES)**

LAPLACETRANSFORM,PROPERTIESOFLAPLACETRANSFORM,LAPLACETRANSFORMOF PERIODIC FUNCTIONS. FINDING INVERSE LAPLACE TRANSFORM BY

DIFFERENT METHODS, CONVOLUTIONTHEOREM.EVALUATIONOFINTEGRALSBYLAPLACETRANSFORM,SOLVINGODES AND PDES BY LAPLACE TRANSFORM METHOD. FOURIER TRANSFORMS.

**TEXT/REFERENCES:**


- D.POOLE,"LINEARALGEBRA:AMODERNINTRODUCTION",BROOKS/COLE,2005.
- N.P. BALI AND M. GOYAL, "A TEXT BOOK OF ENGINEERING MATHEMATICS", LAXMI PUBLICATIONS, 2008.
- B.S.GREWAL,"HIGHERENGINEERINGMATHEMATICS",KHANNAPUBLISHERS,2010.
- V.KRISHNAMURTHY,V.P.MAINRAANDJ.L.ARORA,"ANINTRODUCTIONTOLINEAR ALGEBRA", AFFILIATED EAST-WEST PRESS, 2005.

| ESC | BasicElectricalEngineering | L:3 | T:1 | P:2 | Credit:5 |
|---|---|---|---|---|---|

**MODULE1:DCCIRCUITS(8LECTURES)**

ELECTRICAL CIRCUIT ELEMENTS (R, L AND C), VOLTAGE AND CURRENT SOURCES, KIRCHHOFF CURRENT AND VOLTAGE LAWS, ANALYSIS OF SIMPLE CIRCUITS WITH DC EXCITATION. STAR-DELTA CONVERSION, NETWORK THEOREMS (SUPERPOSITION, THEVENIN, NORTON AND MAXIMUM POWER TRANSFER THEOREMS). TIME-DOMAIN ANALYSIS OF FIRST- ORDER RL AND RC CIRCUITS

**MODULE2:ACCIRCUITS(8LECTURES)**

REPRESENTATIONOFSINUSOIDALWAVEFORMS,PEAK,RMSANDAVERAGEVALUES(FORM FACTOR AND PEAK FACTOR), IMPEDANCE OF SERIES AND PARALLEL CIRCUIT, PHASOR REPRESENTATION,REALPOWER,REACTIVEPOWER,APPARENTPOWER,POWERFACTOR,POWER TRIANGLE. ANALYSIS OF SINGLE-PHASE AC CIRCUITS CONSISTING OF R, L, C, RL, RC, RLC COMBINATIONS (SERIES AND PARALLEL), RESONANCE. THREE-PHASE BALANCED CIRCUITS, VOLTAGE AND CURRENT RELATIONS IN STAR AND DELTA CONNECTIONS.

**MODULE3:MAGNETICCIRCUITS:(4LECTURES)**

INTRODUCTION, SERIES AND PARALLEL MAGNETIC CIRCUITS, ANALYSIS OF SERIES AND PARALLEL MAGNETIC CIRCUITS.

**MODULE4:TRANSFORMERS(6LECTURES)**

MAGNETICMATERIALS,BHCHARACTERISTICS,IDEALANDPRACTICALTRANSFORMER, EMF EQUATION, EQUIVALENT CIRCUIT, LOSSES IN TRANSFORMERS, REGULATION AND EFFICIENCY. AUTO-TRANSFORMER AND THREE-PHASE TRANSFORMER CONNECTIONS.

**MODULE5:ELECTRICALMACHINES(10LECTURES)**

CONSTRUCTION, WORKING, TORQUE-SPEED CHARACTERISTIC AND SPEED CONTROL OF SEPARATELY EXCITED DC MOTOR. GENERATION OF ROTATING

MAGNETIC FIELDS, CONSTRUCTION AND WORKING OF A THREE-PHASE INDUCTION MOTOR, SIGNIFICANCE OF TORQUE-SLIPCHARACTERISTIC.LOSSCOMPONENTSANDEFFICIENCY,STARTINGANDSPEED CONTROLOFINDUCTIONMOTOR.CONSTRUCTIONANDWORKINGOFSYNCHRONOUS GENERATORS.

**MODULE6:ELECTRICALINSTALLATIONS(6LECTURES)**

COMPONENTS OF LT SWITCHGEAR: SWITCH FUSE UNIT (SFU), MCB, ELCB, MCCB, TYPES OF WIRES AND CABLES, EARTHING. TYPES OF BATTERIES, IMPORTANT CHARACTERISTICSFORBATTERIES.ELEMENTARYCALCULATIONSFORENERGYCONSUMPTION, POWER FACTOR IMPROVEMENT AND BATTERY BACKUP.

**SUGGESTEDTEXT/REFERENCEBOOKS**


- *D.P.KOTHARIANDI.J.NAGRATH,"BASICELECTRICALENGINEERING",TATA MCGRAW HILL, 2010.*
- *D.C.KULSHRESHTHA,"BASICELECTRICALENGINEERING",MCGRAWHILL,2009.*
- *L. S. BOBROW,"FUNDAMENTALSOFELECTRICALENGINEERING",OXFORD UNIVERSITY PRESS, 2011.*
- *E.HUGHES,"ELECTRICALANDELECTRONICSTECHNOLOGY",PEARSON,2010.*
- *V. D. TORO, "ELECTRICAL ENGINEERING FUNDAMENTALS", PRENTICE HALL INDIA, 1989.*
- *BASICELECTRICALENGINEERINGBYFITZERALD,ETAL,TATAMCGRAWHILL*
- *FUNDAMENTALSOFELECTRICALENGG.BYR.PRASAD,PHIPUBLICATION*
- *BASICELECTRICALENGINEERINGBYV.K.MEHTAANDROHITMEHTA,S.CHAND PUBLICATION*


**COURSEOUTCOMES**

- TOUNDERSTANDANDANALYZEBASICELECTRICANDMAGNETICCIRCUITS
- TOSTUDYTHEWORKINGPRINCIPLESOFELECTRICALMACHINESANDPOWER CONVERTERS.
- TOINTRODUCETHECOMPONENTSOFLOWVOLTAGEELECTRICALINSTALLATIONS

***LABORATORY***

**LISTOFEXPERIMENTS/DEMONSTRATIONS**

- BASICSAFETYPRECAUTIONS.INTRODUCTIONANDUSEOFMEASURINGINSTRUMENTS – VOLTMETER, AMMETER, MULTI-METER, OSCILLOSCOPE. REAL-LIFE RESISTORS, CAPACITORS AND INDUCTORS.
- MEASURING THE STEADY-STATE AND TRANSIENT TIME-RESPONSE OF R-L, R-C, AND R-L-CCIRCUITSTOASTEPCHANGEINVOLTAGE(TRANSIENTMAYBEOBSERVEDON

ASTORAGEOSCILLOSCOPE).SINUSOIDALSTEADYSTATERESPONSEOFR-L,ANDR-CCIRCUITS–IMPEDANCECALCULATIONANDVERIFICATION.OBSERVATIONOFPHASE DIFFERENCES BETWEEN CURRENT AND VOLTAGE. RESONANCE IN R-L-C CIRCUITS.

- TRANSFORMERS: OBSERVATION OF THE NO-LOAD CURRENT WAVEFORM ON AN OSCILLOSCOPE (NON- SINUSOIDAL WAVE-SHAPE DUE TO B-H CURVE NONLINEARITY SHOULD BE SHOWN ALONG WITH A DISCUSSION ABOUT HARMONICS). LOADING OF A TRANSFORMER:MEASUREMENTOFPRIMARYANDSECONDARYVOLTAGESAND CURRENTS, AND POWER.
- THREE-PHASETRANSFORMERS:STARANDDELTACONNECTIONS.VOLTAGE ANDCURRENTRELATIONSHIPS(LINE-LINEVOLTAGE,PHASE-TO-NEUTRALVOLTAGE, LINEANDPHASECURRENTS).PHASE-SHIFTSBETWEENTHEPRIMARYANDSECONDARY SIDE. CUMULATIVE THREE-PHASE POWER IN BALANCED THREE-PHASE CIRCUITS.
- DEMONSTRATION OF CUT-OUT SECTIONS OF MACHINES:DC MACHINE (COMMUTATOR-BRUSHARRANGEMENT),INDUCTIONMACHINE(SQUIRRELCAGEROTOR),SYNCHRONOUS MACHINE(FIELDWINGING-SLIPRINGARRANGEMENT)ANDSINGLE-PHASEINDUCTION MACHINE.
- TORQUESPEEDCHARACTERISTICOFSEPARATELYEXCITEDDCMOTOR.
- SYNCHRONOUS SPEED OF TWO AND FOUR-POLE, THREE-PHASE INDUCTION MOTORS. DIRECTION REVERSAL BY CHANGE OF PHASE-SEQUENCE OF CONNECTIONS. TORQUE- SLIP CHARACTERISTIC OF AN INDUCTION MOTOR. GENERATOR OPERATION OF AN INDUCTION MACHINE DRIVEN AT SUPER- SYNCHRONOUS SPEED.
- SYNCHRONOUSMACHINEOPERATINGASAGENERATOR:STAND-ALONEOPERATIONWITH A LOAD. CONTROL OF VOLTAGE THROUGH FIELD EXCITATION.
- DEMONSTRATIONOF(A)DC-DCCONVERTERS(B)DC-ACCONVERTERS–PWMWAVEFORM
  (C) THE USE OF DC-AC CONVERTER FOR SPEED CONTROL OF AN INDUCTION MOTOR AND (D) COMPONENTS OF LT SWITCHGEAR.

**LABORATORYOUTCOMES**

- GETANEXPOSURETOCOMMONELECTRICALCOMPONENTSANDTHEIRRATINGS.
- MAKEELECTRICALCONNECTIONSBYWIRESOFAPPROPRIATERATINGS.
- UNDERSTANDTHEUSAGEOFCOMMONELECTRICALMEASURINGINSTRUMENTS.
- UNDERSTANDTHEBASICCHARACTERISTICSOFTRANSFORMERSANDELECTRICALMACHINES.
- GETANEXPOSURETOTHEWORKINGOFPOWERELECTRONICCONVERTERS

| ESC | EngineeringGraphics&Design | L:1 | T:0 | P:4 | Credit:3 |
|---|---|---|---|---|---|

**TRADITIONALENGINEERINGGRAPHICS:**

PRINCIPLESOFENGINEERINGGRAPHICS;ORTHOGRAPHICPROJECTION;DESCRIPTIVE GEOMETRY; DRAWING PRINCIPLES; ISOMETRIC PROJECTION; SURFACE DEVELOPMENT; PERSPECTIVE; READING A DRAWING; SECTIONAL VIEWS; DIMENSIONING & TOLERANCES; TRUE LENGTH, ANGLE; INTERSECTION, SHORTEST DISTANCE.

**COMPUTERGRAPHICS:**

ENGINEERING GRAPHICS SOFTWARE; -SPATIAL TRANSFORMATIONS; ORTHOGRAPHIC PROJECTIONS; MODEL VIEWING; CO-ORDINATE SYSTEMS; MULTI-VIEW PROJECTION; EXPLODED ASSEMBLY; MODEL VIEWING; ANIMATION; SPATIAL MANIPULATION; SURFACE MODELLING; SOLID MODELLING, INTRODUCTION TO BUILDING INFORMATION MODELLING (BIM).

***(EXCEPTTHEBASICESSENTIALCONCEPTS,MOSTOFTHETEACHINGPARTCANHAPPEN CONCURRENTLY IN THE LABORATORY)***

**MODULE1:INTRODUCTIONTOENGINEERINGDRAWING**

PRINCIPLES OF ENGINEERING GRAPHICS AND THEIR SIGNIFICANCE, USAGE OF DRAWING INSTRUMENTS, LETTERING, CONIC SECTIONS INCLUDING THE RECTANGULAR HYPERBOLA(GENERALMETHODONLY);CYCLOID,EPICYCLOID,HYPOCYCLOIDAND INVOLUTE; SCALES – PLAIN, DIAGONAL AND VERNIER SCALES

**MODULE2:ORTHOGRAPHICPROJECTIONS**

PRINCIPLESOFORTHOGRAPHICPROJECTIONS-CONVENTIONS-PROJECTIONSOFPOINTS AND LINES INCLINED TO BOTH PLANES; PROJECTIONS OF PLANES INCLINED PLANES - AUXILIARY PLANES

**MODULE3:PROJECTIONSOFREGULARSOLIDS**

THOSEINCLINEDTOBOTHTHEPLANES-AUXILIARYVIEWS;DRAWSIMPLEANNOTATION, DIMENSIONING AND SCALE. FLOOR PLANS THAT INCLUDE: WINDOWS, DOORS, AND FIXTURES SUCH AS WC, BATH, SINK, SHOWER, ETC.

**MODULE4:SECTIONSANDSECTIONALVIEWSOFRIGHTANGULARSOLIDS**

COVERING, PRISM, CYLINDER, PYRAMID, CONE – AUXILIARY VIEWS; DEVELOPMENT OF SURFACES OF RIGHT REGULAR SOLIDS- PRISM, PYRAMID, CYLINDER AND CONE; DRAW THE SECTIONAL ORTHOGRAPHIC VIEWS OF GEOMETRICAL SOLIDS, OBJECTS FROM INDUSTRY AND DWELLINGS (FOUNDATION TO SLAB ONLY)

**MODULE5:ISOMETRICPROJECTIONS**

PRINCIPLES OF ISOMETRIC PROJECTION – ISOMETRIC SCALE, ISOMETRIC VIEWS, CONVENTIONS; ISOMETRIC VIEWS OF LINES, PLANES, SIMPLE AND COMPOUND SOLIDS; CONVERSIONOFISOMETRICVIEWSTOORTHOGRAPHICVIEWSANDVICE-VERSA,CONVENTIONS

**MODULE6:OVERVIEWOFCOMPUTERGRAPHICS**

LISTINGTHECOMPUTERTECHNOLOGIESTHATIMPACTONGRAPHICALCOMMUNICATION, DEMONSTRATINGKNOWLEDGEOFTHETHEORYOFCADSOFTWARE[SUCHAS:THEMENUSYSTEM, TOOLBARS (STANDARD, OBJECT PROPERTIES, DRAW, MODIFY AND DIMENSION), DRAWING AREA (BACKGROUND, CROSSHAIRS, COORDINATE SYSTEM), DIALOG BOXES AND WINDOWS, SHORTCUT MENUS (BUTTON BARS), THE COMMAND LINE (WHERE APPLICABLE), THE STATUS BAR, DIFFERENT METHODS OF ZOOM AS USED IN CAD, SELECT AND ERASE OBJECTS.; ISOMETRIC VIEWS OF LINES, PLANES, SIMPLE AND COMPOUND SOLIDS]

**MODULE7:CUSTOMISATION&CADDRAWING**

CONSISTINGOFSETUPOFTHEDRAWINGPAGEANDTHEPRINTER,INCLUDINGSCALE SETTINGS, SETTING UP OF UNITS AND DRAWING LIMITS; ISO AND ANSI STANDARDS FOR COORDINATE DIMENSIONING AND TOLERANCING; ORTHOGRAPHIC CONSTRAINTS, SNAP TO OBJECTS MANUALLY AND AUTOMATICALLY; PRODUCING DRAWINGS BY USING VARIOUS COORDINATEINPUTENTRYMETHODSTODRAWSTRAIGHTLINES,APPLYINGVARIOUSWAYSOF DRAWING CIRCLES.

**MODULE8:ANNOTATIONS,LAYERING&OTHERFUNCTIONS**

COVERING APPLYING DIMENSIONS TO OBJECTS, APPLYING ANNOTATIONS TO DRAWINGS;SETTINGUPANDUSEOFLAYERS,LAYERSTOCREATEDRAWINGS,CREAT

E,EDIT AND USE CUSTOMIZED LAYERS; CHANGING LINE LENGTHS THROUGH MODIFYING EXISTING LINES (EXTEND/LENGTHEN); PRINTING DOCUMENTS TO PAPER USING THE PRINT COMMAND; ORTHOGRAPHICPROJECTIONTECHNIQUES;DRAWINGSECTIONALVIEWSOFCOMPOSITERIGHT REGULAR GEOMETRIC SOLIDS AND PROJECT THE TRUE SHAPE OF THE SECTIONED SURFACE; DRAWINGANNOTATION,COMPUTER-AIDEDDESIGN(CAD)SOFTWAREMODELINGOFPARTSAND ASSEMBLIES.PARAMETRICANDNON-PARAMETRICSOLID,SURFACE,ANDWIREFRAMEMODELS. PART EDITING AND TWO-DIMENSIONAL DOCUMENTATION OF MODELS. PLANAR PROJECTION THEORY, INCLUDING SKETCHING OF PERSPECTIVE, ISOMETRIC, MULTIVIEW, AUXILIARY, AND SECTION VIEWS. SPATIAL VISUALIZATION EXERCISES. DIMENSIONING GUIDELINES, TOLERANCING TECHNIQUES; DIMENSIONING AND SCALE MULTI VIEWS OF DWELLING.

