

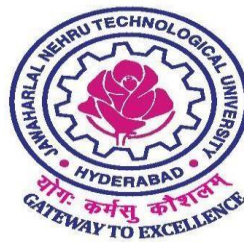
**COURSE STRUCTURE  
AND  
DETAILED SYLLABUS**

**ELECTRONICS & COMMUNICATION ENGINEERING**

**FOR**

**B.TECH FOUR YEAR DEGREE COURSE**

**(Applicable For The Batches Admitted From 2021-2022)**



**JNTUH COLLEGE OF ENGINEERING HYDERABAD  
(AUTONOMOUS)  
KUKATPALLY, HYDERABAD-500085  
TELANGANA, INDIA**

**JNTUH COLLEGE OF ENGINEERING HYDERABAD**  
**(AUTONOMOUS)**  
**B.TECH. FOUR YEAR DEGREE COURSE**  
**(ELECTRONICS & COMMUNICATION**  
**ENGINEERING)**  
**COURSE STRUCTURE**

**I YEAR****I SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1	BSC	Matrix Algebra and Calculus	3	1	0	4
2	ESC	Programming for Problem Solving	3	0	0	3
3	BSC	Engineering Chemistry	3	1	0	4
4	HSMC	English	2	0	0	2
5	ESC-LC	Programming for Problem Solving Lab	0	0	3	1.5
6	BSC-LC	Engineering Chemistry Lab	0	0	2	1
7	HSMC-LC	English Language and Communication Skills Lab	0	0	2	1
8	ESC-LC	Engineering Workshop practice	0	0	3	1.5
<b>Total Credits</b>						18

**I YEAR****II SEMESTER**

S. No.	Course Code	Course Title	L	T	P	Credits
1.	BSC	Applied and Multi Variable Calculus	3	1	0	4
2.	BSC	Applied Physics	3	1	0	4
3.	ESC	Basic Electrical Engineering	3	0	0	3
4.	ESC	Engineering Graphics	1	0	3	2.5
5.	BSC-LC	Applied Physics Lab	0	0	3	1.5
6.	ESC-LC	Basic Electrical Engineering Lab	0	0	2	1
7.	ESC	Applied Python Programming Lab	0	1	2	2
<b>Total Credits</b>						18

**J.N.T.U.H COLLEGE OF ENGINEERING HYDERABAD  
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(ELECTRONICS AND COMMUNICATION ENGINEERING)  
COURSE STRUCTURE**

**II YEAR****I SEMESTER**

S.No.	Course Type	Subject	L	T	P	Credits
1	BSC	Electronic Devices and Circuits	3	1	0	4
2	PCC-1	Network Analysis & Transmission Lines	3	0	0	3
3	PCC-2	Signals and Systems	3	0	0	3
4	PCC-3	Switching Theory and Logic Design	3	1	0	4
5	PCC-4	Probability Theory and Stochastic Processes	3	1	0	4
6	ESC-LC	Electronic Devices and Circuits Lab	0	0	2	1
7	LC-1	Digital Logic Design Lab	0	0	2	1
8	LC-2	Modelling and Simulation Lab	0	0	2	1
9	*MC	Constitution of India	2	0	0	0
		<b>Total</b>	<b>17</b>	<b>03</b>	<b>06</b>	<b>21</b>

**II YEAR****II SEMESTER**

S.No.	Course Type	Subject	L	T	P	Credits
1	BSC	Numerical Methods, Complex variables and Graphs	3	1	0	4
2	PCC-5	Electromagnetic Fields and Waves	3	0	0	3
3	PCC-6	Analog and Digital Communications	3	1	0	4
4	PCC-7	Linear and Digital Integrated Circuits	3	0	0	3
5	PCC-8	Analog and Pulse Circuits	3	1	0	4
6	LC-3	Analog and Digital Communications Lab	0	0	2	1
7	LC-4	Linear and Digital Integrated Circuits Lab	0	0	2	1
8	ESC-LC	Analog and Pulse Circuits Lab	0	0	2	1
9	*MC	Environmental Science	2	0	0	0
		<b>Total</b>	<b>17</b>	<b>03</b>	<b>06</b>	<b>21</b>

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COURSE STRUCTURE**

**III YEAR****I SEMESTER**

S.No.	Course Type	Subject	L	T	P	Credits
1	PCC-9	Digital Signal Processing	3	1	0	4
2	PCC-10	Microprocessors and Controllers	3	1	0	4
3	PCC-11	Control Systems	3	1	0	4
4	PEC- 1	Professional Elective - 1	3	0	0	3
5	PEC- 2	Professional Elective - 2	3	0	0	3
6	LC-5	Microprocessors and Controllers Lab	0	0	3	1.5
7	LC-6	Digital Signal Processing Lab	0	0	3	1.5
8	HSMC-LC	Advanced English Language and Communication Skills Lab	0	0	2	1
9	*MC	Introduction to Cyber security	0	0	2	0
		<b>Total</b>	<b>15</b>	<b>03</b>	<b>10</b>	<b>22</b>

**III YEAR****II SEMESTER**

S.No.	Course Type	Subject	L	T	P	Credits
1	HSMC	Business Economics & Financial Analysis	3	0	0	3
2	PCC-12	Antennas and Propagation	3	1	0	4
3	PCC-13	Computer Networks	3	1	0	4
4	PCC-14	VLSI Design	3	1	0	4
5	OEC-1	Open Elective-1	3	0	0	3
6	LC-7	Computer Networks Lab	0	0	2	1
7	LC-8	VLSI Design Lab	0	0	3	1.5
8	LC-9	Communication Systems Lab for IOT	0	0	3	1.5
	*MC	Introduction to Artificial Intelligence	2	0	0	0
		<b>Total</b>	<b>17</b>	<b>03</b>	<b>06</b>	<b>22</b>

**Summer between III & IV Year: Industry Oriented Mini Project**

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COURSE STRUCTURE**

**IV YEAR****I SEMESTER**

S.No.	Course Type	Subject	L	T	P	Credits
1	PCC-15	Microwave Engineering	2	0	0	2
2	PEC- 3	Professional Elective - 3	3	0	0	3
3	PEC- 4	Professional Elective - 4	3	0	0	3
4	OEC- 2	Open Elective - 2	3	0	0	3
5	LC-10	Antennas and Microwave devices Lab	0	0	2	1
6	HSMC	Management Fundamentals for Engineers	3	0	0	3
7	MINI PROJ	Mini Project/Summer Internship	0	0	4	2
8	PROJ	Project Stage-I	0	0	6	3
9	SEMINAR	Seminar	0	0	2	1
		<b>Total</b>	<b>14</b>	<b>00</b>	<b>14</b>	<b>21</b>