**MODULE9:DEMONSTRATIONOFASIMPLETEAMDESIGNPROJECTTHATILLUSTRATES**

GEOMETRY AND TOPOLOGY OF ENGINEERED COMPONENTS: CREATION OF ENGINEERING MODELS AND THEIR PRESENTATION IN STANDARD 2D BLUEPRINT FORM AND AS 3D WIRE- FRAME AND SHADED SOLIDS; MESHED TOPOLOGIES FOR ENGINEERING ANALYSIS AND TOOL- PATH GENERATION FOR COMPONENT MANUFACTURE; GEOMETRIC DIMENSIONING AND TOLERANCING;USEOFSOLID-MODELINGSOFTWAREFORCREATINGASSOCIATIVEMODELSAT THE COMPONENT AND ASSEMBLY LEVELS. FLOOR PLANS THAT INCLUDE: WINDOWS, DOORS, AND FIXTURES SUCH AS WC, BATH, SINK, SHOWER, ETC. APPLYING COLOUR CODING ACCORDING TO BUILDING DRAWING PRACTICE; DRAWING SECTIONAL ELEVATION SHOWING FOUNDATION TO CEILING; INTRODUCTION TO BUILDING INFORMATION MODELLING (BIM).

**SUGGESTEDTEXT/REFERENCEBOOKS:**

- *BHATTN.D.,PANCHALV.M.&INGLEP.R.,(2014),ENGINEERINGDRAWING, CHAROTAR PUBLISHING HOUSE*
- *SHAH,M.B.&RANAB.C.(2008),ENGINEERINGDRAWINGANDCOMPUTERGRAPHICS, PEARSON EDUCATION*
- *AGRAWALB.&AGRAWALC.M.(2012),ENGINEERINGGRAPHICS,TMHPUBLICATION*
- *NARAYANA,K.L.&PKANNAIAH(2008),TEXTBOOKONENGINEERINGDRAWING, SCITECHPUBLISHERS*
- *(CORRESPONDINGSETOF)CADSOFTWARETHEORYANDUSERMANUALS*

**COURSEOUTCOMES**

ALLPHASESOFMANUFACTURINGORCONSTRUCTIONREQUIRETHECONVERSIONOFNEW IDEASANDDESIGNCONCEPTSINTOTHEBASICLINELANGUAGEOFGRAPHICS.THEREFORE, THERE ARE MANY AREAS (CIVIL, MECHANICAL, ELECTRICAL, ARCHITECTURAL AND INDUSTRIAL)INWHICHTHESKILLSOFTHECADTECHNICIANSPLAYMAJORROLESINTHE DESIGN AND DEVELOPMENT OF NEW PRODUCTS OR CONSTRUCTION. STUDENTS PREPARE FOR ACTUAL WORK SITUATIONS THROUGH PRACTICAL TRAINING IN A NEW STATE-OF-THE-ART COMPUTER DESIGNED CAD LABORATORY USING ENGINEERING SOFTWARE

**THISCOURSEISDESIGNEDTOADDRESS:**

- TOPREPAREYOUTODESIGNASYSTEM,COMPONENT,ORPROCESSTOMEETDESIRED NEEDS WITHIN REALISTIC CONSTRAINTS SUCH AS ECONOMIC, ENVIRONMENTAL, SOCIAL, POLITICAL, ETHICAL, HEALTH AND SAFETY, MANUFACTURABILITY, AND SUSTAINABILITY
- TOPREPAREYOUTOCOMMUNICATEEFFECTIVELY
- TOPREPAREYOUTOUSETHETECHNIQUES,SKILLS,ANDMODERNENGINEERINGTOOLS NECESSARY FOR ENGINEERING PRACTICE

**THESTUDENTWILLLEARN:**

- INTRODUCTIONTOENGINEERINGDESIGNANDITSPLACEINSOCIETY
- EXPOSURETOTHEVISUALASPECTSOFENGINEERINGDESIGN
- EXPOSURETOENGINEERINGGRAPHICSSTANDARDS
- EXPOSURETOSOLIDMODELLING
- EXPOSURETOCOMPUTER-AIDEDGEOMETRICDESIGN
- EXPOSURETOCREATINGWORKINGDRAWINGS
- EXPOSURETOENGINEERINGCOMMUNICATION

**ECE**

**Semester III (Second year)**
**Branch/Course Electronics & Communication Engineering**

| Sr. No. | Course Code | Course Title | L | T | P | Contact Hrs./wk. | Credits |
|---|---|---|---|---|---|---|---|
| 1 | EC101 | Network Theory | 3 | 1 | 0 | 4 | 4 |
| 2 | EC102 | Signals and Systems | 3 | 0 | 0 | 3 | 3 |
| 3 | BS101 | Mathematics-III | 3 | 0 | 0 | 3 | 3 |
| 4 | EC103 | Object Oriented Programming | 3 | 0 | 0 | 3 | 3 |
| 5 | EC103P | Object Oriented Programming Lab | 0 | 0 | 2 | 2 | 1 |
| 6 | ES101 | Basic Electronics | 3 | 0 | 0 | 3 | 3 |
| 7 | ES101P | Basic Electronic Science Lab | 0 | 0 | 2 | 2 | 1 |
| 8 | ES102 | Electrical and Electronic Material | 3 | 0 | 0 | 3 | 3 |
| 9 | ES102P | Electrical and Electronic Material Lab | 0 | 0 | 2 | 2 | 1 |
| 10 | ECP1 | 1. Language Lab. (1 Week)<br>2. Industrial Visit/Internship (2 Weeks)<br>3. Fundamental Electronics Lab Training (1 Week) | 0 | 0 | 12 | 12 | 4 |
| | **TOTAL** | | | | | 37 | **26** |

**ECE**

| EC101 | Network Theory | 3L:1T:0P | 3 Credits |
|---|---|---|---|

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1 | Introduction to signals, their classification and properties, different types of systems, LTI systems and their properties, periodic waveforms and signal synthesis, properties and applications of Laplace transform | 8 |
| 2 | System modeling in terms of differential equations and transient response of R, L, C, series and parallel circuits for impulse, step, ramp, sinusoidal and exponential signals by classical method and using Laplace transform. | 8 |
| 3 | Graph theory : Concept of tree, Tie-set matrix, Cut-set matrix and application to solve electric networks. Two port networks – Introduction of two port parameters and their interconversion, Interconnection of two 2-port networks, Open circuit and Short circuit impedances and ABCD constants, Relation be- tween image impedances and Short circuit and Open circuit impedances. | 10 |
| 4 | Network functions, their properties and concept of transfer impedance, Hurwitz polynomial ,Positive real function and synthesis of LC, RC, RL Networks in Foster's I and II, Cauer's I and II forms. | 10 |
| 5 | Introduction of passive filter and their classification, frequency response, Characteristic impedance of low pass, high pass, Band Pass and Band reject proto- type section | 4 |
| | Total | 40 |

| Sl. No. | Name of Authors / Books /Publishers |
|---|---|
| 1 | "Engineering Circuit Analysis", by W H Hayt, TMH Eighth Edition |
| 2 | "Network analysis and synthesis", by F F Kuo, John Weily and Sons, 2nd Edition |
| 3 | "Circuit Theory", by S Salivahanan, Vikas Publishing House 1st Edition, 2014 |
| 4 | "Network analysis", by M. E. Van Valkenburg, PHI, 2000 |
| 5 | "Networks and Systems", by D. R. Choudhary, New Age International, 1999 |
| 6 | "Electric Circuit", Bell Oxford Publications, 7th Edition. |

| EC102 | Signals and Systems | 3L:0T:0P | 3 Credits |
|---|---|---|---|

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1 | Introduction to Signal and System : Definition, classification of systems, standard test signal, properties of system, properties of linear system, Proper- ties: linearity: additivity and homogeneity, Shift-invariance, Causality | 10 |
| 2 | Linear time-invariant (LTI) systems, impulse response and step response, con- volution, Characterization of causality and stability of linear time-invariant systems. System representation through differential equations and difference equations. | 7 |
| 5 3 | Laplace transformation : Laplace transform of some important function, Shift theorem and its application, Laplace transform of periodic signals, Func- tional analysis of response, Initial and Final value theorems, Response to peri- odic sinusoidal excitation, Region Of Convergence, Poles and Zeros of system, Laplace domain analysis, Solution to differential equations. | 9 |
| 4 | Analysis of Fourier Methods : Fourier series expansion, Functional symme- try condition, Exponential form of Fourier series, Fourier integral and Fourier transform, Multiplication and their effect in the frequency domain, Magnitude and Phase response, DTFT, Parseval's Theorem | 9 |
| 5 | Z-transformation : Z transform of Discrete time signal, LTI system, solution of difference equation, Application of Z transform to open loop system, Region Of Convergence, z-domain analysis. | 5 |
| | Total | 40 |

| Sl. No. | Name of Authors / Books /Publishers |
|---|---|
| 1 | "Signal and System", A.V Oppenheim, A.S Willsky and I.T Young, Prentice Hall |
| 2 | "Signals and Systems - Continuous and Discrete", R.F. Ziemer, W.H. Tranter and D.R. Fannin, 4th edition, Prentice Hall |
| 3 | "Analysis of Linear System" by D.K Cheng, Narosa pub. House |
| 4 | "Signal & system" by H.P Hsu, Tata McGraw Hill |

| BS101 | Mathematics III | 3L:0T:0P | 3 Credits |
|---|---|---|---|

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1 | Unit1 (6 Lectures): Polynomials: Orthogonal Polynomials – Lagrange's, Cheby-sev Polynomials; Trigonometric Polynomials; Wavelet transforms : properties, methods, inverses and their applications. | 6 |
| 2 | Unit2 (10 Lectures): Sets, relations and functions: Basic operations on sets, Cartesian products, disjoint union (sum), and power sets. Different types of relations, their compositions and inverses. Different types of functions: Ber and Bei functions; recurrence relations, orthogonality properties. | 10 |
| 3 | Unit3 (6 Lectures): Introduction to Graphs: Graphs and their basic properties – degree, path, cycle, subgraph, isomorphism, Eulerian and Hamiltonian walk, trees. | 6 |
| 4 | Unit4 (10 Lectures): Basic Statistics: Measures of Central tendency: Mo-ments, skewness and Kurtosis ; Probability distributions - Binomial, Poisson and Normal ; evaluation of statistical parameters for these three distributions, Correlation and regression – Rank correlation. | 10 |
| 5 | Unit5 (10 Lectures): Applied Statistics: Curve fitting by the method of least squares- fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations. | 10 |
| | Total | 40 |

| Sl. No. | Name of Authors / Books /Publishers |
|---|---|
| 1 | 1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley and amp; Sons, 2006. |
| 2 | 2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010. |
| 3 | 4. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw- Hill, New Delhi, 2010 |

| | |
|---|---|
| 4 | C. L. Liu, Elements of Discrete Mathematics, 2nd Ed., Tata McGraw-Hill, 2000. |

## EC 103 - Object Oriented Programming

| EC103 | Object Oriented Programming | 3L:0T:0P | 3 Credits |
|---|---|---|---|

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1 | Introduction to C++ : Object Oriented Technology, Advantages of OOP, Input-output in C++, Tokens, Keywords, Identifiers, Data Types C++, De- rives data types. The void data type, Type Modifiers, Typecasting, Constant, Operator, Precedence of Operators, Strings. | 3 |
| 2 | Control Structures : Decision making statements like if-else, Nested if-else, goto, break, continue, switch case, Loop statement like for loop, nested for loop, while loop, do-while loop. | 3 |
| 3 | Functions : Parts of Function, User-defined Functions, Value-Returning Func- tions, void Functions, Value Parameters, Function overloading, Virtual Func- tions. | 3 |
| 4 | Classes and Data Abstraction : Structure in C++, Class, Build-in Op- erations on Classes,Assignment Operator and Classes, Class Scope, Reference parameters and Class Objects (Variables), Member functions, Accessor and Mutator Functions, Constructors, default Constructor, Destructors. | 15 |
| 5 | Overloading and Templates : Operator Overloading, Function Overload- ing, Function Templates, Class Templates. | 5 |
| 6 | Inheritance : Single and Multiple Inheritance, virtual Base class, Abstract Class, Pointer and Inheritance, Overloading Member Function. | 5 |
| 7 | Pointers and Arrays : Void Pointers, Pointer to Class, Pointer to Object, The this Pointer, Void Pointer, Arrays. | 6 |
| 8 | Exception Handling : The keywords try, throw and catch. Creating own Exception Classes, Exception Handling Techniques (Terminate the Program, Fix the Error and Continue, Log the Error and Continue), Stack Unwinding. | 5 |
| | Total | 40 |

| Sl. No. | Name of Authors / Books /Publishers |
|---|---|
| 1 | "Thinking in C++", Volume 1 and 2 by Bruce Eckel, Chuck Allison, Pearson Education |
| 2 | "Mastering C++", 1/e by Venugopal, TataMcGraw Hill. |
| 3 | "Object Oriented Programming with C++", 3/e by E. Balaguruswamy, Tata McGraw Hill. |
| 4 | "Starting Out with Object Oriented Programming in C++", by Tony Gaddis, Wiley India. |

| | | |
|---|---|---|
| **Object Oriented Programming Lab are according to the theory mentioned above.** | 0L: 0T: 2P | 1 Credit |

| | | | |
|---|---|---|---|
| ES101 | Basic Electronics | 3L:0T:0P | 3 Credits |

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1 | PN junction diode : Depletion layer, Barrier potential, Forward and Reverse bias, Breakdown voltage, I-V characteristics of PN junction diode, Knee voltage, Ideal PN junction diode, Diode capacitances, Breakdown diodes (Avalanche and Zener diode). Photodiode and Light Emitting Diode. | 8 |
| 2 | Rectifiers and filters : Half wave and Full wave rectifiers (Centre-tap and Bridge), Regulation, Ripple factor, R-C, L-C and Pi filters. Clipping and Clamping circuits, Voltage multiplier. | 8 |
| 3 | BJT: Basic theory and Operation of PNP and NPN transistors, Characteristics of C-B, C-E and C-C configuration. Biasing : Base bias, Emitter feedback bias, Voltage divider bias, Load line, Operating point, Incremental analysis using hybrid model. | 10 |
| 4 | FET : Introduction, Operation, I-V characteristics, JFET parameters, JFET amplifiers. MOSFET: Introduction, Operation, MOSFET parameters. | 8 |
| 5 | Integrated circuit: Characteristics of an ideal Operational Amplifier. Application as inverting, noninverting amplifiers. Summer, Difference Amplifier, Differentiator, Integrator. Feedback Amplifiers. | 8 |
| | Total | 42 |

| Sl. No. | Name of Authors / Books /Publishers |
|---|---|
| 1 | "Electronic devices and circuit theory" by Boylestead and Nashelsky, Pearson |
| 2 | "Electronic principle" by Albert Malvino and Davis J Bates, TMH |
| 3 | "Integrated Electronics", By Jacob Millman and Christos Halkias |

**Basic Electronics Lab are according to the theory mentioned above.**

| ES102 | Electrical & Electronic Material | 3L:0T:0P | 3 Credits |
|---|---|---|---|

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1 | Atomic structure and bonding in materials. Crystal structure of materials, Crystal systems, Unit cells and space lattices, Determination of structures of simple crystals by X-ray diffraction, Miller indices of planes and directions, Packing geometry in Metallic, Ionic and Covalent solids. Concept of amor- phous, single and polycrystalline structures and their effect on properties of materials. Crystal growth techniques. Imperfections in crystalline solids and their role in influencing various properties. | 8 |
| 2 | Band theory of Solids : Energy band diagram, E – K Diagram, Reduced E – K Diagram, Insulators, Semiconductors & Conductors. | 5 |
| 3 | Semiconductor : Single Crystal, Polycrystalline and Amorphous, Fermi – Dirac Distribution, Hall effect, Intrinsic & Extrinsic, N type & P type, Crystal growth – (1) Preparation of electronic grade polycrystal in Siemens reactor,(2) Czochrarlski Method & Float Zone method of bulk single crystal ingot prepara- tion (3) Mirror finished wafer preparation (4) Epitaxial film growth – Chemical Vapor phase Deposition & Liquid Phase Epitaxy (5) Molecular Beam Epitaxy. | 10 |
| 4 | Dielectric behavior of materials : Polarization, Dielectric constant at low frequency & high frequency, Dielectric loss, Piezoelectricity & FerroElectricity | 5 |
| 5 | Magnetic Properties : Origin of magnetism in metallic and ceramic ma- terials, Paramagnetism, Diamagnetism, Antiferromagnetism, Ferromagnetism, Ferrimagnetism, magnetic hysteresis, Influence of temperature on magnetic be- haviour, domains and Hysteresis. | 5 |
| 6 | Superconductors : Low and High temperature (YBaCuO) superconductors, Meissner effect, Applications. | 4 |
| 7 | Printed Circuit Board : Manufacturing process, Single- & Double-sided boards, surface mounted devices | 3 |
| | Total | 40 |

| Sl. No. | Name of Authors / Books /Publishers |
|---|---|
| 1 | “Solid State Physics”, by Kittel, McGraw Hill. |
| 2 | “Principles of Electric Engineering Materials & Devices”, by S.O. Kasp, Mc- Graw Hill. |
| 3 | “Structure & properties of materials (VOL VI), Electronic Properties”, by |

| | |
|---|---|
| | Robert M. Rose, Lawrence A.Shepherd & John Wulf, Wiley Eastern Ltd. |

| | | |
|---|---|---|
| **Electrical and Electronics Materials Lab are according to the theory mentioned above.** | 0L: 0T: 2P | 1 Credit |

## 104 – ELECTRONICS & COMMMUNICATION ENGINEERING

**Semester IV [Second year] Branch/Course Electronics & Communication Engineering**

| sr. no. | CODE | Course Title | L | T | P | H | Credit |
|---|---|---|---|---|---|---|---|
| 1 | | Digital Circuits | 3 | 1 | 0 | 4 | 4 |
| 2 | | Digital Circuits Lab | 0 | 0 | 2 | 2 | 1 |
| 3 | | Analog Circuits | 3 | 0 | 0 | 3 | 3 |
| 4 | | Analog Circuits Lab | 0 | 0 | 2 | 2 | 1 |
| 5 | | Semiconductor Physics and Devices | 3 | 0 | 0 | 3 | 3 |
| 6 | | Semiconductor Physics and Devices Lab | 0 | 0 | 2 | 2 | 1 |
| 7 | | Analog Communication | 3 | 0 | 0 | 3 | 3 |
| 8 | | Analog Communication Lab | 0 | 0 | 2 | 2 | 1 |
| 9 | | Electromagnetic Theory | 3 | 1 | 0 | 4 | 4 |
| 10 | | OpenElective-1 / MOOC/SWAYAM Courses | 3 | 0 | 0 | 3 | 2 |
| 11 | | Stress Management by Yoga (Non-Credit) | 2 | 0 | 0 | 2 | 0 |
| | | | TOTAL | | | | 23 |

**Electronics & Communication Engineering IV Semester**

**Branch Code – 104**

| EC104 | Digital Circuits | 3L:1T:0 P | 3 Credits |
|---|---|---|---|

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1 | Digital Principle : Analog vs Digital, Number system, Computer Codes, Digital Signals, Waveforms Positive and Negative logic, Logic Gate : basic, universal and others, Truth Table, Logic functions, IC Chips, Timing Diagram, Electrical analogy. | 5 |
| 2 | Boolean laws and theorems : Logic functions, Conversion of logic func- tions into truth table and vice versa. SOP and POS forms of representation, Canonical form, minterms and maxterms, Simplification of logic functions by theorems and Karnaugh's map, don't care conditions. | 5 |
| 3 | Analysis and synthesis of Combinational logic circuits:<br><br>Compara- tors, Multiplexers, Encoder, Decoder, 7 Segment Display, Half Adder and Full Adder, Subtractors, Serial and Parallel Adders, BCD Adder | 6 |
| 4 | Sequential circuit blocks and latches : Flip-Flops-Race around condition, Master-Slave and Edge triggered SR, JK, D and T Flip Flop, Shift registers, Counters-Synchronous and Asynchronous: Design of ripple counter | 10 |
| 5 | Timing circuit : Multivibrators, Monostable and Astable timer: LM555 | 4 |
| 6 | Integrated circuit logic families : RTL, DTL, TTL, CMOS, IIL/I2L (In- tegrated Injection logic and Emitter Coupled logic). | 5 |
| 7 | Use of building blocks : Designing larger systems such as Digital-to-Analog Converters (DAC) : Weighted resistors and R-2R, Analog-to-Digital(ADC)- converter, counter and succession. | 5 |
| | Total | 40 |

| Sl. No. | Name of Authors / Books /Publishers |
|---|---|
| 1 | "Digital Fundamentals", Floyd and Jain., Pearson |
| 2 | "Digital Logic and Computer Design", M.Morris Mano, |

| | |
|---|---|
| | Pearson |
| 3 | “Fundamentals of Digital Circuits”, A.Anand Kumar, PHI |
| 4 | “Digital Systems”, Ronald J.Tocci, Neal S.Widmer, Pearson |

| | | |
|---|---|---|
| **Digital Circuits and Systems Lab are according to the theory mentioned above.** | **0L: 0T: 2P** | **1 Credit** |

| EC105 | Analog Circuits | 3L:0T:0P | 3 Credits |
|---|---|---|---|

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1 | Small signal amplifiers : CB, CE, CC configurations, hybrid model for transistor at low frequencies, RC coupled amplifiers, mid band model, gain and impedance, comparisons of different configurations, Emitter follower, Darlington pair (derive voltage gain, current gain, input and output impedance). Hybrid-model at high frequencies (pi - model). | 7 |
| 2 | Multistage Amplifiers : Cascade and Cascode amplifiers, Calculations of gain, impedance and bandwidth. Design of multistage amplifiers. Feedback Amplifiers: Feedback concept, Classification of Feedback amplifiers, Properties of negative Feedback amplifiers, Impedance considerations in different config- urations. Analysis of feedback Amplifiers. | 11 |
| 3 | Field Effect Transistor : Introduction, Classification, FET characteristics, Operating point, Biasing, FET small signal Model, Enhancement and Depletion type MOSFETs, FET Amplifier configurations (CD,CG and CS). | 7 |
| 4 | Oscillators : Barkhausen criterion , Sinusoidal Oscillators, the RC phase- shift oscillator, resonant circuit Oscillators, a general form of oscillator circuit, the Wien -bridge oscillator, Crystal oscillators, Hartley, Colpitt's and Clapp's Oscillator. | 8 |
| 5 | Power Amplifiers : Power dissipations in transistors, Amplifiers Classifica- tion, (Class-A, Class-B, Class-C, Class-AB) Efficiency analysis, Push-Pull and Complementary Push-pull amplifiers, Cross over distortion and Harmonic distortion in Push-Pull amplifier. Tuned amplifiers (single, double and stagger tuned amplifier). | 6 |
| | Total | 40 |

| Sl. No. | Name of Authors / Books /Publishers |
|---|---|
| 1 | "Electronic Devices and Circuit Theory", Boylestad and Nashelsky, PEARSON PUBLICATION. |
| 2 | "Electronic devices and circuits", Salivahanan, Suresh Kumar, Vallavaraj, TMH, 1999 |
| 3 | "Integrated Electronics, Analog and Digital Circuits and Systems", J. Millman and Halkias, TMH, 2000 |
| 4 | "Micro Electronic Circuits", Sedra and Smith, Oxford University Press, 2000 |
| 5 | "Electronic Devices and Circuits", David A Bell, Oxford University Press, 2000 |

| | | |
|---|---|---|
| **Analog Circuits Lab are according to the theory mentioned above.** | **0L: 0T: 2P** | **1 Credit** |

| EC106 | Semiconductor Physics and Devices | 3L:0T:0P | 3 Credits |
|---|---|---|---|

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1 | Basics of Semiconductor Physics : Semiconductor carrier modelling- Bonding model, Energy band model, Carriers, Band gap, Carrier properties (Effective mass, Intrinsic carrier concentration, Doping), Density of states, Fermi function, Equilibrium carrier concentration (formula for n and p and np product), Charge neutrality relationship, Determination of Fermi level, Carrier concentration, Temperature dependence. Carrier Action - Drift, Mobility, Drift Current, Resistivity, Diffusion Current, Total current, Relation between the diffusion constants and mobility (Einstein's relationship), Recombination-Generation (Band- to-Band, R-G Centres, Auger, Impact Ionization). Equation of state, Continuity equation, Minority Carrier Diffusion Equation. | 10 |
| 2 | PN Junction Diode : Step junction, Built-in potential, Depletion width, Depletion Approximation, Electrostatic relationship (Charge density, Deple- tion width, Potential, Electric field) for Va = 0, Va ¡ 0 and Va ¿ 0, Ideal Diode Equation (Qualitative and Quantitative derivation : Band Model, Assump- tions, Approximation, Boundary condition), Deviation from Ideal (R-G Cur- rent, Series resistance, High Level Injection ), Junction Breakdown (Avalanche and Zener), Reverse Bias Junction Capacitance, forward Bias Diffusion Capac- itance, Qualitative understanding of Turn on and Turn-off transients. Zener Diode, Tunnel diode, Varactor diode, Schottky diode. | 10 |
| 3 | Physics and technologies of BJT : Operational considerations, Modes and Configurations, Performance Parameters (Emitter Efficiency, Base Transport Factor, Common Base Current Gain, Common Emitter Current Gain and their derivation for an ideal transistor, Deviation from ideal (Base Width Modula- tion Punch Through, Avalanche Breakdown, Geometrical effects, R-G current), Small signal modelling. | 6 |
| 4 | Physics and technologies of FET : JUNCTION FET (Theory of operation, I-V relationship), MOS CAPACITOR (Energy Band diagram, Gate-Voltage relationship, Capacitance-Voltage characteristics), MOSFET (Theory of oper- ation, Threshold voltage, I-V characteristics), NON IDEAL MOS (M-S work function difference, oxide charges, threshold adjustment and considerations) | 6 |
| | Introduction to UJT, SCR, Triac and Diac (Construction, | |

| | | |
|---|---|---|
| 5 | Working, Charac- teristics and Application), UJT Relaxation oscillator.<br>Optoelectronic Devices : Photo diodes (PIN and Avalanche), Solar cell, LED, Solid State LASER diodes. | 8 |
| | Total | 40 |

| Sl. No. | Name of Authors / Books /Publishers |
|---|---|
| 1 | "Semiconductor Device Fundamentals", by R. F. Pierret, Addison-Wesley pub- lishing company, 1996 |
| 2 | "Semiconductor Physics and Devices: Basic Principles", by Donald A. Neamen, 3rd Edition, 2003 |
| 3 | "Physics of Semiconductor Devices" S. M. Sze, 2nd edition, 1981 |

| | | |
|---|---|---|
| **Semiconductor Physics Lab are according to the theory mentioned above.** | **0L: 0T: 2P** | **1 Credit** |

| EC107 | Analog Communication | 3L:0T:0 P | 3 Credits |
|---|---|---|---|

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1 | Introduction to the communication system : Block diagram of commu- nication system and comparative study of analog and digital communication. | 3 |
| 2 | Modulation(upward frequency translation) and demodulation (downward fre- quency translation) and the need for modulation: broad classification of modu- lation [linear (amplitude-AM) and exponential (frequency-FM and phase-PM)] | 7 |
| 3 | Generation of double side band (DSB) with carrier, double side band with suppressed carrier (DSB-SC) and single side band with suppressed carrier: De- modulation of double side band with carrier –incoherent detector or envelope detector, peak diode detector, coherent or synchronous detection of DSBSC and single side band with suppressed carrier. | 8 |
| 4 | Superhetrodyne Receivers : Characteristics , Intermediate Frequency and its advantages, image rejection of the Receiver. | 5 |
| 5 | Generation of FM signals(direct and indirect methods) and Demodulation. | 5 |
| 6 | Noise: Different types of Noise, SNR in AM, FM and PM System and use of emphasis Circuit in FM for SNR optimization. | 4 |
| 7 | Analog pulse modulation : PAM, PWM, PPM and demodulation; compar- ative study of various analog pulse modulation | 8 |
| | Total | 40 |

| Sl. No. | Name of Authors / Books /Publishers |
|---|---|
| 1 | "Electronic Communication system", by Kennedy. TMH. |
| 2 | "Communication system", by Haykin, Wiley |
| 3 | "Communication system", by Bruce carison . TMH. |
| 4 | "Modern Digital And Analog Communication", B.P.LATHI Oxford |

| **Analog Communication Lab are according to the theory mentioned above.** | **0L: 0T: 2P** | **1 Credit** |
|---|---|---|

| EC108 | Electromagnetic Theory | 3L:1T:0 P | 3 Credits |
|---|---|---|---|

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1 | Introduction to Vector Algebra, Coordinate Systems and Transformation, Vec- tor Calculus. Electrostatics : Coulomb's law, Gauss's law and its applica- tions, the potential functions, Equipotential surface, Poisson's and Laplace's equation, Applications (solution for some simple cases), Capacitance, Elec- trostatic energy, Conductor properties and boundary conditions between di- electricS and dielectric-conductor interface, Uniqueness Theorem. | 10 |
| 2 | Magnetostatics : Biot-Savart law, Ampere's circuital law, Curl, Stoke's the- orem, Magnetic flux and magnetic flux density, Energy stored in magnetic field, Ampere's force law, Magnetic vector potential, Analogy between electric and magnetic field. | 6 |
| 3 | Maxwell's equations, Equation of Continuity for time varying field. Inconsis- tency of Ampere's circuital law, Maxwell's equations in differential and integral form.<br>Electromagnetic waves : Solution of wave equation in free space, Uniform plane wave propagation, Uniform plane waves, the wave equation for conduct- ing medium, Wave propagation in lossless medium and in conductive medium, Conductors and dielectrics, Polarization | 10 |
| 4 | Reflections and Refractions : Reflection by a perfect conductor with normal as well as oblique incidence. Reflection and refraction by perfect dielectrics with normal and oblique incidence. Surface impedance.<br>Poynting vector : Poynting theorem, Instantaneous, Average and Complex Poynting vector, Power loss in a plane conductor. | 8 |
| 5 | Transmission Lines : Transmission line theory, low loss radio-frequency and UHF transmission line. UHF line as a transformer, voltage step up of the quarter wave transformer. Transmission line chart (Smith Chart). | 8 |
| | Total | 40 |

| Sl. | Name of Authors / Books /Publishers |
|---|---|

| No. | |
|---|---|
| 1 | "Time-harmonic Electromagnetic Fields", R. F. Harrington, Wiley-IEEE Press, 2001 |
| 2 | "Fields and Waves in Communication Electronics", Ramo, S., Whinnery, J.R., and Van Duzer, T., 3rd Ed., John Wiley and Sons, 1994 |
| 3 | "Advanced Engineering Electromagnetics", Balanis, C.E., Wiley India Pvt. Ltd., Reprint, 2008 |
| 4 | "Microwave Engineering", Pozar, D.M., 3rd Ed., John Wiley and Sons, 2004 |

**SemesterV(Thirdyear]**
**Branch/CourseElectronics&CommunicationEngineering**

| **SemesterV-104,Electronics&CommunicationEngineering** | | | | | | |
|---|---|---|---|---|---|---|
| **Sr. No.** | **Course Code** | **CourseTitle** | **L** | **T** | **P** | **Credits** |
| 1 | EC109 | DigitalSignalProcessing | 3 | 0 | 0 | 3 |
| 2 | EC109P | DigitalSignalProcessing Lab | 0 | 0 | 2 | 1 |
| 3 | EC110 | MicroprocessorsandMicrocontrollers | 3 | 0 | 0 | 3 |
| 4 | EC110P | MicroprocessorsandMicrocontrollersLab | 0 | 0 | 2 | 1 |
| 5 | EC111 | LinearControlSystems | 3 | 1 | 0 | 4 |
| 6 | EC112 | Linear Circuits and IntegratedApplications | 3 | 0 | 0 | 3 |
| 7 | EC112P | Linear Circuits and IntegratedApplications Lab | 0 | 0 | 2 | 1 |
| 8 | EC113 | Probability and Stochastic TheoryProcesses | 3 | 0 | 0 | 3 |
| 9 | EC114 | ComputerNetworksand Security | 3 | 0 | 0 | 3 |
| 10 | | EnvironmentalScience | 3 | 0 | 0 | 0 |
| 11 | | SummerEntrepreneurship-II | 0 | 0 | 12 | 6 |
| | | Constitution of India/Essence of Indian KnowledgeTraditional | 3 | 0 | 0 | 0 |
| | | **TOTAL** | | | | 26 |

## 104 - Electronics & Communication EngineeringVSemester

**EC111 LinearControlSystem 3L:1T:0P 3 Credits**

1. Control Systems: Basics & Components, Introduction to basic terms, ClassificationsandtypesofControlSystems,Blockdiagrams&Signalflowgraphs.Transferfunction,Determinationoftransferfunctionusing Blockdiagramreductiontechniquesand Mason'sGainformula.Controlsystemcomponents:Electrical,Mechanical,Electronic, AC/DC Servo Motors,StepperMotors, Tacho Generators,Synchros,MagneticAmplifiers,ServoAmplifiers 8 Hrs.
2. Time-DomainAnalysis:Timedomainperformancespecifications,Transientresponse of first and second order systems,Steadystateerrors and Static errorconstants in unityfeedback control systems, response with P, PI and PID controllers,Limitationsoftimedomainanalysis. 8 Hrs.
3. Frequency Domain Analysis : Polarandinverse polar plots, Frequencydomainspecifications and Performance of LTI systems, Logarithmicplots (Bode plots),GainandPhaseMargins,Relativestability.Correlation with time domain performance,Closed loop frequency responses from Open loop response. Limitations of frequencydomainanalysis,Minimum/Non-minimumphasesys-tems 8Hrs.
4. StabilityandCompensationTechniques:Concepts,absolute,Asymptotic,Conditional andMarginalstability, Routh–Hurwitz andNyquiststabilitycriterion,Rootlocustechniqueanditsapplication.Conceptsofcompensation,series/parallel/series-parallel/feedback compensation, Lag/Lead/Lag- Lead networksforcompensation,CompensationusingP,PI,PIDcontrollers 8Hrs.
5. Control System Analysis using State Variable Methods Control SystemsEngineeringSyllabusStatevariablerepresentation-Conversion of state variablemodels totransferfunctions-Conversionoftransferfunctionstostatevariablemodels-Solution of state equations-Concepts of Controllability and Observability Stabilityof linearsystems-Equivalencebetweentransferfunction and statevariablerepresentations-Statevariableanalysisofdigitalcontrolsystem-Digitalcontroldesignusingstatefeedback.8Hrs.