**IV YEAR****II SEMESTER**

S.No.	Course Type	Subject	L	T	P	Credits
1	PEC-5	Professional Elective - 5	3	0	0	3
2	PEC-6	Professional Elective - 6	3	0	0	3
3	OEC- 3	Open Elective - 3	3	0	0	3
4	PROJ	Project Stage-II	0	0	16	8
		<b>Total</b>	<b>09</b>	<b>00</b>	<b>16</b>	<b>17</b>

**Professional Elective – 1**

1. Operating Systems
2. OOPS through Java
3. Data Analytics

**Professional Elective - 2**

1. Network Security and Cryptography
2. Artificial Neural Networks and Deep Learning
3. Electronic Measurements and Instrumentation

**Professional Elective - 3**

1. Digital Image Processing
2. Speech Signal Processing
3. Bio-Medical Signal Processing

**Professional Elective – 4**

1. Micro-Chip fabrication Techniques
2. Low Power VLSI
3. Testing and Testability

**Professional Elective - 5**

1. Radar Systems
2. Satellite Communications
3. Optical Communications

**Professional Elective - 6**

1. Wireless Communication Networks
2. Adaptive Signal Processing
3. Analog IC Design

**Open Elective – 1**

Electronic Sensors

**Open Elective – 2**

System Design through IoT

**Open Elective - 3**

Principles of Communications

**J.N.T.U.H COLLEGE OF ENGINEERING HYDERABAD  
(AUTONOMOUS)  
B.TECH HONOURS COURSE  
(ELECTRONICS AND COMMUNICATION ENGINEERING)  
COURSE STRUCTURE**

**B. TECH HONOURS COURSE**

**Stream 1: IC Design**

1. Mixed Signal Design
2. System on Chip
3. Embedded RTOS
4. RF IC Design

**Stream 2: Signal Processing**

1. Advanced Digital Signal Processing
2. Digital Signal Processors
3. Transfer Techniques
4. RF Signal Processing

**Stream 3: Communication**

1. Detection and Estimation Theory
2. Coding Theory & Techniques
3. Next Generation Communications
4. Advanced Radar Techniques

**\* Project-2 credits**

**MATRIX ALGEBRA AND CALCULUS****I Year B.Tech. I Sem**

L	T	P	C
3	1	0	4

**Pre-requisites:** Mathematical Knowledge of 12<sup>th</sup>/ Intermediate level**Objectives:** To learn

- Types of matrices and their properties.
- Concept of a rank of the matrix and applying this concept to know the consistency and solving the system of linear equations.
- Concept of Eigenvalues and Eigenvectors and to reduce the quadratic form to canonical form
- Methods of solving the differential equations of first and higher order.
- Geometrical approach to the mean value theorems and their application to the mathematical problems
- Evaluation of surface areas and volumes of revolutions of curves.
- Evaluation of improper integrals using Beta and Gamma functions.

**Course outcomes:**

After learning the contents of this paper the student must be able to

- Write the matrix representation of a set of linear equations and to analyse the solution of the system of equations
- Find the Eigenvalues and Eigenvectors
- Reduce the quadratic form to canonical form using orthogonal transformations.
- Identify whether the given differential equation of first order is exact or not
- Solve higher differential equation and apply the concept of differential equation to real world problems
- Solve the applications on the mean value theorems.
- Evaluate the improper integrals using Beta and Gamma functions

**UNIT-I: Matrices****10 L**

**Matrices:** Rank of a matrix: Echelon form, Normal form, System of linear equations: solving system of Homogeneous and Non-Homogeneous equations, Gauss-elimination method, LU Decomposition method.

Linear Transformation and Orthogonal Transformation: Eigenvalues and Eigenvectors and their properties, Eigenvalues and Eigenvectors of Symmetric, Hermitian, Skew-Symmetric, Skew-Hermitian, Orthogonal and Unitary matrices.

**UNIT-II: Diagonalization of a Matrix****8 L**

Diagonalization of a matrix. Cayley-Hamilton Theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton Theorem. Quadratic forms and Nature of the Quadratic Forms: Reduction of Quadratic form to canonical forms by Orthogonal Transformation.

**UNIT-III: Mean value theorems and Beta, Gamma functions****10 L**

Mean value theorems: Rolle's theorem, Lagrange's Mean value theorem with their Geometrical Interpretation and applications, Cauchy's Mean value Theorem, Taylor's Series. (All theorems without proof).

Applications of definite integrals to evaluate surface areas and volumes of revolutions of curves (Only in Cartesian coordinates), Definition of Improper Integral: Beta and Gamma functions and their applications.

**UNIT-IV: First Order ODE****10 L**

Exact differential equations, converting non-exact equations to exact equations, Linear and Bernoulli's differential equations. Applications: Newton's law of cooling, Law of natural growth and decay, orthogonal trajectories and electrical circuits. First order equations with higher degree: solvable for the differential coefficient, dependent variable and Independent variable.

### UNIT-V: Ordinary Linear Differential Equations of Higher Order

10 L

Second order linear differential equations with constant coefficients - Non-Homogeneous terms of the type  $e^{ax}$ ,  $\sin ax$ ,  $\cos ax$ , polynomials in  $x$ ,  $e^{ax}V(x)$  and  $x V(x)$  - method of variation of parameters, Equations reducible to linear ODE with constant coefficients, Legendre's equation, Cauchy-Euler equation. Applications: Bending of beams, Electrical circuits and simple harmonic motion.

#### Text Books

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36<sup>th</sup> Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006.
- 3.

#### References

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint, 2002.
2. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
3. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11<sup>th</sup> Reprint, 2010.

**PROGRAMMING FOR PROBLEM SOLVING****I Year B.Tech. I Sem**

L	T	P	C
3	0	0	3

Prerequisites: Nil

Course Objectives:

1. To learn the fundamentals of computers.
2. To understand the various steps in Program development.
3. To learn the syntax and semantics of C Programming Language.
4. To learn the usage of structured programming approach in solving problems.

Course Outcomes:

The student will learn

1. To write algorithms and to draw flowcharts for solving problems.
2. To translate the algorithms/flowcharts to programs (in C language).
3. To code and test, a given logic in C programming language.
4. To formulate simple algorithms for arithmetic and logical problems.
5. To decompose a problem into functions and to develop modular reusable code.
6. To use arrays, pointers, strings and structures to formulate algorithms and programs. Searching and sorting problems.