**Sl.No.Nameof Authors/Books/Publishers**


1 "AutomaticControlSystem",B.C.Kuo,PrenticeHallof India,7thedition,2001
2 "ControlSystemsEngineering-PrinciplesandDesign",NagraathandGopalNewAgePublishers
3 "Controlsystemsengineering",NormanS.Nise,JohnWileyandSons(Asia)Singapore
4 "DesignofFeedbackControlSystem",RaymondT.Stefani,OxfordUniversityPress
5 "Moderncontrolengineering",K.Ogata,Pearson,2002

**EC112LinearIntegratedCircuitsandApplications3L:1T:0P 3**

**Credits(Paper Code: -104504)**

1 ICFabrication:ICclassification,fundamentalofmonolithicICtechnology,epitaxialgrowth, masking and etching, diffusion of impurities.Realization of monolithic ICs andpackaging.Fabricationofdiodes,capacitance,resistanceandFETs 9Hrs.

2 CharacteristicsofOPAMP:IdealOP-AMPcharacteristics,DCcharacteristics,ACcharacteristics,differentialamplifier;frequencyresponseofOP-AMP;BasicapplicationsofOp-Amp–InvertingandNon-invertingAmplifiers,V/IandI/Vconverters,Summer,DifferentiatorandIntegrator 9Hrs.

3 Applications of OPAMP : Instrumentation amplifier, Log and Antilog Amplifiers, first andsecondorderactivefilters,comparators,multivibrators,wave-formgenerators,clippers, clampers,peak detector, S/Hcircuit,D/Aconverter (R- 2R ladderandweightedresistortypes),A/DconvertersusingOp-Amps. 9Hrs.

4 Special ICs: Functional block, characteristics and application circuits with 555 Timer IC-566voltagecontrolledoscillator IC;565-phase lockloop IC,Ana- logmultiplier ICs. 9 Hrs.

5 Application ICs : IC voltage regulators –LM78XX, 79XX Fixed voltage regulators-LM317,723 Variablevoltageregulators, switchingregulator- SMPS- LM 380 power amplifier-ICL8038functiongeneratorIC. 9Hrs.

**Sl.No.Nameof Authors/Books/Publishers**


1 "Op-ampandLinearICs",DavidA.Bell,Oxford,2013

2 "LinearIntegratedCircuits",D.RoyChoudhary,SheilB.Jani,IIedition,NewAge,2003

3 "Op-ampsandLinearIntegratedCircuits",RamakantA.Gayakward,IVedition,PearsonEducation, PHI, 2000

4 "OpampsandLinearIntegratedCircuitsConceptsandApplications",Fiore,Cengage,2010

5 "FundamentalsofAnalogCircuits",FloydandBuchla,Pearson,2013

6 "IntegratedElectronics- Analogand Digitalcircuitssystem",Jacob Millman,ChristosC.Halkias,Tata McGrawHill, 2003

7 "Op-ampandLinearICs",RobertF.Coughlin,FredrickF.Driscoll,PHILearning,6thedition,2012


**LinearIntegratedCircuitsandApplicationsLabareaccordingtothetheorymentioned above. 0L:0T:2P 1Credit**

**EC113ProbabilityTheoryandStochasticProcesses 3L:0T:0P 3 Credits**

1. Setsandsetoperations;Probabilityspace;ConditionalprobabilityandBayestheorem;Combinatorialprobabilityandsamplingmodels. 4 Hrs.
2. Discreterandomvariables,probabilitymassfunction,probabilitydistributionfunction, example random variables and distributions; Continuous random variables,probability density function, probability distribution function, example distributions;6Hrs.
3. Joint distributions, functions of one and two random variables,moments of randomvariables;Conditional distribution, densities and moments;Characteristic functionsof arandomvariable;Markov,ChebyshevandChernoff bounds. 8Hrs.
4. Randomsequences and modes of convergence (everywhere,almosteverywhere,probability, distribution andmeansquare);Limittheorems;Strongand weaklawsof large numbers,centrallimittheorem. 10 Hrs.
5. Random process.Stationary processes.Mean and covariance functions. Ergodicity.TransmissionofrandomprocessthroughLTI.Powerspectraldensity,MarkovchainandMarkov processes. 10 Hrs.

**Sl.No.Nameof Authors/Books/Publishers**


1 "ProbabilityandRandomProcesseswithApplicationstoSignalProcessing,"H.StarkandJ.Woods, ThirdEdition,PearsonEducation

2 "Probability,RandomVariablesandStochasticProcesses",A.PapoulisandS.UnnikrishnanPillai, FourthEdition,McGrawHill.

3 "IntroductiontoProbabilityTheorywithStochasticProcesses",K.L.Chung,SpringerInternational

**EC109Digital SignalProcessing 3L:0T:0P 3Credits**

| | | |
|---|---|---|
| 1 | Overviewof DSP,BasicElementsof DSPsystem,Advantages of DSPover Analog,Classificationof signals, Conceptof frequency in continuoustime and discretetime,Continuoustime andDiscretetimesinusoidalsignals. | 7Hrs. |
| 2 | Discrete time systems :Lineartimeinvariant, Responseof LTIsystem convolutionsum,description of discretetimesystemby difference equation andcompletesolutionofdifferenceequation,Implementationofdiscretetimesystems,Correlationofdiscretetimesignals | 6Hrs. |
| 3 | TransformanditsapplicationstotheanalysisofLTISystems | 3 Hrs. |
| 4 | DiscreteTimeFourierTransform,PropertiesofDTFT | 4 Hrs. |
| 5 | FrequencydomainrepresentationofLTISystems | 5 Hrs. |
| 6 | SamplingandreconstructionofAnalogsignals | 5 Hrs. |
| 7 | DiscreteFourierseries,DiscreteFouriertransform,PropertiesofDFT,FFT | 5Hrs. |
| 8 | Digitalfilterstructure: FIRandIIRdesigns | 5 Hrs. |

**Nameof Authors/Books/Publishers**

a. "DigitalSignalProcessing"byProakisand Manolakis,Pearson
b. "DigitalSignalProcessing"byIngleandProakis,Thomson
c. "DigitalTimeSignalProcessing"byOppenheimandSchafer,Pearson
d. "DigitalSignalProcessing:ComputerBased Approach"byMitra,TMH

**DigitalSignalProcessingLab 0L:0T:2P 1Credit**

**ListofExperiments**

1. Torepresentbasicsignals(Unitstep,unitimpulse,ramp,exponential,sineandcosine).
2. Todevelopprogramfordiscreteconvolution
3. Todevelopprogramfordiscretecorrelation
4. Tounderstandstabilitytest
5. Tounderstandsamplingtheorem
6. Todesign analogfilters(low-pass,highpass,bandpass,bandstop)
7. Todesigndigitalfilters(low-pass,highpass,bandpass,bandstop)
8. Todesignfirfiltersusingwindowstechniques

**EC110MicroprocessorsandMicrocontrollers 3L: 0T:0P 3 Credits**

1 Introduction to Microprocessor Systems: Architecture and Pin diagram of 8085, TimingDiagram,Memoryorganization, Addressingmodes,Interrupts.AssemblyLanguageProgramming,8085interrupts,AdditionalI/Oconceptsandprocesses.8 Hrs.

2 Interfacingof 8085 with 8255, 8254/ 8253, 8251, 8259: Introduction, Generation ofI/OPorts,ProgrammablePeripheralInterface(PPI)-Intel8255,Sample-and-HoldCircuitand Multiplexer,Keyboardand Display Interface,Keyboardand DisplayController(8279),Programmable Interval timers(Intel8253/8254), USART(8251),PIC(8259),DAC,ADC,LCD,StepperMotor. 12Hrs.

3 Introduction to 8086, 80286, 80386 and80486 Microprocessor:8086 Architecture,Generationofphysicaladdress,Pindiagramof8086,MinimumModeandMaximummode,Bus cycle, MemoryOrganization, MemoryInterfacing, AddressingModes,AssemblerDirectives,Instructionsetof8086,AssemblyLanguageProgramming, HardwareandSoftware Interrupts. Introduction of 80286, 80386,and80486microprocessor 9Hrs.

4 Overview of Microcontroller 8051: Introduction to 8051 Microcontroller, Architecture,Memoryorganization,Specialfunctionregisters,PortOperation,MemoryInterfacing, I/OInterfacing, Programming 8051 resources, interrupts, Programmer'smodel of 8051, Operandtypes, Operandaddressing,Datatransfer instructions,Arithmetic instructions, Logic instructions, Controltransfer instructions, TimerandCounterProgramming,InterruptProgramming. 11 Hrs.

**Nameof Authors/Books/Publishers**


1 "MicroprocessorsandMicrocontrollers",MuhammadAliMazidi,Pearson,2006
2 "MicroprocessorsandInterfacing,ProgrammingandHardware",DouglasVHall,TataMcGrawHill, 2006
3 "MicroProcessorArchitecture,Programmingand Applicationswiththe8085",RameshGaonkar,PHI
4 "The8051MicrocontrollerandEmbeddedSystems",MuhammadAliMazidi,JaniceGillispieMazidi,RolinD.MCKinlay,2ndEdition,PearsonEducation,2008
5 "The8086Microprocessor:ProgrammingandInterfacingThePC",KennethJ.Ayala,Delmar Publishers, 2007
6 "AdvancedMicroprocessorsandPeripherals",AKRay,KMBhurchandi,TataMcGrawHill, 2007


**MicroprocessorsandMicrocontrollersLabareaccordingtothetheorymentionedabove.0L : 0T:2P 1Credit**

**EC114ComputerNetworks andSecurity 3L:0T:0P 3 Credits**

1 **Data communication Components:**Representation of dataandits flow Networks ,Various ConnectionTopology, Protocolsand Standards, OSI model, TransmissionMedia, LAN: Wired LAN, Wireless LANs, ConnectingLAN and VirtualLAN, Techniquesfor Bandwidth utilization: Multiplexing- Frequency division, Time division and Wavedivision,Conceptsonspreadspectrum 10 Hrs.

2 **Data Link Layer and Medium Access Sub Layer:** ErrorDetectionand Error CorrectionFundamentals,Blockcoding,HammingDistance,CRC;FlowControlandErrorcontrolprotocols- StopandWait,Go back - N ARQ,Se- lective RepeatARQ, SlidingWindow, Piggybacking, RandomAccess, Multiple access protocols- PureALOHA,SlottedALOHA,CSMA/CD,CDMA/CA 10Hrs.

3 **NetworkLayer:**Switching,Logicaladdressing–IPv4,IPv6;Addressmapping– ARP,RARP,BOOTP andDHCP–Delivery, ForwardingandUnicast Routingprotocols.TransportLayer:ProcesstoProcessCommunication,UserDatagramProto-col(UDP),Transmission ControlProtocol(TCP), SCTPCongestionControl; Qualityof Service,QoSimprovingtechniques:LeakyBucketandToken Bucketalgorithm. 8Hrs.

4 **Application Layer:** Domain Name Space (DNS), DDNS, TELNET, EMAIL, File TransferProtocol(FTP),WWW,HTTP,SNMP,Bluetooth,Firewalls,BasicconceptsofCryptography 6 Hrs.

5 **Network Security:**Passive and Active Attacks, SymmetricEncryption, EncryptionAlgorithms,KeyDistribution,TrafficPadding,MessageAuthen-tication,Hashfunction,Secure Hash function,Public-keyEncryption, Digital Signature, RSA PublicKey Encryption algorithm, Key Management,Secure Socket Layer and Transport layerSecurity,SSL Architecture, SSL Record Pro- tocol, Change Cipher Spec Protocol,AlertProtocol,handshakeProtocol,IPlevelsecurityIPSEC,ApplicationlayersecurityPGP,Firewall,VirtualPrivateNetworks. 8Hrs.

**Nameof Authors/Books/Publishers**


1 “DataCommunicationandNetworking”,4thEdition,BehrouzA.Forouzan,McGraw-Hill
2 “DataandComputerCommunication”,8thEdition,WilliamStallings,PearsonPrenticeHall India
3 “ComputerNetworks”,8thEdition,AndrewS.Tanenbaum,PearsonNewInternationalEditio n.
4 “InternetworkingwithTCP/IP”,Volume1,6thEditionDouglasComer,PrenticeHallofIndia.
5 “TCP/IPIllustrated”,Volume1,W.RichardStevens,Addison-Wesley,UnitedStatesofAmerica
6 “NetworkSecurityBible”,by Cole,KrutzandConley,Wileydreamtech

| | | | |
|---|---|---|---|
| **MC 401** | **EnvironmentalScience** | **3L : 0T:0P**<br>**0Credits** | **(Mandatorynon-creditcourse)** |

We as human being are not an entity separate from the environment around usrather we are a constituent seamlessly integrated and co-exist with the environment aroundus.We arenotanentitysoseparatefromtheenvironmentthatwecanthinkofmasteringand controlling it rather we must understand that each and every action of oursreflectsontheenvironmentandviceversa.AncientwisdomdrawnfromVedasaboutenvironment and its sustenance reflects these ethos. There is a direct application of thiswisdomeveninmoderntimes.Ideaofanactivitybasedcourseonenvironmentprotectionistosensitizethestudentsontheaboveissuesthroughfollowingtwotypeofactivities:

**(a) AwarenessActivities:**

i) Smallgroupmeetingsaboutwatermanagement,promotionofrecycleuse,generationoflesswaste,avoidingelectricitywaste
ii) Sloganmakingevents
iii) Postermakingevents
iv) Cyclerally
v) Lecturesfromexperts

**(b) ActualActivities:**

i) Plantation
ii) Giftingatreetoseeitsfullgrowth
iii) Cleanlinessdrive
iv) Driveforsegregationofwaste
v) Tolivesomebigenvironmentalistforaweekorsotounderstandhiswork
vi) Toworkinkitchengardenformess
vii) Toknowaboutthedifferentvarietiesofplants
viii) ShuttingdownthefansandACsofthecampusforanhourorso

**SemesterVI(Third year]**
**Branch/CourseElectronics&CommunicationEngineering**

| Course Code | Paper Title | L | T | P | Credits | branch |
|---|---|---|---|---|---|---|
| | BiologyforEngineers | 2 | 1 | 0 | 3 | 104 |
| | ComputerOrganizationandArchitecture | 3 | 0 | 0 | 3 | 104 |
| | Digital Communication | 3 | 1 | 2 | 5 | 104 |
| | DisasterManagement | 3 | 0 | 0 | 0 | 104 |
| | ElectronicsInstrumentsandMeasurement | 3 | 1 | 2 | 5 | 104 |
| | MOOCs/SWAYAM/NPTELCourses -2 | 2 | 0 | 0 | 2 | 104 |
| | ProgramElective-I | 3 | 0 | 0 | 3 | 104 |
| | Workshop/headsonTraining/SoftSkill | 3 | 0 | 0 | 0 | 104 |

**SemesterVI(Third year]**
**Branch/CourseElectronics&CommunicationEngineering**

**EC115DigitalCommunication 3L:1T:0P 3Credits**

**Contents** **Hours**

**1 Introduction:** Block Diagram of Digital Communication System, Advantages of Digital communication system over Analogcommunication systems, Sampling theorem, Signal reconstruction in timedomain, Practical andFlat Top Sampling, Sampling of Band-pass Signal, Aliasing Problem,Uniform and Non-uniformquantization. Signal to Quantization ratio of Quantized Signal. 7 Hrs.

**2 Baseband Transmission:**Line Coding and its properties, Various types of PCM waveforms. Attributes of PCM waveforms, Mary Pulse Modulation waveforms, Differential Pulse Code Modulation, Multiplexingof PCMsignals, Delta modulation, Idling noise and slope overload, AdaptiveDelta Modulation, AdaptiveDPCM,Comparisonof PCMand DM 9 Hrs.

**3 Baseband Detection:**Error performancedegradation in communication systems, Eb/NO parameter, Matchedfilteranditsderivation, Inter-Symbol Interference (ISI),Nyquistcriterion for zero ISI and raised cosine spectrum, Correlation detector : Decision thresholdand Error probability for Binary, Unipolar(on-off ) signalling 7 Hrs.

**4 Band-pass Modulation and Demodulation:**Types of digital modulation, Waveformsfor Amplitude, Frequencyand PhaseShift Keying, Methodof generationanddetectionof coherent andnon-coherent binaryASK, FSK and PSK,Differentialphaseshiftkeying,Quadrature modulation techniques, M- ary FSK,MinimumShift Keying (MSK),Probability of error and comparison of variousdigitalmodulation techniques 9 Hrs.

**5 Error:**A base band signal receiver, Probability of error, The Optimum filter, MatchedFilter, Probability of error in Matchedfilter, Coherent reception, Coherent receptionof ASK, PSKand FSK,Non-Coherent receptionof ASK, FSK, PSK and QPSK, Calculation of bit error probability of BPSK and BFSK, Errorprobability for QPSK 6 Hrs.

**6 Multiple Access Techniques:** Time division multiplexing, Frequency division multiplexing, Code division multiplexing, Introduction to upcoming techniques of transmission 2 Hrs.

**Sl.No.NameofAuthors/Books /Publishers**


1. "CommunicationSystems",SimonHaykin,Wileypublication,4thEdition,2004
2. "Digital CommunicationFundamentalsand Applications",Bernard Sklar,Pearson Education India, 2nd Edition, 2009

3. "ModernElectronicCommunication",MillerGaryM,Prentice-Hall,6thEdition, 1999
4. "DigitalCommunications",JohnProakis,TataMcGrawHill,5thEdition, 2007
5. "ElectronicCommunicationSystems,FundamentalsThrough Advanced",WayneTomsi, Pearson Education, 4th Edition, 2001

**DigitalCommunicationLabareaccordingtothetheorymentionedabove.0L:0T:2P 1 Credit**

**EC116ElectronicsInstrumentsandMeasurements 3L:1T:0P 3Credits**

Contents Hours

1 Introduction to Standards of Measurement, Errors and their evaluation. Calibration, Accuracy, Precision Sensitivity, Resolution, Noise, etc. 3 Hrs.

2 Measurements of voltage, current, power and energy:Moving iron, moving coil, thermal, Induction and Rectifier type.

Measurements of power factor and frequency: Dynamometer and moving iron single and three phase power factor meters, Resonance, moving coil and moving iron frequency meters.

Range extension of voltmeter, ammeter, Wattmeter and Energy meter: Voltmeter multipliers, Ammeter shunt, Current and Potential Transformers 10 Hrs.

3 Galvanometer:D'Arsonval,VibrationandBallisticgalvanometers 5Hrs.

4 Bridges:D.C.bridges:Kelvindoublebridge,WheatstonebridgeandCarey-Fosterbridge; A.C.bridges: MaxwellBridge,HayandOwenbridges,AndersonBridge,WienBridge, Schering Bridge and Heaviside-Campbell Bridge 7 Hrs.

5 Potentiometer's Principle, Standardization and application: D.C. Potentiometers:Crompton and Vernier potentiometers, A.C. Potentiometers: Coordinate type and Polar type 5 Hrs.

6 Magnetic measurements:Measurementof magneticflux by ballisticgalvanometer and fluxmeter,Determination of B-H curveand hysteresis loop, Separation of iron loss into hysteresisand eddy current losses,Measurement of iron loss and its separation on Lloyad-Fisher squares 5 Hrs.

7 Digitalmeasurements:DigitalvoltmeterandmultimeterUniversal counteranditsuses for measurements of frequency,ratioof twofrequencies,Time period and Pulsewidth. 5Hrs.

**NameofAuthors/Books /Publishers**


1 "MeasurementSystem,ApplicationandDesign",EODoeblin,TMH
2 "Course in Electrical and Electronic Measurement and Instrumentation", A K Sawhney,Dhanpat Rai and Sons
3 "ElectronicMeasurementsandInstrumentation",RajendraPrasad,KhannaPublishers
4 "BasicElectricalMeasurements",M.B.Stout,PrenticeHall


**ElectronicInstrumentsandMeasurementLabareaccordingtothetheorymentionedabove.**
**0L:0T:2P 1Credit**

**EC117ComputerOrganizationand Architecture 3L:0T:0P 3Credits**

Contents Hours

1 Introduction: Computer Arithmetic, Instruction sets, Introduction to computer organization, CPU Design.Micro programmed Control: Control Memory, Address sequencing, Micro programming, sequencing and execution of microinstructions. 10 Hrs.

2 Memory system: Hierarchical memory structure, Cache memories, Set Associative memory, Virtual Memory, Paging, Segmentation, Input-Output Inter- face, Asynchronous Data Transfer, Programmed I/O, Interrupts, Direct Memory Access 8 Hrs.

3 Input-OutputOrganization: BasicInput/OutputStructure of Computers, serial andparallel communications, AsynchronousDataCommunication, Programmed I/O, Interrupt DrivenI/O, Interrupt Controller, DMA,Device Drivers,Buses. 10 Hrs.

4 Introduction to Parallel Processing:Evolutionof computer systems (RISC vs.CISC), Parallelismin uniprocessor systems, Architectural classification schemes. 5 Hrs.

5 Principles of PipeliningandVectorprocessing:Pipelinestrategy, Pipelineperformance, Controlsand Data paths,Overlapped parallelism,Principles of designing pipelined processors, Vectorprocessing requirements 7 Hrs.

**NameofAuthors/Books /Publishers**


1 ComputersystemarchitecturebyM.Morris Mano
2 ComputerArchitectureandparallelprocessingbyKaiHwang,Briggs,McGraw
3 Hill
4 ComputerArchitecturebyCarter,TataMcGrawHill.
5 ComputerSystemOrganizationandArchitecturebyJohnD.Carpinelli,Pearson Education

| BSC109 | BiologyforEngineers | 3L:0T:0P | 3credits |
|---|---|---|---|

[3 credit course; 2 (onehour) lectures and one (one hour) tutorial per week.Only lecture hoursare shown]

**Module1**.(2hours)- Introduction
**Purpose:** To convey that Biology is as important a scientific discipline as Mathematics, Physics and Chemistry

Bring out the fundamental differences between science and engineering by drawing a comparison betweeneyeandcamera,Birdflyingandaircraft.Mentionthemostexcitingaspectofbiologyasan independent scientific discipline. Why we need to study biology?Discusshowbiological observations of 18th Century that lead to major discoveries.Examples from Brownian motion and the origin of thermodynamics by referring to the original observation of Robert Brown and Julius Mayor. These examples will highlight the fundamental importance of observations in any scientific inquiry.

**Module2**.(3hours)-Classification
**Purpose:** To convey that classification per se is not what biology is all about.The underlying criterion, such as morphological, biochemical or ecological be highlighted. Hierarchy of life forms at phenomenological level. A common thread weaves this hierarchy Classification. Discussclassification based on (a) cellularity- Unicellular or multicellular (b) ultrastructure-prokaryotes or eucaryotes.(c) energy and Carbon utilization -Autotrophs, heterotrophs, lithotropes (d) Ammonia excretion – aminotelic, uricoteliec, ureotelic (e) Habitata- acquatic or terrestrial (e) Molecular taxonomy-three major kingdomsof life. A givenorganism can come under different categorybased on classification. Model organisms for the study of biology come from different groups.E.coli, S. cerevisiae, D. Melanogaster, C. elegance,A. Thaliana, M. musculus

**Module3**.(4hours)-Genetics
**Purpose:**Toconveythat"GeneticsistobiologywhatNewton'slawsaretoPhysicalSciences"

Mendel's laws, Concept of segregation and independent assortment. Concept of allele.Gene mapping, Gene interaction, Epistasis. Meiosis and Mitosis be taught as a part of genetics. Emphasis to be give not to the mechanicsof cell division nor the phasesbut howgeneticmaterial passesfrom parenttooffspring.Conceptsofrecessivenessanddominance.Conceptofmappingofphenotypeto genes.Discuss about the single gene disorders in humans. Discusstheconcept of complementation using human genetics.

**Module4**.(4hours)-Biomolecules
**Purpose**: To convey that all forms of life has the same building blocks and yet the manifestationsare as diverse as one can imagine

Molecules of life.In this context discuss monomeric units and polymeric structures. Discuss about sugars, starch and cellulose.Amino acids and proteins.Nucleotides and DNA/RNA.Two carbon units and lipids.

**Module5**.(4Hours).Enzymes
**Purpose:**Toconveythatwithoutcatalysislifewouldnothaveexistedonearth

Enzymology: How to monitor enzyme catalyzed reactions. How does an enzyme catalyzereactions. Enzymeclassification.Mechanismofenzymeaction.Discussatleasttwoexamples.Enzymekinetics and kinetic parameters.Why should we know these parameters to understand biology? RNA catalysis.

**Module6**.(4hours)-Information Transfer
**Purpose:** The molecular basis of coding and decoding genetic information is universal Molecular basis of information transfer.DNA as a genetic material. Hierarchy of DNA structure- from single stranded to double helix to nucleosomes.Concept of genetic code.Universality and degeneracyof genetic code. Define gene in terms of complementation and recombination.

**Module7**.(5hours).Macromolecularanalysis
**Purpose:**Howtoanalysesbiologicalprocessesatthereductionistic level

Proteins- structure and function. Hierarch in protein structure. Primary secondary, tertiary and quaternary structure.Proteins as enzymes, transporters, receptors and structural elements.

**Module8**.(4hours)-Metabolism

**Purpose:** The fundamental principles of energy transactions are the same in physical and biological world.

Thermodynamics as applied to biological systems.Exothermic and endothermic versus endergonic and exergoinc reactions.Concept of $K_{eq}$and its relation to standard free energy.Spontaneity. ATP as an energy currency.This should include the breakdown of glucose to $CO_2$ + $H_2O$ (Glycolysis and Krebs cycle) and synthesis of glucose from $CO_2$and $H_2O$ (Photosynthesis). Energy yielding and energy consuming reactions. Concept of Energy charge

**Module9**.(3hours)-Microbiology
Concept of single celled organisms. Concept of species and strains. Identification and classificationof microorganisms. Microscopy. Ecologicalaspects of single celled organisms.Sterilization and media compositions. Growth kinetics.

**Module10**:PlantPhysiologycovering,Transpiration;Mineralnutrition(3Lectures)

**Module 10B**: Ecology covering, Ecosystems- Components, types, flow of matter and energy in an ecosystem; Community ecology- Characteristics, frequency, life forms, and biological spectrum; Ecosystem structure- Biotic and a-biotic factors, food chain, food web, ecological pyramids; (3 Lectures)

**References:**


1. Biology:Aglobalapproach:Campbell,N.A.;Reece,J.B.;Urry,Lisa;Cain,M,L.;Wasserman, S.A.;Minorsky,P.V.;Jackson,R.B.PearsonEducationLtd
2. OutlinesofBiochemistry,Conn,E.E;Stumpf,P.K;Bruening,G;Doi,R.H.,JohnWileyandSons
3. PrinciplesofBiochemistry(VEdition),ByNelson,D.L.;andCox,M.M.W.H.Freemanand Company
4. MolecularGenetics(Secondedition),Stent,G.S.;andCalender,R.W.H.Freemanandcompany, Distributed by Satish Kumar Jain for CBS Publisher
5. Microbiology,Prescott,L.MJ.P.HarleyandC.A.Klein1995.2ndeditionWm,C.Brown Publishers


**ECEL1012 Digital CMOS VLSI Design 3 Credits**

**1 MOS transistor theory and modelling:-**

The Metal Oxide Semiconductor (MOS) Structure, MOS System under External Bias, Structure and Operation of MOS Transistor (MOSFET), Current-Voltage Characteristics, Scaling and Small-geometry Effects, MOSFET modelling, Small-signal model. 8 Hours

**2 Fabrication and Layout of CMOS ICs:-**

Fabrication Process Flow: Basic Steps, CMOS nWell Process, Layout Design Rules, Full-Custom Mask Layout Design. 8 Hours

**3 MOS INVERTERS Static characteristics:-**

Resistive-Load Inverter, Inverters with n-Type MOSFET Load, CMOS Inverter. Switching characteristics and interconnect effects :- Delay-Time definitions, Calculation of Delay times, Inverter Design with Delay Constraints, Estimation of Interconnect Parasitics, Calculation of Interconnect Delay, Switching Power Dissipation of CMOS In- verters. 10 Hours

**4 Combinational MOS logic circuits:-**

MOS Logic Circuits with Depletion MOS Loads, CMOS Logic Circuits, Complex Logic Circuits, CMOS Trans- mission Gates (Pass Gates) 8 Hours

**5 Sequential MOS logic circuits:-**

Behaviour of Bistable elements, The SR Latch Circuit, Clocked Latch and Flip-Flop Circuits, CMOS D-Latch and Edge- Triggered Flip-Flop. 8 Hours

**Name of Authors / Books /Publishers**

1 "CMOS: Digital Integrated Circuits", by Sung-Mo Kang and Yusuf Leblibici, 3rd edition, McGraw-Hill Higher Education, 2003

**ECEL 1011 Digital Image & Video Processing 3L: 0T: 0P 3 Credits**

1 Digital Image Fundamentals: Elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels neighbourhood, adjacency, connectivity, distance measures 8 Hours.

2 Image Enhancements and Filtering: Gray level transformations, histogram equalization and specifications, pixel-domain smoothing filters – linear and order-statistics, pixel-domain sharpening filters – first and second derivative, two-dimensional DFT and its inverse, frequency domain filters –low-pass and high-pass. 8 Hours.

3 Color Image Processing: Color models–RGB, YUV, HSI; Color transformations formulation, color complements, color slicing, tone and color corrections; Color image smoothing and sharpening; Color Segmentation. 8 Hours.

4 Image Segmentation: Detection of discontinuities, edge linking and boundary detection, thresholding–global and adaptive, region-based segmentation. 6 Hours.

5 Wavelets and Multi-resolution image processing: Uncertainty principles of Fourier Transform, Time frequency localization, continuous wavelet trans- forms, wavelet bases and multi-resolution analysis, wavelets and Sub band filter banks, wavelet packets. Image Compression-Redundancy–inter-pixel and psycho-visual; Loss less compression – predictive, entropy; Lossy compression- predictive and transform coding; Discrete Cosine Transform; Still image com- pression standards–JPEG and JPEG-2000 8 Hours.

6 Fundamentals of Video Coding: Inter-frame redundancy, motion estimation techniques – full-search, fast search strategies, forward and backward motion prediction, frame classification – I, P and B; Video sequence hierar- chy–Group of pictures, frames, slices, macro-blocks and blocks; Elements of a video encoder and decoder; Video coding standards – MPEG and H.26X. Video Segmentation-Temporal segmentation–shot boundary detection, hard- cuts and soft-cuts; spatial segmentation–motion-based; Video object detection and tracking. 12 Hours.

**Name of Authors / Books /Publishers**

1 R.C. Gonzalez and R.E. Woods, Digital Image Processing, Second Edition, Pearson Education 3rd edition 2008

2 Anil Kumar Jain, Fundamentals of Digital Image Processing, Prentice Hall of India 2nd edition 2004

3 Murat Tekalp, Digital Video Processing" Prentice Hall, 2nd edition 2015.

**ECEL1013 Scientific Computing 3credit.**

1 Introduction: Sources of Approximations, Data Error and Computational, Truncation Error and Rounding Error, Absolute Error and Relative Error, Sensitivity and Conditioning, Backward Error Analysis, Stability and Accuracy Computer Arithmetic: Floating Point Numbers, Normalization, Properties of Floating Point System, Rounding, Machine Precision, Subnormal and Gradual Underflow, Exceptional Values, Floating- Point Arithmetic, Cancellation 8 Hours

2 System of liner equations: Linear Systems, Solving Linear Systems, Gaussian elimination, Pivoting, Gauss-Jordan, Norms and Condition Numbers, Symmetric Positive Definite Systems and Indefinite System, Iterative Methods for Linear Systems Linear least squares: Data Fitting, Linear Least Squares, Normal Equations Method, Orthogonalization Methods, QR factorization, Gram- Schmidt Orthogonalization, Rank Deficiency, and Column Pivoting 8 Hours

3 Eigenvalues and singular values: Eigenvalues and Eigenvectors, Methods for Computing All Eigenvalues, Jacobi Method, Methods for Computing Selected Eigenvalues, Singular Values Decomposition, Application of SVD Non- linear equations: Fixed Point Iteration, Newton's Method, Inverse Interpolation Method Optimization: One-Dimensional Optimization, Multidimensional Unconstrained Optimization, Nonlinear Least Squares 8 Hours

4 Interpolation: Purpose for Interpolation, Choice of Interpolating, Function, Polynomial Interpolation, Piecewise Polynomial Interpolation Numerical Integration And Differentiation: Quadrature Rule, Newton-Cotes Rule, Gaussian Quadrature Rule, Finite Difference Approximation, Initial Value Problems for ODES, Euler's Method, Taylor Series Method, Runga-Kutta Method, Extrapolation Methods, Boundary Value Problems For ODES, Finite Difference Methods, Finite Element Method, Eigenvalue Problems 8 Hours

5 Partial Differential Equations, Time Dependent Problems, Time Independent Problems, Solution for Sparse Linear Systems, Iterative Methods Fast Fourier Transform, FFT Algorithm, Limitations, DFT, Fast polynomial Multiplication, Wavelets, Random Numbers And Simulation, Stochastic Simulation, Random Number Generators, Quasi-Random Sequences 8 Hours

**Name of Authors / Books /Publishers**

1 Heath Michael T., "Scientific Computing: An Introductory Survey", McGraw-Hill, 2ndEd. 2002 22

2 Press William H., Saul A. Teukolsky, Vetterling William T and Brian P. Flannery, “Numerical Recipes: The Art of Scientific Computing”, Cambridge University Press, 3rd Ed., 2007
3 Xin-she Yang (Ed.)., “Introduction To Computational Mathematics”, World Scientific Publishing Co., 2nd Ed., 2008
4 Kiryanov D. and Kiryanova E., “Computational Science”, Infinity Science Press, 1st Ed., 2006
5 Quarteroni, Alfio, Saleri, Fausto, Gervasio and Paola, “Scientific Computing With MATLAB and Octave”, Springer, 3rd Ed., 2010.