**UNIT – I:**

**Introduction to Computers:** Computer Systems, Computing Environments, Computer Languages, Creating and running programs, Software Development Method, Algorithms, Pseudo code, flow charts, applying the software development method.

**Introduction to C Language:** Background, Simple C programs, Identifiers, Basic data types, Variables, Constants, Input / Output, Operators. Expressions, Precedence and Associativity, Expression Evaluation, Type conversions, Bit wise operators, Statements, Simple C Programming examples.

**UNIT – II:**

**Statements:** if and switch statements, Repetition statements – while, for, do-while statements, Loop examples, other statements related to looping – break, continue, go to, Simple C Programming examples.

**Designing Structured Programs:** Functions, basics, user defined functions, inter function communication, Scope, Storage classes-auto, register, static, extern, scope rules, type qualifiers, recursion- recursive functions, Preprocessor commands, example C programs

**UNIT – III:**

**Arrays and Strings:** Concepts, using arrays in C, inter function communication, array applications, two – dimensional arrays, multidimensional arrays, C program examples. Concepts, C Strings, String Input / Output functions, arrays of strings, string manipulation functions, string / data conversion, C program examples.

#### UNIT – IV:

**Pointers:** Introduction (Basic Concepts), Pointers for inter function communication, pointers to pointers, compatibility, memory allocation functions, array of pointers, programming applications, pointers to void, pointers to functions, command –line arguments.

**Input and Output:** Concept of a file, streams, standard input / output functions, formatted input / output functions, text files and binary files, file input / output operations, file status functions (error handling), C program examples.

#### UNIT – V:

**Derived types:** Structures – Declaration, definition and initialization of structures, accessing structures, nested structures, arrays of structures, structures and functions, pointers to structures, self-referential structures, unions, typedef, bit fields, enumerated types, C programming examples.

**Sorting and Searching:** Selection sort, Bubble sort, Insertion sort, Linear search and Binary search methods.

#### Text Books:

1. C Programming & Data Structures by B.A.Forouzan and R.F. Gilberg, Third Edition,Cengage Learning.
2. Problem Solving and Program Design in C by J.R. Hanly and E.B. Koffman, Fifth Edition,Pearson Education.
3. The C Programming Language by B.W. Kernighan and Dennis M.Ritchie, PHI/PearsonEducation

#### Reference Books:

1. C for Engineers and Scientists by H.Cheng, Mc.Graw-Hill International Edition
2. Data Structures using C by A. M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education, PHI
3. C Programming & Data Structures by P. Dey, M Ghosh R Thereja, Oxford University Press

**ENGINEERING CHEMISTRY****I Year B.Tech. I Sem**

L	T	P	C
3	1	0	4

**OBJECTIVES:**

1. To bring adaptability to the concepts of chemistry and to acquire the required skills to become a perfect engineer.
2. To acquire the knowledge of water treatment, electrochemistry and corrosion which are essential for the Engineers and in industry.
3. To acquire the skills pertaining to Polymers and Energy sources to apply them for various engineering fields etc.
4. To impart then knowledge of Engineering materials and their aspects useful for understanding material chemistry.

**OUTCOMES:** The basic concepts included in this course will help the student to gain:

1. Differentiate hard and soft water; solve the related problems on water purification and its significance in industry and daily life.
2. Understand the principles, concepts of electrochemistry and causes of corrosion, its consequences and methods to minimize corrosion to improve industrial designs.
3. The required skills to get clear concepts on polymers and energy sources and their applications to various engineering fields etc.
4. The knowledge of engineering materials such as Portland cement, white cement, concrete and lubricants etc.

**Unit-I: Water and its treatment: (11 hours)**

Introduction – hardness of water – Causes of hardness. Types of hardness: temporary and permanent. Expression and units of hardness. Estimation of hardness of water by complexometric method. Potable water and its specifications. Steps involved in treatment of water – Disinfection of water by chlorination, breakpoint chlorination, Ozonisation. Boiler troubles - Scale, Sludge, Priming, Foaming and Caustic embrittlement. Treatment of boiler feed water by Calgon conditioning, Phosphate conditioning and Colloidal conditioning. External treatment of water- Ion exchange process. Desalination of water – Reverse osmosis. Numerical problems based on Determination of hardness of water.

**Unit-II: Electrochemistry and corrosion: (12 Hours)**

**Electrochemistry:** Electrochemical cells – Cell, Electrode, electrode potential, standard electrode potential, Nernst equation-derivation and significance- Electrochemical series and its applications. Construction and functioning of Calomel, Quinhydrone and glass electrode. Determination of pH of a solution by using quinhydrone and glass electrode. Numerical problems. Potentiometric titrations. Batteries – Primary (Lithium cell) and secondary batteries (Lead – acid storage battery and Lithium ion battery).

**Corrosion:** Causes and effects of corrosion – Theories of chemical and electrochemical corrosion – mechanism of electrochemical corrosion. Galvanic corrosion, Concentration cell corrosion- water-line and pitting corrosion. Factors affecting rate of corrosion, Corrosion control methods- Cathodic protection – Sacrificial anodic protection and impressed current cathodic methods. Surface coatings – metallic coatings – Methods of coatings - Hot dipping - galvanization, tinning. cementation, electroplating and electroless plating of copper.

**Unit – III: Polymeric materials: (11 Hours)**

Polymers: Definition, Monomer, functionality and degree of polymerisation. Classification – Types of Polymerisation - Addition & Condensation – Mechanisms of Polymerisation. Plastics: Definition, characteristics - Compounding and fabrication- Methods of Moulding - Thermoplastics and Thermosets – Preparation, properties and applications– PVC, Teflon and Bakelite. Fibres: Definition, Characteristics. Preparation, Properties and applications of Terylene, Nylon 6:6. Elastomers: Definition and characteristics. Natural rubber- structure, processing of latex, Vulcanisation. Preparation, properties and applications of BuNa-S and Butyl rubber. Conducting Polymers- Definition, Classification. Mechanism of conduction in Polyacetylene, Polyaniline & Applications. Biodegradable polymers - Concept, Synthetic and Natural polymers, Polylactic acid, Poly Vinyl alcohol, Nylon-2 and Nylon – 6. Applications and advantages of biodegradable polymers.