**Semester VII (Fourth Year]**
**Branch/Course Electronics & Communication Engineering**

| Course Code | Course Title | L | T | P | Credits | Branch | | | |
|---|---|---|---|---|---|---|---|---|---|
| 104701 | Business Analytics | 3 | 0 | 0 | 3 | 104 | TH | 70 | 30 |
| 104702 | Cost Management of Engineering Projects | 3 | 0 | 0 | 3 | 104 | TH | 70 | 30 |
| 100705 | Graduate Employability Skills and Competitive Courses (GATE, IES, etc.) | 3 | 0 | 0 | 0 | 104 | TH | 0 | 0 |
| 1047xx | Program Elective - III | 3 | 0 | 0 | 3 | 104 | TH | 70 | 30 |
| 1047xx | Program Elective- II | 3 | 0 | 0 | 3 | 104 | TH | 70 | 30 |
| 104703 | Wireless Communication | 3 | 0 | 0 | 3 | 104 | TH | 70 | 30 |
| 100709 | Project-I | 0 | 0 | 12 | 6 | 104 | PR | 30 | 20 |
| 100702 | Summer Entrepreneurship-III | 0 | 0 | 16 | 8 | 104 | PR | 30 | 20 |

**107401 Business Analytics 3L:0T:0P 3 Credits**

**Contents**

1 Unit 1: (8 Lectures) Business analytics: Overview of Business analytics, Scopeof Business analytics, Business Analytics Process, Relationship of Business An- alytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, DescriptiveStatistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview. 8

2 Unit 2: (8 Lectures) Trendiness and Regression Analysis: Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology. 8

3 Unit 3: (8 Lectures) Organization Structures of Business analytics: Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predictive Modelling Predictive analytics analysis, Data Mining, Data

Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modelling, nonlinear Optimization. 8

4 Unit 4: (10 Lectures) Forecasting Techniques: Qualitative and JudgmentalForecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Fore- casting Time Series with Seasonality, Regression Forecasting with Casual Vari- ables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New- Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.
10

5 Unit 5: (8 Lectures) Decision Analysis: Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making. Recent trends:In Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism. 8

**Sl. No. Name of Authors / Books /Publishers**

1. Business analytics Principles, Concepts, and Applications by Marc J. Schniederjans, Dara G. Schniederjans, Christopher M. Starkey, Pearson FT Press.
2. Business Analytics by James Evans, persons Education

**107704 Wireless Communication 3L:0T:0P 3 Credits**

**Contents**

1 Introduction to Wireless Communication Systems: Evolution of mobileradio communications; examples of wireless comm. systems; paging systems; Cordless telephone systems; overview of generations of cellular systems, comparison of various wireless systems.
4

2 Introduction to Personal Communication Services (PCS): PCS architecture, Mobility management, Networks signalling. The Cellular Concept and Multiple Access Techniques: A basic cellular system, Frequency Reuse basic theory of hexagonal cell layout, spectrum efficiency, FDM/TDM, Cellular System, channel allocation schemes, Handover Analysis, cellular CDMA, Soft capacity, Erlang capacity comparison, multiple access techniques: FDMA, TDMA, CDMA. 9

3 2G Networks: Second generation,digital, wireless systems: GSM,I S136 (D-AMPS), IS-95 CDMA. Global system for Mobile Communication (GSM) system overview: GSM Architecture, Mobility Management, Network signalling, mobile management, voice signal processing and coding. Spread SpectrumSystems- Cellular code Division Access Systems-

Principle, Power Control, effects of multipath propagation on code division multiple access. 11

4 2.5G Mobile Data Networks: Introduction to Mobile Data Networks, General Packet Radio Services (GPRS): GPRS architecture, GPRS Network nodes, EDGE, Wireless LANs, (IEEE 802.11), Mobile IP. Third Generation (3G) Mo- bile Services: Introduction to International Mobile Telecommunications 2000 (IMT 2000) vision, Wideband Code Division Multiple Access (W-CDMA), and CDMA 2000, Quality of services in 3G, Introduction to 4G. 11

5 Introduction to Wireless Channels and Diversity: Fast Fading Wireless Channel Modelling, Rayleigh/Ricean Fading Channels, BER Performance in Fading Channels, Introduction to Diversity modelling for Wireless Communications. 5

**Sl.No. Name of Authors / Books /Publishers**


1. Theodore S. Rappaport, "Wireless Communications: Principles and Practice" 2nd Edition (2008), 2008
2. Andrew J Viterbi, "CDMA Principles of spread spectrum communications",Addition Wesley, 1995
3. J S Lee and L E Miller, "CDMA systems engineering handbook", Artech House,1998
4. Marvin K Simon, Jim K Omura, Robert A Scholtz, BaryKlevit, "SpreadSpectrum Communications", 1995
5. Sergio Verdu, "Multiuser Detection", Cambridge University Press, 1998


| 104702 | CostManagementofEngineeringProjec | 3L:0T:0P | 3Credits |
|---|---|---|---|

| Sl. No | Content | Contact Hours |
|---|---|---|
| 1 | Unit 1:(8Lectures)Introductionand Overview ofthe StrategicCostManage-mentProcess: Cost concepts indecision-making; Relevantcost, Differential cost,IncrementalcostandOpportunitycost. Objectives | 8 |
| 2 | Unit 2:(8Lectures) Provision ofdata forDecision-Making: Project: meaning, Differenttypes,whytomanage, costoverrunscentres, variousstagesofproject execution: conception tocommissioning. Project executionasconglomeration oftechnical andnon-technical | 8 |
| 3 | Unit 3:(6Lectures) Project team: Roleofeachmember. ImportanceProject site: Data required with significance. Project contracts. Types | 6 |

| | | |
|---|---|---|
| 4 | Unit4:(12Lectures) Project commissioning: Mechanical andprocessCostBehaviourand Profit PlanningMarginal Costing; Distinctionbetween Marginal CostingandAbsorption Costing; Break-evenAnalysis, Cost-Volume-Profit Analysis. Various decision-making problems. StandardCosting andVariance Analysis. Pricing strategies:ParetoAnalysis. Targetcosting,LifeCycleCost- ing. | 10 |
| 5 | Unit 5:(10Lectures) Activity-BasedCostManagement: BenchMarking; BalancedScoreCard and Value-Chain Analysis. BudgetaryControl; Flexible Budgets; Performancebudgets; Zero-based budgets. MeasurementofDivi- sionalprofitabilitypricing decisions including transfer pricing. Quantitative techniques forcost management | 10 |
| | Tota | 42 |

| Sl. No | NameofAuthors/Books/Publishers |
|---|---|
| 1 | CostAccounting AManagerial Emphasis, PrenticeHallofIndia, |
| 2 | Charles T.HorngrenandGeorgeFoster, Advanced |
| 3 | Robert SKaplan AnthonyA.Alkinson, |
| 4 | . AshishK.Bhattacharya,Principles andPracticesofCostAccounting A.H. |
| 5 | .D.Vohra, QuantitativeTechniques inManagement,TataMcGraw HillBook |

**100710 Antennas and Wave Propagation 3L:0T:0P 3 Credits**

**Contents**

**Fundamental Concepts :** Physical concept of radiation, Radiation pattern, near-and far-field regions, reciprocity, directivity and gain, effective aperture, polarization, input impedance, efficiency, Friis transmission equation, radiation integrals and auxiliary potential functions.

**Radiation:** Potential function and electromagnetic fields, a small current element radiation, Power radiated by current element and radiation resistance, Radiation from quarter wave monopole and half wave dipole.

**Antenna Arrays:** Analysis of uniformly spaced arrays with uniform and non- uniform excitation amplitudes, extension to planar arrays, synthesis of antenna arrays using Schelkun off polynomial method, Woodward-Lawson method.

Aperture and Reflector Antennas-Huygens' principle, radiation from rectangular and circular apertures, design considerations, Babinet's principle, Radiation from sectoral and pyramidal horns, design concepts, prime-focus parabolic re- flector and cassegrain antennas.

**Broadband Antennas:** Log-periodic and Yagi-Uda antennas, frequency independent antennas, broadcast antennas.

**Microstrip Antennas:** Basic characteristics of micro strip antennas, feeding methods, methods of analysis, design of rectangular and circular patch antennas.

**Basic Concepts of SmartAntennas:** Concept and benefits of smart antennas, fixed weight beam forming basics, Adaptive beam forming. Different modes of Radio Wave propagation used in current practice.

**Guided waves and waveguides:** Waves between parallel planes. TM and TE waves, Their propagation and attenuation in parallel plane guides, Rectangular wave guides – TE and TM waves in rectangular guides, Wave impedance, Circular wave guides, Introduction to resonators.

**Sl. No. Name of Authors / Books /Publishers**


1 "Antennas", J.D. Kraus, McGraw Hill, 1988
2 "Antenna Theory - Analysis and Design", C.A. Balanis, John Wiley, 1982
3 "Antenna Engineering Handbook", McGraw hill, 1984
4 "Micro Strip Antennas", I.J. Bahl and P. Bhartia, Artech House, 1980
5 "Electromagnetic Waves", R.K. Shevgaonkar, Tata McGraw Hill, 2005
6 "Electromagnetic Waves and Radiating Systems", (Prentice-Hall Electrical Engineering Series) by Edward C. Jordan, 2006
7 "Antennas and Radio Wave Propagation", R.E. Collin, McGraw Hill, 1985

**104705 Optical Fiber Communication 3L:0T:0P 3 Credits**

**1. Introduction:** Optical Fiber :-Structures, Wave guiding and Fabrication Nature of light, Basic optical laws and Definition, Optical fiber modes and Con- figuration, Mode theory for circular waveguides, Single mode fibers, Graded index fiber, Fiber materials, Fabrication and mechanical properties, Fiber optic cables, Basic Optical Communication System, Advantage of Optical Commu- nication System

**2. Attenuation in Optical Fibers:** Introduction, Absorption, Scattering, Very Low Loss Materials, All Plastic and Polymer-Clad-Silica Fibers. Wave Prop- agation: Wave propagation in Step-Index and Graded Index Fiber, Overall Fiber Dispersion-Single Mode Fibers, Multimode Fibers, Dispersion-Shifted Fiber, Dispersion, Flattened Fiber, Polarization

**3. Source and Detectors:** Design and LED's for Optical Communication, Semiconductor Lasers for Optical Fiber Communication System and their types, Semiconductor Photodiode Detectors, Avalanche Photodiode Detector and Photo multiplier Tubes. Source to fiber power launching - Output patterns, Power coupling, Power launching, Equilibrium Numerical Aperture, Laser diode to fiber coupling. Optical detectors- Physical principles of PIN and APD, Detector response time, Temperature effect on Avalanche gain, Comparison of Photo detectors. Optical receiver operation- Fundamental receiver operation, Digital signal transmission, error sources, Receiver configuration, Digital receiver performance, Probability of error, Quantum limit, Analog receivers

4. **Optical Fiber Communication Systems:** Data Communication Networks – Network Topologies, Mac Protocols, Analog System. Advanced Multiplexing Strategies – Optical TDM, Sub carrier Multiplexing, WDM Network. Archi- tectures: SONET/SDH. Optical Transport Network, Optical Access Network, Optical Premise Network. Applications-Military Applications, Civil, Consumer and Industrial Applications.

**Sl. No. Name of Authors / Books /Publishers**


1. "Optical Communication System", Gowar, IEEE Press – 2nd Edition
2. "Fiber Optics and Opto Electronics", R.P.Khare, Oxford Publication
3. "Optical Information Processing", F. T. S. Yu, Wiley, Newyork, 1983
4. "Fiber optic Communication Systems", John Wiley and sons, New York, 1992
5. "An Introduction to Fiber Optics", A. Ghatak, K. Thyagarajan, Cambridge University Press.
6. "Optical Communication Components and Systems", J. H. Franz and V. K. Jain, Narosa Publish, 2013.
7. "Optical Fiber Communications", John M. Senior, PEARSON, 3rd Edition,2010

**104706 Micro and Nano Electronics 3L:0T:0P 3 Credits**

**Contents**

1. EVOLUTION OF NANOELECTRONICS Moore's Law, Silicon Electronics, Limitations, Discussion of the International Technology Roadmap char- acteristics: Need for new concepts in electronics, Silicon MOS Transistor from Micro to Nano, Future Opportunities, Nanocomputing

2. TUNNEL JUNCTIONS AND APPLICATIONS OF TUNNELING Tunneling Through a Potential Barrier, Potential Energy Profiles for Material Interfaces – Metal -Insulator, Metal - Semiconductor, and Metal – Insulator- Metal Junctions , Applications of Tunneling, Field Emission, Gate - Oxide Tunneling and Hot Electron Effects in MOSFETs, Double Barrier Tunneling and the Resonant Tunneling Diode.

3. BALLISTIC AND SPIN TRANSPORT Coulomb Blockade , Tunnel Junction Excited by a Current Source , Coulomb Blockade in a Quantum Dot Circuit , Single Electron Transistor, Ballistic Transport , Electron Col- lisions and Length Scales, Ballistic Transport Model, Quantum Resistance and Conductance, Transport of Spin and Spintronics Devices ,Applications.

4. MOLECULAR ELECTRONICS Introduction to molecular electronics - An atomistic view of electrical resistance, Schrodinger equation, Self - consis- tent field, Bandstructure, Level broadening, Coherent transport, Non-coherent transport in molecular electronics devices , Molecular Devices, Logic Switches, Interface Engineering - Issues

**Sl.No. Name of Authors / Books /Publishers**


1. George W. Hanson, "Fundamentals of Nanoelectronics", Prentice Hall, 2007
2. K a r l Goser et.al, "Nanoelectronics and Nanosystems: From Transistors toMolecular and Quantum devices", Springer, 2005
3. Mark. A. Reed and Takhee, "Molecular Electronics", American Scientific Publishers, 2003
4. Mitin V., V. Kochelap, and M. Stroscio, "Introduction to", Cambridge University Press, 2008
5. Michael C. Petty, "Molecular Electronics: From Principles to Practice", JohnWiley and Sons, Ltd, 2007.
6. Ramachandran K. I. et.al, "Computational Chemistry and Molecular Modeling", Springer, 2008.
7. J. H. Franz and V. K. Jain, "Optical Communication Components and Systems", Narosa Publish, 2013
8. John M. Senior, "Optical Fiber Communications", PEARSON, 3rd Edition, 2010.

**104708 High Speed Electronics 3L:0T:0P 3 Credits**

**Contents**

1. Transmission line theory : Basics, Crosstalk and non-ideal effects, Signal integrity, Impact of packages, Vias, Traces, Connectors, Non-ideal return cur- rent paths, High frequency power delivery, Methodologies for design of high speed buses, Radiated emissions and minimizing system noise, Noise Analysis, Sources, Noise Figure, Gain compression, Harmonic distortion, Inter modulation, Cross-modulation, Dynamic range

2. Devices: Passive and active, Lumped passive devices (models), Active (models, low vs. high frequency).

3. RF Amplifier Design, Stability, Low Noise Amplifiers, Broadband Amplifiers (and Distributed) Power Amplifiers, Class A, B, AB and C, D E Integrated circuit realizations, Cross-over distortion Efficiency RF power output stages.

4. Mixers, Up conversion Down conversion, Conversion gain and spurious response, Oscillators Principles, PLL Transceiver architectures.

5 Printed Circuit Board Anatomy, CAD tools for PCB design, Standard fabrication, Microvia Boards, Board Assembly, Surface Mount Technology, Through Hole Technology, Process Control and Design challenges.