**Unit – IV: Energy sources: (12 Hours)**

Fuels: Definition, classification with examples. Calorific value. Determination of calorific value by Junker's

gas Calorimeter. Characteristics of good fuel. Coal: Types- Analysis of coal- proximate analysis. Petroleum-Refining- Fractional distillation- composition, properties and uses of petrol, diesel and kerosene. Cracking-types, Moving bed catalytic cracking. Knocking - Octane and Cetane rating, Composition, characteristics and uses of LPG, CNG. Biodiesel-Transesterification. Advantages. Hydrogen fuel- Production, storage, advantages and limitations. Combustion - Definition, Calculation of air required for the combustion of fuel, numerical problems related to calorific value and combustion.

#### **Unit-V: Engineering Materials: (10 Hours)**

Portland cement: Composition and constituents. Setting and hardening of cement, special cements- properties and uses of High alumina cement, White cement and water proof cement. RCC, Decay of Concrete. Refractories: Classification, Properties - Refractoriness, RUL, Chemical inertness and porosity. Characteristics of a good refractory. Engineering Applications. Failure of a refractory. Lubricants: functions of lubricants, Classification, Mechanism of Lubrication, Properties - Viscosity, Acid value, Flash & Fire point, Cloud & Pour point, Aniline point.

#### **Text Book:**

1. Engineering Chemistry – PC Jain and M Jain – Dhanpath Rai and Sons, New Delhi.

#### **Reference Books:**

1. Text book of Engineering Chemistry by Ramadevi, Venkata Ramana Reddy & Prashanth Rath, Cengage learning publications.
2. A text book of Engineering Chemistry by Thirumala Chary, Laxminarayana, Shashikala. Pearson Publications.

**ENGLISH****I Year B.Tech. I Sem**

L	T	P	C
2	0	0	2

**INTRODUCTION**

In view of the growing importance of English as a tool for global communication and the consequent emphasis on training students to acquire language skills, the syllabus of English has been designed to develop linguistic, and communicative competencies of Engineering students. In English classes, the focus would be on the skills development in the areas of vocabulary, grammar, reading and writing. For this, the teachers use the prescribed text for detailed study. The students are encouraged to read the texts leading to reading comprehension and different known/unknown passages may be given for practice in the class. The time is utilized for working out the exercises given after each excerpt. Authentic materials of a similar kind, for example, newspaper articles, advertisements, promotional material are used to supplement exercises. *The focus in this syllabus is on skill development in the areas of Vocabulary, Grammar, Reading and Writing Skills and practice of language skills in various contexts.*

**LEARNING OBJECTIVES**

The course will help students to:

- Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar, Reading and Writing skills.
- Develop study skills and communication skills in formal and informal situations.
- Equip students to study engineering subjects more effectively and critically using the theoretical and practical components of the syllabus.

**Reading****Skills****Objectives**

- To develop an awareness in students about the significance of silent reading and comprehension.
- To develop students' ability to guess meanings of words from the context and grasp the overall message of the text, draw inferences, etc.,
- To facilitate the students practice the sub-skills of reading viz., Skimming and Scanning the text, Intensive and Extensive Reading, Reading for Pleasure, Identifying the topic sentence, Inferring lexical and contextual meaning, Recognizing Coherence/Sequencing of Sentences.

☒ **NOTE:** *The students will be trained in reading skills using the prescribed texts for detailed study. They will be tested in reading comprehension of different 'unseen' passages which may be taken from authentic texts, such as magazines/newspaper articles.*

## Writing Skills

### Objectives

1. To bring an awareness in the students about the difference between formal and informal writing
2. To make students understand sentence structures and variations in process writing
3. To develop students' creativity in different disciplines of academic writing

### SYLLABUS

The course content / study material is divided into **Five Units**.

#### Unit –I

Chapter entitled '*Presidential Address*' by **Dr. A.P.J. Kalam** from "*Fluency in English– A Coursebook for Engineering Students*" published by Orient BlackSwan, Hyderabad

**Vocabulary:** The Concept of Word Formation -The Use of Prefixes and Suffixes- Collocations

**Grammar:** Punctuation - Identifying Common Errors in Writing with reference to Articles.

**Reading:** Reading and its Importance- Techniques for Effective Reading.

**Writing:** Sentence Structures -Use of Phrases and Clauses in Sentences- Paragraph Writing - Creating Coherence and Cohesiveness.

#### Unit –II

Chapter entitled *Satya Nadella: Email to Employees on his First Day as CEO* from "*Fluency in English– A Coursebook for Engineering Students*" Published by Orient BlackSwan, Hyderabad.

**Vocabulary:** Synonyms and Antonyms – Homonyms, Homophones and Homographs

**Grammar:** Identifying Common Errors in Writing with Reference to Noun-Pronoun Agreement – Words with appropriate Prepositions - Phrasal Verbs

**Reading:** Improving Comprehension Skills – Techniques for Good Comprehension

**Writing:** Writing Formal Letters – Format - Letter of Complaint and Reply - Letter of Requisition and Reply.

#### Unit –III

**Vocabulary:** Acquaintance with Phrases from Foreign Languages (Latin/French) with a focus on usage in English

**Grammar:** Tenses - Identifying Common Errors in Writing with Reference to Misplaced Modifiers and Tenses

**Reading:** Sub-skills of Reading- Skimming and Scanning.

**Writing:** Job Application with Resume- Writing Introduction and Conclusion - Essay Writing.

#### Unit –IV

Chapter entitled '*Good Manners*' by **J.C. Hill** from *Fluency in English – A Coursebook for Engineering Students*" published by Orient BlackSwan, Hyderabad

**Vocabulary:** Standard Abbreviations in English – Idioms – One Word Substitutes

**Grammar:** Subject-Verb Agreement - Redundancies and Clichés in Oral and Written Communication – Sequence of Tenses.

**Reading:** Comprehension- Intensive Reading and Extensive Reading- Reading Practice – '*If*' by Rudyard Kipling.

**Writing:** Writing Practices - Information Transfer -Précis Writing.

#### Unit –V

Chapter entitled '*Father Dear Father*' by **Raj Kinger** from *Fluency in English – A Coursebook for Engineering Students*" Published by Orient BlackSwan, Hyderabad

**Vocabulary:** Technical Vocabulary and their Usage – Indian Colloquial Terms

**Grammar:** Common Errors in English

**Reading:** Reading Comprehension-Exercises for Practice.

**Writing:** Technical Reports- Introduction – Characteristics of a Report – Categories of Reports Formats- Structure of Reports (Manuscript Format) -Types of Reports - Writing a Report.

**Note:** *Listening and Speaking skills which are given under Unit-6 in AICTE Model Curriculum are covered in the syllabus of ELCS Lab Course.*

👉 (Note: As the syllabus of English given in AICTE Model Curriculum-2018 for B.Tech First Year is **Open-ended**, besides following the prescribed textbook, it is required to prepare teaching/learning materials **by the teachers collectively** in the form of handouts based on the needs of the students in their respective colleges for effective teaching/learning in the class.)

### **COURSE OUTCOMES**

Students will be able to:

1. Choose appropriate vocabulary and sentence structures for their oral and written communication.
2. Demonstrate their understanding of the rules of functional grammar.
3. Develop comprehension skills from the known and unknown passages and respond appropriately.
4. Take an active part in drafting paragraphs, letters, essays, abstracts and reports in various contexts
5. Adapt basic proficiency in English

### **PRESCRIBED TEXTBOOK:**

1. *“Fluency in English – A Coursebook for Engineering Students”* by Board of Editors: Hyderabad: Orient BlackSwan Pvt. Ltd. 2016. Print.

### **Suggested Reading:**

- (i) *Practical English Usage*. Michael Swan. OUP. 1995.
- (ii) *Remedial English Grammar*. F.T. Wood. Macmillan.2007
- (iii) *Contemporary English Grammar Structures and Composition*. David Green. Macmillan. 2010.
- (iv) *Communication Skills*. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.

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## PROGRAMMING FOR PROBLEM SOLVING LAB

**I Year B.Tech. I Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>0</b>	<b>0</b>	<b>3</b>	<b>1.5</b>

### Objectives

1. To learn the fundamentals of computers.
2. To understand the various steps in Program development.
3. To learn the syntax and semantics of C Programming Language.
4. To learn the usage of structured programming approach in solving problems.

### Outcomes

1. Write algorithms and to draw flowcharts for solving problems.
2. Translate the algorithms/flowcharts to programs (in C language).
3. Code and test a given logic in C programming language.
4. Formulate simple algorithms for arithmetic and logical problems.
5. Decompose a problem into functions and to develop modular reusable code.
6. Use arrays, pointers, strings and structures to formulate algorithms and programs.
7. Searching and sorting problems.

### Week 1:

1. Write a C program to find the sum of individual digits of a positive integer.
2. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.
3. Write a C program to generate the first n terms of the sequence.
4. Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.
5. Write a C program to find the roots of a quadratic equation.

### Week 2:

6. Write a C program to find the factorial of a given integer.
7. Write a C program to find the GCD (greatest common divisor) of two given integers.
8. Write a C program to solve Towers of Hanoi problem.
9. Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +, -, \*, /, % and use Switch Statement)

### Week 3:

10. Write a C program to find both the largest and smallest number in a list of integers.
11. Write a C program that uses functions to perform the following:
  - i) Addition of Two Matrices
  - ii) Multiplication of Two Matrices

### Week 4:

12. Write a C program that uses functions to perform the following operations:
  - i) To insert a sub-string in to a given main string from a given position.
  - ii) To delete n Characters from a given position in a given string.
13. Write a C program to determine if the given string is a palindrome or not
14. Write a C program that displays the position or index in the string S where the string T begins, or – 1 if S doesn't contain T.
15. Write a C program to count the lines, words and characters in a given text.

### Week 5:

16. Write a C program to generate Pascal's triangle.
17. Write a C program to construct a pyramid of numbers
18. Write a C program to read in two numbers, x and n, and then compute the sum of this geometric progression:  $1+x+x^2+x^3+\dots+x^n$   
 For example: if n is 3 and x is 5, then the program computes 1+5+25+125.  
 Print x, n, the sum  
 Perform error checking.

For example, the formula does not make sense for negative exponents – if  $n$  is less than 0. Have your program print an error message if  $n < 0$ , then go back and read in the next pair of numbers of without computing the sum. Are any values of  $x$  also illegal? If so, test for them too.

**Week 6:**

19. 2's complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2's complement of 11100 is 00100. Write a C program to find the 2's complement of a binary number.
20. Write a C program to convert a Roman numeral to its decimal equivalent.

**Week 7:**

21. Write a C program that uses functions to perform the following operations:
  - i) Reading a complex number
  - ii) Writing a complex number
  - iii) Addition of two complex numbers
  - iv) Multiplication of two complex numbers(Note: represent complex number using a structure.)

**Week 8:**

22. . i) Write a C program which copies one file to another.  
ii) Write a C program to reverse the first  $n$  characters in a file.  
(Note: The file name and  $n$  are specified on the command line.)
23. . i) Write a C program to display the contents of a file.  
ii) Write a C program to merge two files into a third file (i.e., the contents of the first file followed by those of the second are put in the third file)

**Week 9:**

24. Write a C program that implements the following sorting methods to sort a given list of integers in ascending order
  - i) Bubble sort
  - ii) Selection sort
  - iii) Insertion sort

**Week 10:**

25. Write C programs that use both recursive and non recursive functions to perform the following searching Operations for a Key value in a given list of integers:
  - i) Linear search
  - ii) Binary search

**Textbooks:**

1. C Programming & Data Structures, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
2. Problem Solving and Program Design in C, J.R. Hanly and E.B. Koffman, Fifth Edition, Pearson Education.
3. The C Programming Language, B.W. Kernighan and Dennis M.Ritchie, PHI/Pearson Education

**References:**

1. C for Engineers and Scientists, H.Cheng, Mc.Graw-Hill International Edition
2. Data Structures using C – A.M.Tanenbaum, Y.Langsam, and M.J. Augenstein, Pearson Education / PHI
3. C Programming & Data Structures, P. Dey, M Ghosh R Thereja, Oxford University Press

**ENGINEERING CHEMISTRY LABORATORY****I Year B.Tech. I Sem**

L	T	P	C
0	0	2	1

**I. Volumetric Analysis:**

1. Estimation of Ferrous iron by Dichrometry method.
2. Estimation of Ferrous iron by Permanganometry method.
3. Estimation of Hardness of water by EDTA Complexometry method.