**Sl.No. Name of Authors / Books /Publishers**


1. "High-Speed Digital System Design: A Handbook of Interconnect Theory and Design Practices", Stephen H. Hall, Garrett W. Hall, James A. McCall, Wiley-IEEE Press,2000
2. "The Design of CMOS Radio-Frequency Integrated Circuits", Thomas H. Lee, Cambridge University Press, 2004
3. "RF Microelectronics", BehzadRazavi, Prentice-Hall, 1998
4. "Microwave Transistor Amplifiers", Guillermo Gonzalez, 2nd Edition, Prentice Hall
5. "RF and Microwave Wireless systems", Kai Chang, Wiley
6. "Electronic Product design", R.G. Kaduskar and V.B.Baru, Wiley India, 2011

**104709 Digital System Design 3L:0T:1P 4 Credits**

Contents

1. Introduction to Digital Design Concepts: Review of digital design fundamentals, minimization and design of combinational circuits, sequential machine fundamentals

2. Clocked Sequential Finite State Machines: State diagram, analysis of synchronous circuits, derivation of state graphs and tables, reduction of state tables, state assignment, design of sequence detectors, serial data code conversion, design of synchronous sequential state machine, design and applications of counters and shift registers

3. Multiinput System Controllers Design: System controller, controller design principles, timing and frequency considerations, DFD development, controller architecture design, asynchronous input handling, state assignment concepts, flip-flop level implementation using VEM's

4. Sequential Design using LSI & MSI circuits: Using decoders, multiplexers in sequential circuits, sequential network design using ROMs, PLAs and PALs, Programmable gate Arrays (PGAs)

5 Asynchronous Sequential Finite State Machines: Introduction, analysis of asynchronous networks, races and cycles, derivation of primitive flow tables, reduction of primitive flow tables, state assignments, hazards, asynchronous sequential network design

6 VHDL: Why VHDL? Basic Language Elements, Data objects, classes and data types, operators, overloading, logical operators, VHDL representation of Digital design entity and architectural declarations, introduction to behavioral, dataflow and structural models

**Sl.No. Name of Authors / Books /Publishers**


1 William I Fletcher "An Engineering Approach to Digital Design", PHI, 3rd Indian reprint, (1994)
2 Z Navabi "VHDL-Analysis and Modelling of Digital Systems", McGraw Hill, 2nd Edition (1997)
3 Kevin Skahill "VHDL for Programmable Logic", Pearson Education, 1st Indian Reprint (2004)
4 Jr. Charles H. Roth, "Fundamentals of Logic Design", Jaico Publishers, 4th Edition, (2002).
5 M Morris Mano "Digital Design", Pearson Education, 3rd Edition (2002)

**104710 VLSI Technology 3L:0T:0P 3 Credits**

**Contents**

1 Introduction to MOS technology: Introduction to IC technology, MOS and related VLSI technology, Basic MOS transistors (Enhancement mode and depletion mode), NMOS process, CMOS process (P – Well, N – Well, Twin – tub processes), Bi CMOS process flow, aspects of CMOS and Bi CMOS devices.

2 Brief introduction of VLSI: Architecture Definition, Functional Design, Logic Design, Circuit Design and Physical Design

2 Crystal growth and doping: Starting materials, Czochralski technique, Gradient freeze technique, Considerations for proper crystal growth (role of point defects, thermal gradients, turbulences, pull and spin rate, crystal orientation, crystal hardening techniques), Doping (rapid stirring conditions, partial stirring conditions, radial doping variations), Zone processes (Zone refining, Zone leveling, neutron transmutation doping)

3 Diffusion: Diffusion in a concentration gradient, Diffusion equation, Impurity behavior in Silicon, diffusion systems for Silicon, redistribution during oxide growth, diffusion during oxide growth, cooperative diffusion, evaluation techniques for diffused layers in Silicon.

4 Epitaxy: Nucleation and growth, doping, dislocation, thermally induced strain, Molecular Beam exitaxy, Vapor phase epitaxy for Silicon, Liquid phase epitaxy.

5 Ion-Implantation: Penetration range (nuclear and electronic stopping, Transverse effects), Implantation damage, annealing, Ion – Implantation systems, process consideration, high energy and high current implants.

6 Native Films : Thermal Oxidation of silicon (kinetics of oxide growth, oxidation systems, oxidation induced stacking faults, properties of thermal oxides), Thermal nitridation of Silicon, Plasma.

7 Deposited Films: Films deposition methods (vacuum evaporation, sputter deposition, Chemical vapor Deposition), Film characteristics (step coverage, grown habit, mechanical stress, electromigration)

8 Etching and Cleaning : wet chemical etching in silicon based processes, Dry physical etching, Dry chemical etching, Reactive Ion etching, Etch induced damage, Cleaning (wet and dry).

9 Lithography : Photo reactive materials, pattern generation and mask making, pattern transfer- optical printing, advanced techniques (short wavelength, multilayer resist, phase shifting masks, Electron beam techniques, Xray printing), Mask defects, Pattern transfer defects.

10 Process integration: Isolation, (P-N junction, Mesa, Oxide), self alignment, local oxidation, planarization, metallization, gettering, Process flow for CMOS

**Sl. No. Name of Authors / Books /Publishers**


1 'Basic VLSI Design by Pucknell and Eshraghian.
2 VLSI Fabrication Principles by Sorab Gandhi.
3 The science and engineering of Microelectronic Fabrication by Stephen Campbell.
4 VLSI Design by Sujata Pandey and Manoj Pandey.
5 CMOS VLSI design by Wolfe.

**104711 Information and Coding Theory 3L:0T:0P 3 Credits**

Contents

1 Information Theory: Definition of Information, Entropy, Mutual Information, Properties of Mutual Information, Fundamental Inequality, I.T. Inequality, Divergence, Properties of Divergence, Divergence Inequality, Relationship between entropy and mutual information, Chain Rules for entropy, relative entropy and mutual information.

2 Channel Capacity: Uniform Dispersive Channel, Uniform Focusing Channel, Strongly Symmetric Channel, Binary Symmetric Channel, Binary Erasure Channel. Channel Capacity of the all these channels, Channel Coding Theo- rem, Shannon-Hartley Theorem.

3 Data Compression: Kraft inequality, Huffman codes, Shannon-Fano coding, Arithmetic Coding.

4 Linear Block Codes: Systematic linear codes and optimum decoding for the binary symmetric channel; Generator and Parity Check matrices, Syndrome decoding on symmetric channels; Hamming codes; Weight enumerators and the MacWilliams identities; Perfect codes. Cyclic Codes, BCH codes; Reed- Solomon codes, Justeen codes, MDS codes, Alterant, Goppa and generalized BCH codes; Spectral properties of cyclic codes.

5 Decoding of BCH codes: Berlekamp's decoding algorithm, Massey's minimum shift-register synthesis technique and its relation to Berlekamp'salgo- rithm. A fast Berlekamp - Massey algorithm.

6 Convolution codes: Wozencraft's sequential decoding algorithm, Fann's algorithm and other sequential decoding algorithms; Viterbi decoding algorithm, Turbo Codes, Concatenated Code

**Sl. No. Name of Authors / Books /Publishers**


1 Simon Haykin, "Communication Systems", 4th Edition, John Wiley and Sons, 2001

2 ArijitSaha, "Information Theory, Coding and Cryptography", Pearson Education, 2013

3 Thomas M. Cover, Joy A. Thomas, "Elements of Information Theory", Wiley India Pvt. Ltd, 2nd Edition, 2013
4 J.Mary Jones, "Information and Coding Theory", Springer, 2000
5 Ranjan Bose, "Information Theory, Coding and Cryptography", Tata Mc-Graw Hill, 2nd Edition, 2008

| Course Code | Paper Title | L | T | P | Credits | TH/PR | ESE | IA |
|---|---|---|---|---|---|---|---|---|
| 1048xx | Open Elective- I | 3 | 0 | 0 | 3 | TH | 70 | 30 |
| 1048xx | Open Elective- II | 3 | 0 | 0 | 3 | TH | 70 | 30 |
| 1048xx | Program Elective- IV | 3 | 0 | 0 | 3 | TH | 70 | 30 |
| 1048xx | Program Elective- V | 3 | 0 | 0 | 3 | TH | 70 | 30 |
| 100801 | Project-II | 0 | 0 | 12 | 6 | PR | 30 | 20 |

**Electronics & Communication Engineering**

Open Elective

**104808 Machine Learning 3L:0T:0P 3 Credits**

1. Introduction: Basic definitions, types of learning, hypothesis space and inductive bias, evaluation, cross-validation. Linear regression, Decision trees, overfitting 8

2. Instance based learning, Feature reduction, Collaborative filtering basedrecommendation. Probability and Bayes learning. 8

3. Logistic Regression, Support Vector Machine, Kernel function and Kernel SVM 8

4. Neural Network: Perceptron, multilayer network, backpropagation, introduction to deep neural network 8

5. Computational learning theory, PAC learning model, Sample complexity, VCDimension, Ensemble learning. Clustering: k-means, adaptive hierarchical clustering,Gaussian mixture model. 8

**Sl. No. Name of Authors / Books /Publishers**

1 Machine Learning. Tom Mitchell. First Edition, McGraw- Hill, 1997, 1997

2 Introduction to Machine Learning Edition 2, by Ethem Alpaydin

**104809 Introduction to MEMS 3L:0T:0P 3 Credits**

1. Introduction to Micro electromechanical Systems (MEMS) and MEMS Fabrication Technologies, Materials and Substrates for MEMS, Processes for Micro- machining - Basic Process Tools, Advanced Process Tools 8

2. MEMS Structure and Systems: General Design Methodology, Techniquesfor Sensing and Actuation, Passive MEM Structures, Sensors. Actuators, Mechanical Vibrations,ComputerAided Design of MEMS and tools 7

3. Applications of MEMS in RF/Microwave: The MEMS Switch and itsDesign Consideration. The MEM Resonator and its Design Considerations, MicromachiningEnhanced Planar Microwave Passive Elements. Other MEMS Based RF/Microwave Circuits and System 15

4. Packaging and Reliability for MEMS: Key Design and Packaging Considerations. DieAttach Processes. Wiring and Interconnects. Types of PackagingSolutions. Reliability and Failure Analysis 10

**Sl. No. Name of Authors / Books /Publishers**

1 Nadim Maluf and Kirt Williams, "An Introduction to Microelectromechanical Systems Engineering", Artech, 2nd Edition (2004).

2 Hector J. De Los Santos " Introduction to Microelectromechanical Microwave Systems", Artech, 2nd Edition (2004).

**100808 Common Paper (EE/ECE)**

**Internet of Things 3L:0T:0P 3 Credits**

1. Introduction: Internet of Things PromisesDefinitionScopeSensors forIoT ApplicationsStructure of IoT IoT Map Device
9

2. SEVEN GENERATIONS OF IOT SENSORS TO APPEAR: Industrial sensors Description & Characteristics–First Generation – Description & Characteristics–Advanced Generation – Description & Characteristics–Integrated IoT Sensors – Description & Characteristics–Polytronics Systems – Description & Characteristics–Sensors Swarm – Description&Characteristics–Printed Electronics – Description & Characteristics–IoT Generation Roadmap 9

3 TECHNOLOGICAL ANALYSIS: Wireless Sensor Structure–Energy Storage Module–Power Management Module–RF Module–Sensing Module 9

4 IOT DEVELOPMENT EXAMPLES: ACOEM Eagle – EnOcean PushButton – NEST Sensor – Ninja Blocks -Focus on Wearable Electronics 9

5 PREPARING IOT PROJECTS: Creating the sensor project: Preparing Raspberry Pi-Clayster libraries - Hardware- Interacting with the hardware- Interfacing the hardware- Internal representation of sensor values - Persisting data - External representation of sensor values - Exporting sensor data - Creating the actuator project- Hardware - Interfacing the hardware - Creating a controller - Representing sensor values - Parsing sensor data - Calculating control states - Creating a camera - Hardware -Accessing the serial port on Raspberry Pi - Interfacing the hardware - Creating persistent default settingsAdding configurable properties - Persisting the settings - Working with the current settings Initializing the camera
9

**Sl. No. Name of Authors / Books /Publishers**

1 Dr. Guillaume Girardin, Antoine Bonnabel, Dr. Eric Mounier, ’Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 -2024’,Yole Development Copyrights, 2014

2 Peter Waher, ’Learning Internet of Things’,Packt Publishing, 2015

3 Editors OvidiuVermesan PeterFriess,’Internet of Things – From Research andInnovation to Market

4 Deployment’, River Publishers, 2014

5 N. Ida, Sensors, Actuators and Their Interfaces, Scitech Publishers, 2014

**104810 Power Electronics 3L:0T:0P 3 Credits**

1. Semiconductor Switching Devices: Review of Thyristor, two transistorModel of SCR, classification and V-I characteristics, junction temperature, gate circuit ratings, triggering process, UJT and characteristics, UJT as a relaxation oscillator, triggering UJT using SCR, turn off methods, fast recovery diodes, schottky diodes, Series and parallel connections of SCR, DIAC, TRIAC, Power MOSFETS, application of SCR. 7

2. Power Rectification: Classification of rectifiers, half, full, three-phase rectifier, semi converters, full converters, freewheeling diodes, circuits using SCR, voltage multiplying rectifier circuits, transformer utility factor 5

3. Regulated Power Supplies: Classification of voltage regulators, short periodand long period accuracy of voltage regulator, D.C. voltage regulators, complete series voltage regulator circuit with ICs, SMPS basic principles, step up and step down circuits, UPS. 5

4. Inverters: Introduction, simple Inverters and Power Inverter using SCR, output voltage control in inverter waveform control, PWM inverters, reduction of harmonies with the help of PWM inverters. 5

5. Induction and Dielectric Heating: Induction heating effect of frequencypower requirements, merits and application of induction heating, Dielectric heating, dielectric properties of a few typical materials, thermal losses, appli- cation of dielectric heating, skin effect, high frequency sources for induction and dielectric heaters. 6

6. Electronic Control of D.C. Motors: Introduction, control of D.C. shuntmotor, full wave D.C. shunt motor control overload projection, universal motor control, electronic control for reversing motor control using SCR, choppers, their classifications and applications. 6

7. Electronic Control of A.C. Motors: Instability of D.C. motors, variablespeed induction motor drives, T.N. characteristics of I.M. invertors for driving the motor, speed control of I.M. using various methods, cyclo-converters, their classifications and applications. 6

**Sl.No. Name of Authors / Books /Publishers**


1. M H Rashid, “Power electronics”, PHI, 2nd Edition (1998).
2. G K Mithal, “Industrial electronics”, Khanna Publishers, Delhi, 18th Edition (1998).
3. S N Biswas, “Industrial electronics”, Dhanpat Rai and Company, Delhi, 3rd Edition (2000).
4. P S Bhimbra, “Power electronics”, Khanna Publishers, Delhi, 3rd Edition (2002).
5. M D Singh, Khanchandani K B, “Power electronics”, TMH, 6th reprint (2001).

**100813 Big Data Analytics 3L:0T:0P 3 Credits**

**Common Paper (ECE/EEE)**

1. Simple linear regression: Fit a simple linear regression between two variables in R; Interpret output from R; Use models to predict a response variable; Validate the ssumptions of the model. Modelling data: Adapt the simple linear regression model in R to deal with multiple variables; Incorporate continuous and categorical variables in their models; Select the best-fitting model by inspecting the R output. 10

2.Many models: Manipulate nested dataframes in R; Use R to apply simultaneous linear models to large data frames by stratifying the data; Interpret the output of learner models. Classification: Adapt linear models to take into account when the response is a categorical variable; Implement Logistic regression (LR) in R; Implement Generalised linear models (GLMs) in R; Implement Linear discriminant analysis (LDA) in R. 10

3. Prediction using models: Implement the principles of building a modelto do prediction using classification; Split data into training and test sets, perform cross validation and model evaluation metrics; Use model selection for explaining data with models; Analyse the overfitting and bias-variance trade-off in prediction problems. 10

4. Deep learning: Use massive amounts of data to train multi-layer networksfor classification; Understand some of the guiding principles behind training deep networks, including the use of autoencoders, dropout, regularization, and early termination; Use sparklyr and H2O to train deep networks. 10

**Sl. No. Name of Authors / Books /Publishers**

1. DataScience for Business by F. Provost and T. Fawcett

2. Data Mining for the Masses by M. North

**104812 Transducers and Sensors 3L:0T:0P 3 Credits**

1 GENERALISED CONFIGURATIONS, FUNCTIONAL DISCRIPTION& PERFORMANCE CHARACTERISTICS OF MEASURING INSTRU- MENTS: Functional elements of an instrument; active & passive transducers; analog & digital modes of operation; null & deflection methods; I/O configuration of measuring instruments & instrument system – methods of correction for interfering & modifying inputs. Static characteristics; Meaning of static calibration, accuracy, precision & bias. Combination of component errors in overall system-accuracy calculation. Addition, subtraction, division & multiplication. Static sensitivity, linearity, threshold, resolution, hysteresis and dead pace. Scale readability. Span. Generalized static stiffness & input impedance.