**II. Conductometry:**

1. Estimation of the concentration of an acid by Conductometry.

**III. Potentiometry:**

1. Estimation of the amount of  $\text{Fe}^{+2}$  by Potentiometry.

**IV. pH Metry:**

1. Determination of an acid concentration using pH meter.

**V. Preparations:**

1. Preparation of Bakelite.
2. Preparation Nylon-6.

**VI. Lubricants:**

1. Estimation of acid value of given lubricant oil.
2. Estimation Saponification value of a lubricant oil.
3. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

**VII. Corrosion:**

1. Determination of rate of corrosion of mild steel in the presence and absence of inhibitor.

**Recommended Books:**

1. Inorganic Quantitative analysis by A.I. Vogel, ELBS Publications.
2. Laboratory Manual of Engineering Chemistry by Y. Bharathi Kumari & Jyotsna C, VGS Booklinks, Vijayawada, 2009.
3. College Practical Chemistry by V.K. Ahluwalia, Narosa Publications Ltd. New Delhi (2007). Engineering Chemistry Lab Manual by Cengage Publications

## ENGLISH LANGUAGE AND COMMUNICATION SKILLS (ELCS) LAB

**I Year B.Tech. I Sem**

L	T	P	C
0	0	2	1

The **English Language and Communication Skills (ELCS) Lab** focuses on the production and practice of sounds of language and familiarizes the students with the use of English in everyday situations both in formal and informal contexts. **Objectives**

- To facilitate computer-assisted multi-media instruction enabling individualized and independent language learning
- To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
- To bring about a consistent accent and intelligibility in students' pronunciation of English by providing an opportunity for practice in speaking
- To improve the fluency of students in spoken English and neutralize their mother tongue influence
- To train students to use language appropriately for public speaking, group discussions and interviews

### Learning Outcomes

Students will be able to:

- 👍 Understand the nuances of English language through audio- visual experience and group activities
- 👍 Neutralise their accent for intelligibility
- 👍 Speak with clarity and confidence which in turn enhances their employability skills

**Syllabus: English Language and Communication Skills Lab (ELCS) shall have two parts:**

- a. **Computer Assisted Language Learning (CALL) Lab**
- b. **Interactive Communication Skills (ICS) Lab**

### Listening Skills:

Objectives

1. To enable students develop their listening skills so that they may appreciate the role in the LSRW skills approach to language and improve their pronunciation
2. To equip students with necessary training in listening, so that they can comprehend the speech of people of different backgrounds and regions

*Students should be given practice in listening to the sounds of the language, to be able to recognize them and find the distinction between different sounds, to be able to mark stress and recognize and use the right intonation in sentences.*

- Listening for general content
- Listening to fill up information
- Intensive listening
- Listening for specific information

### Speaking Skills:

Objectives

1. To involve students in speaking activities in various contexts
2. To enable students express themselves fluently and appropriately in social and professional contexts
  - Oral practice
  - Describing objects/situations/people
  - Role play – Individual/Group activities
  - Just A Minute (JAM) Sessions

The following course content is prescribed for the **English Language and Communication Skills**

#### Lab. Exercise – I

##### CALL Lab:

*Understand:* Listening Skill- Its importance – Purpose- Process- Types- Barriers- Effective Listening.

*Practice:* Introduction to Phonetics – Speech Sounds – Vowels and Consonants – Minimal Pairs- Consonant Clusters- Past Tense Marker and Plural Marker- *Testing Exercises*

##### ICS Lab:

*Understand:* Spoken vs. Written language- Formal and Informal English.

*Practice:* Ice-Breaking Activity and JAM Session- Situational Dialogues – Greetings – Taking Leave – Introducing Oneself and Others.

**Exercise – II**

**CALL Lab:**

*Understand:* Structure of Syllables – Word Stress– Weak Forms and Strong Forms – Sentence Stress – Intonation.

*Practice:* Basic Rules of Word Accent - Stress Shift - Weak Forms and Strong Forms- Sentence Stress – Intonation -  
*Testing Exercises*

**ICS Lab:**

*Understand:* Features of Good Conversation – Strategies for Effective Communication.

*Practice:* Situational Dialogues – Role-Play- Expressions in Various Situations –Making Requests and Seeking Permissions - Telephone Etiquette.

**Exercise - III**

**CALL Lab:**

*Understand:* Errors in Pronunciation-the Interference of Mother Tongue (MTI).

*Practice:* Common Indian Variants in Pronunciation – Differences between British and American Pronunciation -*Testing Exercises*

**ICS Lab:**

*Understand:* Descriptions- Narrations- Giving Directions and Guidelines.

*Practice:* Giving Instructions – Seeking Clarifications – Asking for and Giving Directions – Thanking and Responding – Agreeing and Disagreeing – Seeking and Giving Advice – Making Suggestions.

**Exercise –**

**IV CALL**

**Lab:**

*Understand:* Listening for General Details.

*Practice:* Listening Comprehension Tests - *Testing Exercises*

**ICS Lab:**

*Understand:* Public Speaking – Exposure to Structured Talks - Non-verbal Communication- Presentation Skills.

*Practice:* Making a Short Speech – Extempore- Making a Presentation.

**Exercise – V**

**CALL Lab:**

*Understand:* Listening for Specific Details.

*Practice:* Listening Comprehension Tests -*Testing Exercises*

**ICS Lab:**

*Understand:* Group Discussion

*Practice:* Group Discussion

**Minimum Requirement of infrastructural facilities for ELCS Lab:**

**1. Computer Assisted Language Learning (CALL) Lab:**

**The Computer Assisted Language Learning Lab** has to accommodate 40 students with 40 systems, with one Master Console, LAN facility and English language learning software for self- study by students.

**System Requirement (Hardware component):**

*Computer network with LAN facility (minimum 40 systems with multimedia) with the following specifications:*

- i) Computers with Suitable Configuration
- ii) High Fidelity Headphones

**2. Interactive Communication Skills (ICS) Lab :**

**The Interactive Communication Skills Lab:** A Spacious room with movable chairs and audio-visual aids with a Public Address System, a T. V. or LCD, a digital stereo –audio & video system and camcorder etc.

**Suggested Software:**

- ❖ Cambridge Advanced Learners' English Dictionary with CD.
- ❖ Grammar Made Easy by Darling Kindersley.
- ❖ Punctuation Made Easy by Darling Kindersley.
- ❖ Oxford Advanced Learner's Compass, 8<sup>th</sup> Edition.
- ❖ English in Mind (Series 1-4), Herbert Puchta and Jeff Stranks with Meredith Levy, Cambridge.
- ❖ English Pronunciation in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- ❖ English Vocabulary in Use (Elementary, Intermediate, Advanced) Cambridge University Press.
- ❖ TOEFL & GRE (KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS).

**References:**

1. Suzanna, R. *A Practical Course in English Pronunciation (with CD)*. McGraw Hill Education. 2017. Print.
2. *Exercises in Spoken English*. Part 1, 2 and 3. CIEFL. Oxford University Press, 1997. Print.
3. Hancock, M. *English Pronunciation in Use. Intermediate Cambridge*: Cambridge University Press. 2009. Print.

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## ENGINEERING WORKSHOP PRACTICE

I Year B.Tech. I Sem

L	T	P	C
0	0	3	1.5

Pre-requisites: Practical skill

Course Objectives: The objectives of this course is to acquire knowledge on the engineering trades.

- i. To impart hands-on practice on Carpentry trade and skills.
- ii. To impart hands-on practice on Fitting trade and skills
- iii. To impart hands-on practice on Black Smithy trade and skills
- iv. To impart hands-on practice on House Wiring trade and skills
- v. To impart hands-on practice on Tin Smithy trade and skills
- vi. To impart hands-on practice on Plumbing trade and

skills Note: At least two exercises to be done from each trade.

A. Carpentry

1. T-Lap Joint
2. Cross Lap Joint
3. Dovetail Joint

B. Fitting

1. Vee Fit
2. Square Fit
3. Half Round Fit

C. Black Smithy

1. Round rod to Square
2. S-Hook
3. Round Rod to Flat Ring

D. House Wiring

1. Parallel / Series Connection of three bulbs
2. Stair Case wiring
3. Florescent Lamp Fitting

E. Tin Smithy

1. Taper Tray
2. Open Scoop
3. Funnel

F. Plumbing

1. Coupling Joint
2. Elbow Joint
3. T Joint

### TEXT BOOKS:

1. Workshop Practice by B.L.Juneja Cengage Learning
2. Elements of Workshop Technology–S. K.Hajra Choudhury and A. K. Hajra Choudhury.

**APPLIED AND MULTIVARIABLE CALCULUS****I Year B.Tech. II Sem**

L	T	P	C
3	1	0	4

**Pre-requisites:** Mathematical Knowledge of 12<sup>th</sup> / Intermediate level**Objectives:** To learn

- Concept, properties of Laplace transforms
- Solving ordinary differential equations using Laplace transforms techniques.
- Partial differentiation, concept of total derivative
- Finding maxima and minima of function of two and three variables.
- Evaluation of multiple integrals and their applications
- The physical quantities involved in engineering field related to vector valued functions
- The basic properties of vector valued functions and their applications to line, surface and volume integrals.

**Course outcomes:**

After learning the contents of this paper the student must be able to

- Use the Laplace transforms techniques for solving ODE's.
- Find the extreme values of functions of two variables with/ without constraints.
- Evaluate the multiple integrals and apply the concept to find areas, volumes, centre of mass and gravity for cubes, sphere and rectangular parallel piped

Evaluate the line, surface and volume integrals and converting them from one to another

**UNIT-I: Laplace transforms:****8 L**

Laplace Transforms; Laplace Transform of standard functions, first shifting theorem, Laplace transforms of functions when they are multiplied and divided by 't', Laplace transforms of derivatives and integrals of function, Evaluation of integrals by Laplace transforms, Laplace transform of periodic functions, Inverse Laplace transform by different methods, convolution theorem (without proof), solving Initial value problems by Laplace Transform method.

**UNIT-II: Partial Derivatives and applications****10 L**

Definitions of Limit and continuity.

Partial Differentiation, Euler's Theorem, Total derivative, Jacobian, Functional dependence & independence, Maxima and minima of functions of two variables and three variables, method of Lagrange multipliers.

**UNIT-III: Multiple Integration****10 L**

Evaluation of Double Integrals (Cartesian and polar coordinates), change of order of integration (only Cartesian form). Evaluation of Triple Integrals, Change of variables (Cartesian to polar) for double and (Cartesian to Spherical and Cylindrical polar coordinates) for triple integrals.

Applications: Areas (by double integrals) and volumes (by double integrals and triple integrals), Centre of mass and Gravity (constant and variable densities) by double and triple integrals (applications involving cubes, sphere and rectangular parallel piped).

**UNIT-IV: Vector Differentiation****10 L**

Vector point functions and scalar point functions. Gradient, Divergence and Curl, Directional derivatives, Tangent plane and normal line, Vector Identities, Scalar potential functions, Solenoidal and Irrotational vectors.

**UNIT-V: Vector Integration****10 L**

Line, Surface and Volume Integrals, Theorems of Green, Gauss and Stokes (without proofs) and their applications.

**Text Books**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36<sup>th</sup> Edition, 2010
2. Erwin kreyszig, Advanced Engineering Mathematics, 9<sup>th</sup> Edition, John Wiley & Sons, 2006
3. M Apostol, Calculus vol-2, John Wiley & Sons

**References**

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9<sup>th</sup> Edition, Pearson, Reprint, 2002
2. Paras Ram, Engineering Mathematics, 2<sup>nd</sup> Edition, CBS Publishes
3. S. L. Ross, Differential Equations, 3<sup>rd</sup> Ed., Wiley India, 1984.

## APPLIED PHYSICS

**I Year B.Tech. II Sem**

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

**Course Objectives:**

The course enables the student to understand:

1. Basic concepts of quantum physics required to deal with behavior of particles and waves.
2. Carrier concentration and recombination process of semiconductor materials.
3. Basic lasing action, various types of lasers and to learn fundamental concepts of Optical fibres.
4. Various polarization mechanisms in dielectric materials and explore the different types of magnetic materials.
5. The unique properties of Superconductors.

**Course Outcomes:**

The student should be able to gain the knowledge on:

1. Wave particle duality and quantization of energy levels.
2. Fundamentals concepts of semiconductor technology.
3. Principles of Lasers and their categorization and properties and categorization of Optical fibres.
4. Characteristics of dielectric and magnetic materials.
5. Various types of superconductors and their transport properties.

**UNIT-I: QUANTUM MECHANICS:** Introduction to quantum physics, Black body radiation, Planck's law, photoelectric effect, Compton effect, wave-particle duality, de Broglie hypothesis, Davisson and Germer experiment, Heisenberg's uncertainty principle, Born's interpretation of the wave function, Schrodinger's time independent wave equation, particle in one dimensional potential box, potential barrier-tunneling effect.

**UNIT-II: SEMICONDUCTOR PHYSICS:** Intrinsic and extrinsic semiconductors: Estimation of carrier-concentration, Dependence of Fermi level on carrier-concentration and variation with temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, Hall Effect, p-n junction diode: I-V Characteristics, Zener diode: I-V Characteristics, Bipolar Junction Transistor (BJT): Construction, Principle of operation and characteristics.