2 MEASUREMENT OF DISPLACEMENT, FORCE, TORQUE & SHAFTPOWER: Principle of measurement of displacement. Resistive potentiometers, variable inductance & variable reluctance pickups, LVDT, capacitance pickup. Principle of measurement of Force, Torque, Shaft power standards& calibration; basic methods of force measurement; characteristics of elastic force transducer-Bonded strain gauge, differential transformer, piezo electric transducer, variable reluctance/FM-oscillator, digital systems. Loading effects; Torque measurement on rotating shafts, shaft power measurement (dynamometers).

3 TEMPERATURE MEASUREMENT: Standards & calibration; thermal expansion methods bimetallic thermometers, liquid-in-glass thermometers, pressure thermometers; thermoelectric sensor (thermocouple) common thermo- couple, reference junction considerations, special materials, configuration & techniques; electrical resistance sensors conductive sensor (resistance thermometers), bulk semiconductor sensors (thermistors), bulk semiconductor sensors (thermistors); junction semiconductor sensors; digital thermometers. Radiation Methods radiation fundamentals, radiation detectors, unchopped (dc) broadband radiation thermometers. Chopped (AC) selective band (photon) radiation thermometers, automatic null balance radiation thermometers (optical pyrometers). Two color radiationthermometers. Black body-tipped fibre optic radiation thermometer, IR imaging systems. Fluoroptic temperature measurement.

4 PRESSURE MEASUREMENT: Standards & calibration; basic methods ofpressure measurement; dead weight gauges & manometer, manometer dynamics; elastic transducers; high pressure measurement; low pressure (vaccum) measurement Mcleod gage, Knudsen gage, momentum-transfer (viscosity) gages, thermal conductivity gages, ionization gages, dual gage technique

5 FLOW MEASUREMENT; Local flow velocity, magnitude and direction. Flowvisualization. Velocity magnitude from pilot static tube. Velocity direction from yaw

tube, pivoted vane, servoed sphere, dynamic wind vector indicator. Hot wire and hot film anemometer. Hot-film shock-tube velocity sensor. Laser Doppler velocimeter; gross volume flow rate: calibration and standards. Constant-area, variable-pressure-drop meters (obstruction meters). Averaging pitot tubes. Constant pressure drop, variable area meters (rotameters), turbine meters, positive displacement meters. Metering pumps. Electromagnetic flow meters. Drag force flow meters. Ultrasonic flow meters, vortex shedding flow meters.

6 LEVEL MEASUREMENT: Capacitance probe; conductivity probes; diaphragm level detector, deferential pressure level detector, radiation level sensors, RADAR level gauges, level transmitter, ultrasonic level detector.

7 LEVEL MEASUREMENT: Capacitance probe; conductivity probes; diaphragm level detector, deferential pressure level detector, radiation level sensors, RADAR level gauges, level transmitter, ultrasonic level detector.

**Sl. No. Name of Authors / Books /Publishers**

1 Measurement systems application and design, ERNEST DOEBELIN, IV Edn. (Chapter 1, 2, 3, 4, 5).
2 Instrument Engineers Hand Book (process measurement), LIPTAK (Chapter6).
3 Electronic Instrumentation – by H S Kalsi TMH 2nd Ed 2004

**Electronics & Communication Engineering**

**Elective Paper**

**Microwave Theory and Techniques 3L:0T:0P 3 Credits**

**100806 common (ECE/EEE)**

Microwave oscillators and amplifiers: Introduction to Microwaves - History of Microwaves, Microwave Frequency bands; Applications of Microwaves: Civil and Military, Medical, advantages and uses of microwave, limitations of conventional vacuum tubes at UHF and microwave frequency, UHF. 7

Passive and Active Microwave Devices: Microwave passive components: Directional Coupler, Magic Tee, Phase Shifters, Isolators, circulators. Attenuator, Microwave active components: Diodes, Transistors, Oscillators, Mixers 8

Microwave Tubes: Klystron, TWT, Magnetron; Microwave Semiconductor Devices: Gunn Diodes, IMPATT diodes, Schottky Barrier diodes, PIN diodes 12

Microwave measurement : Measurement of power, Standing wave detectors and its uses, Impedance measurement, Measurement of frequencies by wave meters, Attenuation Measurement, Noise factor measurement. 8

Microwave receiver: Block Diagram representation, Varactor Diode as mixer, antenna noise and noise temperature. 4

Microwave Systems: Introduction to Radar, MTI Radar Effect of Microwaves on human body. 4

**Sl. No. Name of Authors / Books /Publishers**


1 Microwave devices and circuits by Samuel Y. Laio.
2 Microwave and Radar Engineering by M. Kulkarni, Umesh Publications.
3 Foundations of Microwave Engineering by R.F. Collins, McGraw Hill.
4 Microwave Engineering by David M .Pozar, Wiley.

**104801 ERROR CORRECTING CODES 3L:0T:0P 3 Credits**

Linear block codes: Systematic linear codes and optimum decoding for the binary symmetric channel; Generator and Parity Check matrices, Syndrome decoding on symmetric channels.

Hamming codes: Weight enumerators and the McWilliamidenties; Perfect codes

Introduction to finite fields and finite rings; factorization of (x(n-1)) over a finite field; Cyclic codes.

BCH codes; Idempotents and Masttson-solomon polynomials, Reed-Solomon codes, Justeen codes, MDS codes, Alterant, Goppa and generalized BCH codes, Spectral properties of cyclic codes.; Decoding of BCH codes; Berlekamp's decoding algorithm, Massey's minimum shift register Synthesis techniques and decoding algorithm, Massey's minimum shift register synthesis technique and its relation to Berlekamp's algorithm. A fast Berlekamp – Massey algorithm.

Convolution Codes; Wozencraft's sequential decoding algorithm, Fann's algorithm and other sequential decoding algorithms; Viterbi decoding algorithm.

**Sl. No. Name of Authors / Books /Publishers**

1 F.J. McWilliams and N.J.A. Slone, The theory of error correcting codes.

2 R.E. Balahut, Theory and practice of error control codes, Addison Wesley.

**104802 Speech and Audio Processing 3L:0T:0P 3 Credits**

**Introduction:** Speech production and modeling - Human Auditory System;General structure ofspeech coders; Classification of speech coding techniques – parametric, waveform and hybrid; Requirements of speech codecsquality, coding delays, robustness. Speech Signal Processing:Pitch-period estimation, all-pole and all-zero filters,convolution; Power spectral density, periodogram, autoregressive model, autocorrelation estimation.
10

**Linear Prediction of Speech:** Basic concepts of linear prediction; LinearPrediction Analysis of non-stationarysignals –prediction gain, examples; Levinson-Durbin algorithm; Long term and short-term linear prediction models; Moving average prediction.

**Speech Quantization:**Scalarquantization–uniform quantizer, optimum quantizer, logarithmic quantizer, adaptive quantizer, differential quantizers; Vector quantization – distortion measures, codebook design, codebook types. 10

**Scalar Quantization of LPC:** Spectral distortion measures, Quantizationbased on reflection coefficient and log area ratio, bit allocation; Line spectral frequency – LPC to LSF conversions,quantization based on LSF. 6

**Linear Prediction Coding:** LPC model of speech production; Structures ofLPC encoders and decoders; Voicing detection; Limitations of the LPC model. 6

**Code Excited Linear Prediction:** CELP speech production model;Analysis-by-synthesis; Generic CELP encoders and decoders; Excitation code- book search: state-save method, zero-input zero-state method; CELP based on adaptive codebook, Adaptive Codebook search; Low Delay CELP and algebraic CELP.

**Speech Coding Standards:** An overview of ITU-T G.726, G.728 andG.729standards 8

**Sl. No. Name of Authors / Books /Publishers**


1. “Digital Speech” by A. M. Kondoz, Second Edition (Wiley Students? Edition), 2004
2. “Speech Coding Algorithms: Foundation and Evolution of Standardized Coders”, W.C. Chu, WileyInter science, 2003

**104803 Satellite Communication 3L:0T:0P 3 Credits**

**Introduction to Satellite Communication:** Principles and architecture of satellite Communication, Brief history of Satellite systems, advantages, disadvantages, applications and frequency bands used for satellite communication. 7

**Orbital Mechanics:** Orbital equations, Kepler's laws, Apogee and Perigee for an elliptical orbit, evaluation of velocity, orbital period, angular velocity etc. of a satellite, concepts of Solar day and Sidereal day 9

**Satellite sub-systems:** Study of Architecture and Roles of various sub systems of a satellite system such as Telemetry, tracking, command and monitoring (TTC and M), Attitude and orbit control system (AOCS), Communication sub-system. 10

**Typical Phenomena in Satellite Communication:** Solar Eclipse on satellite, its effects, remedies for Eclipse, Sun Transit Outage phenomena, its effects and remedies, Doppler frequency shift Phenomena and expression for Doppler shift 8

Flux density and received signal power equations, Calculation of System noise temperature for satellite receiver, noise power calculation, C/N ratio calculations in clear air and rainy conditions 6

**Sl. No. Name of Authors / Books /Publishers**


1 Timothy Pratt Charles W. Bostian, Jeremy E. Allnutt: Satellite Communications; Wiley
2 Tri T. Ha: Digital Satellite Communications: Tata McGraw Hill
3 Dennis Roddy: Satellite Communication: 4th Edition, McGraw Hill

**104804Wireless Sensor and Networks 3L:0T:0P 3 Credits**

Introduction: Introduction to Sensor Networks, unique constraints and challenges, Advantage of Sensor Networks, Applications of Sensor Networks, Mobile Adhoc Networks (MANETs) and Wireless Sensor Networks, Enabling technologies for Wireless Sensor Networks.
8

Sensor Node Hardware and Network Architecture: Single-node architecture, Hardware components and design constraints, Operating systems and execution environments, introduction to TinyOS and nesC, Network architecture, Optimization goals and figures of merit, Design principles for WSNs, Service interfaces of WSNs, Gateway concepts.
9

Deployment and Configuration: Localization and positioning, Coverage and connectivity, Single-hop and multihop localization, self configuring localization systems, sensor management. 8

Network Protocols: Issues in designing MAC protocol for WSNs, Classification of MAC Protocols, S-MAC Protocol, B-MAC protocol, IEEE 802.15.4 standard and Zig Bee, Dissemination protocol for large sensor network. Depart- ment of Electronics and Communication Engineering Routing protocols: Is- sues in designing routing protocols, Classification of routing protocols, Energy- efficient routing, Unicast, Broadcast and multicast, Geographic routing. 9

Data Storage and Manipulation: Data centric and content based routing, storage and retrieval in network, compression technologies for WSN, Data aggregation technique.
3

Applications: Detecting unauthorized activity using a sensor network, WSN for Habitat Monitoring. 3

**Sl. No. Name of Authors / Books /Publishers**


1 HolgerKerl, Andreas Willig, “Protocols and Architectures for Wireless Sensor Network”, John Wiley and Sons, 2005
2 Raghavendra, Cauligi S, Sivalingam, Krishna M., ZantiTaieb, “Wireless Sensor Network”, Springer 1st Ed, 2004
3 Feng Zhao, Leonidas Guibas, “Wireless Sensor Network”,Elsevier, 1st Ed, 2004
4 Kazem, Sohraby, Daniel Minoli, TaiebZanti, “Wireless Sensor Network: Technology, Protocols and Application”, John Wiley and Sons 1st Ed, 2007
5 B. Krishnamachari, “Networking Wireless Sensors”, Cambridge University Press.
6 N. P. Mahalik, “Sensor Networks and Configuration: Fundamentals, Standards, Platforms, and Applications” Springer Verlag.

**104805 Adaptive Signal Processing 3L:0T:0P 3 Credits**

General concept of adaptive filtering and estimation, applications and motivation, Review of probability, random variables and stationary random processes, Correlation structures, properties of correlation matrices. 8

Optimal FIR (Wiener) filter, Method of steepest descent, extension to complex valued The LMS algorithm (real, complex), convergence analysis, weight error correlation matrix, excess mean square error and mis-adjustment 8

Variants of the LMS algorithm: the sign LMS family, normalized LMS algorithm, block LMS and FFT based realization, frequency domain adaptive filters, Sub-band adaptive filtering. Signal space concepts - introduction to finite dimensional vector space theory, subspace, basis, dimension, linear operators, rank and nullity, inner product space, orthogonality, Gram-Schmidt orthogonalization, concepts of orthogonal projection, orthogonal decomposition of vector spaces. 8

4 Vector space of random variables, correlation as inner product, forward and backward projections, Stochastic lattice filters, recursive updating of forward and backward prediction errors, relationship with AR modeling, joint process estimator, gradient adaptive lattice. 6

5 Introduction to recursive least squares (RLS), vector space formulation of RLS estimation, pseudoinverse of a matrix, time updating of inner products, development of RLS lattice filters, RLS transversal adaptive filters. Advanced topics: affine projection and subspace based adaptive filters, partial update algorithms, QR decomposition and systolic array. 8

**Sl. No. Name of Authors / Books /Publishers**

1 S. Haykin, Adaptive filter theory, Prentice Hall, 1986.

2 C.Widrow and S.D. Stearns, Adaptive signal processing, Prentice Hall, 1984.

**104806 Analog CMOS VLSI Design 3L:0T:0P 3 Credits**

Basic MOS Device Physics: MOSFET - Thoery, Operation and I-V characteristics, Second order effects, MOS Capacitances, Small-signal model, etc. Single stage amplifiers: Common Source stage, Source Follower, Common Gate stage, Cascode stage. 6

Differential Amplifiers: Single-ended and Differential operation, Basic Differential pair, Common-Mode response, Differential pair with MOS loads, Gilbert cell. Current Mirrors: Basic current mirrors, Cascode current mirror, Wilson current mirror. 10

Frequency response of Amplifiers: Miller effect, CS stage, Source follower, CG stage, Cascode stage, Differential Pair. Noise: Statistical characteristics of Noise, Types of Noise, Representation of Noise in circuits, Noise in Single-stage amplifiers, Noise in Differential pairs. 10

Operational Amplifiers : Performance parameters, One-stage Op Amps, Two-stage Op Amps, Gain boosting, Common-mode feedback, Input range limitations, Slew rate, Power Supply rejection, Noise in Op Amps. 8

Introduction to Switched Capacitor circuits: Sampling switches, Switched-Capacitor Amplifiers, Switched-Capacitor integrator. Phase-Locked Loops: Simple PLL, Charge-Pump PLLs, Applications. 8

**Sl. No. Name of Authors / Books /Publishers**


1 "Design of Analog CMOS Integrated Circuits", by BehzadRazavi, McGraw Hill.

2 "Analysis and Design of Analog Integrated Circuits", by Paul R. Gray, Paul J. Hurst, Stephen H. Lewis, Robert G. Meyer, Wiley

**104807 Biomedical Instrumentation 3L: 0T: 0P3 Credits**

Biomedical signals and Physiological transducers : Source of biomedical signal, Origin of bioelectric signals, recording electrodes, Electrodes for ECG, EMG and EEG Physiological transducers: Pressure, Temperature, photoelectric and ultrasound Transducers. Measurement in Respiratory system: Physiology of respiratory system, Measurement of breathing mechanics Spiro meter, Respiratory therapy equipments Inhalators ventilators and Respirators, Humidifiers, Nebulizers Aspirators, Biomedical recorders: ECG, EEG and EMG. 11

Patient Monitoring systems and Audiometers : Cardiac monitor, Bedside patient monitor, measurement of heart rate, blood pressure, temperature, respiration rate, Arrhythmia monitor, Methods of monitoring fatal heart rate, Monitoring labor activity. Audiometers: Audiometers, Blood cell counters, Oximeter, Blood flow meter, cardiac output measurement, Blood gas analyzers. 11

Modern Imaging systems : Introduction, Basic principle and Block diagram of x-ray machine, x- ray Computed Tomography (CT), Magnetic resonance imaging system (NMR), ultrasonic imaging system. Eco-Cardiograph, Eco Encephalography, Ophthalmic scans, MRI. Therapeutic Equipments: Cardiac pacemakers, cardiac defibrillators, Hemodialysis machine, Surgical diathermy machine. 11

Patient's safety : Precaution, safety codes for electro medical equipment, Electric safety analyzer, Testing of biomedical equipment, Ultrasound therapy unit. Electrotherapy Equipments, Ventilators. 7

**Sl. No. Name of Authors / Books /Publishers**


1 "Hand book of Biomedical Instrumentation", R.S.Khandpur, TMH
2 "Biomedical Instruments: Theory and Design", Walter Welko- Witiz and Sid Doutsch, Wiley
3 "Biomedical Instrumentation and Measurements", Lesile Cromwell, Fred J. Weibell and Erich A. Pfeiffer, PHI
4 "Introduction to Biomedical Equipment Technology", Joseph J. Carr and John M. Brown, Pearson
5 "Textbook of Biomedical Instrumentation System", Shakti Chatterjee, Cengage Learning