**UNIT- III: LASERS AND FIBRE OPTICS**

**Lasers:** Introduction, Laser Beam Characteristics, Interaction of light with matter and the three Quantum Processes, Einstein Coefficients and their relations, Light Amplification, Components of Laser, Three requirements for Lasing Action, Pumping Methods, Types of Lasers: Ruby Laser, He-Ne Laser, Semiconductor Laser, Applications of laser.

**Fibre Optics:** Introduction to Optical Fibre, Total Internal Reflection, Construction of optical fibre, Acceptance angle - Numerical Aperture, classification based on materials, Refractive index profile and mode propagation, Losses in Optical Fibre, Fibre Optic Communication System, Merits of Optical Fibres, Applications.

**UNIT-IV: DIELECTRIC AND MAGNETIC MATERIALS**

**Dielectrics:** Introduction, Basic definitions: Electric field, Electric flux density, Dielectric Constant, Polarization vector, Electric susceptibility, Polarizability, Relation between polarization, susceptibility and dielectric constant, Effect of dielectric on the behavior of a capacitor, Calculation of polarizabilities: Electronic, Ionic and Orientation Polarizations, Internal fields in a solid - Clausius-Mossotti relation, Piezoelectrics, Ferroelectrics and Pyroelectric materials.

**Magnetism:** Introduction, Bohr magneton, classification of Dia, Para and Ferro magnetic materials on the basis of magnetic moment, Hysteresis curve based on domain theory, Soft and hard magnetic materials, Properties of anti- Ferro and ferri magnetic materials, magneto electrics, multi ferroics.

### **UNIT-V: SUPERCONDUCTIVITY**

Introduction to Superconductivity, Low T<sub>c</sub> superconductors, Properties of Superconductors: Zero electrical resistance, Persistent current, Critical temperature, Critical magnetic field, Critical current density, Perfect diamagnetism-Meissner effect, London penetration depth, Flux quantization, Entropy, Heat capacity, Isotope effect, Type-I and Type-II Superconductors, BCS Theory, Josephson Effect, High T<sub>c</sub> Superconductors, Applications.

#### **TEXT BOOKS:**

1. Principles of Physics, Jearl Walker, David Halliday and Robert Resnick-Wiley publications.
2. Engineering Physics, B.K. Pandey, S. Chaturvedi – Cengage Learning.
3. A text book of Engineering Physics, Dr. M. N Avadhanulu, Dr. P.G. Kshirsagar- S. Chand.

#### **REFERENCES:**

1. Engineering Physics, R. K. Gaur - S.L. Gupta, Dhanpat Rai & Sons
2. J. Singh, Semiconductor Optoelectronics: Physics and Technology, Mc Graw-Hill inc. (1995).
3. Introduction to Solid State Physics by Charles Kittel, Wiley student edition.
4. S.M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).

## BASIC ELECTRICAL ENGINEERING

**I Year B.Tech. II Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre-requisites: --**

**Course Objectives:**

- To introduce the concepts of electrical circuits and its components
- To understand magnetic circuits, DC circuits and AC single phase & three phase circuits
- To study and understand the different types of DC/AC machines and Transformers.
- To impart the knowledge of various electrical installations.
- To introduce the concept of power, power factor and its improvement.

**Course Outcomes:**

- To analyze and solve electrical circuits using network laws and theorems.
- To understand and analyze basic Electric and Magnetic circuits
- To study the working principles of Electrical Machines
- To introduce components of Low Voltage Electrical Installations

**UNIT-I:**

**D.C. CIRCUITS**

Electrical circuit elements (R, L and C), voltage and current sources, KVL&KCL, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

**UNIT-II:**

**A.C. CIRCUITS**

Representation of sinusoidal waveforms, peak and rms values, phasor representation, real power, reactive power, apparent power, power factor, Analysis of single-phase ac circuits consisting of R, L, C, RL, RC, RLC combinations (series and parallel), resonance in series R-L-C circuit. Three-phase balanced circuits, voltage and current relations in star and delta connections.

**UNIT-III:**

**TRANSFORMERS**

Ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three-phase transformer connections.

**UNIT-IV:**

**ELECTRICAL MACHINES**

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Significance of torque-slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single-phase induction motor. Construction, working, torque-speed characteristic and speed control of separately excited dc motor. Construction and working of synchronous generators.

**UNIT-V:**

**ELECTRICAL INSTALLATIONS**

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing. Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

**TEXT BOOKS:**

1. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.

**REFERENCES:**

1. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
2. E. Hughes, "Electrical and Electronics Technology", Pearson, 2010.
3. V. D. Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.

## ENGINEERING GRAPHICS

I Year B.Tech. II Sem

L	T	P	C
1	0	3	2.5

**Pre-requisites:** Nil

**Course objectives:**

- To provide basic concepts in engineering drawing
- To impart knowledge about standard principles of orthographic projection of objects
- To draw sectional views and pictorial views of solids

**Course Outcomes:**

At the end of the course, the student will be able to:

- Prepare working drawings to communicate the ideas and information.
- Read, understand and interpret engineering drawings.

**UNIT-I:**

**INTRODUCTION TO ENGINEERING DRAWING:**

Principles of Engineering Graphics and their Significance, Conic Sections including the Rectangular Hyperbola – General method only. Cycloid, Epicycloid and Hypocycloid, Involute. Scales – Plain, Diagonal and Vernier Scales.

**UNIT-II:**

**ORTHOGRAPHIC PROJECTIONS:**

Principles of Orthographic Projections – Conventions – Projections of Points and Lines, Projections of Plane regular geometric figures. —Auxiliary Planes.

**UNIT-III:**

Projections of Regular Solids – Auxiliary Views.

**UNIT-IV:**

Sections or Sectional views of Right Regular Solids – Prism, Cylinder, Pyramid, Cone – Auxiliary views – Sections of Sphere. Development of Surfaces of Right Regular Solids – Prism, Cylinder, Pyramid and Cone

**UNIT-V:**

**ISOMETRIC PROJECTIONS:**

Principles of Isometric Projection – Isometric Scale – Isometric Views – Conventions – Isometric Views of Lines, Plane Figures, Simple and Compound Solids – Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts. Conversion of Isometric Views to Orthographic Views and Vice-versa – Conventions Auto CAD: Basic principles only

**TEXT BOOKS:**

1. Engineering Drawing by N.D. Bhatt, Charotar
2. Engineering Drawing and Graphics by Rane and Shah, Pearson Edu.

**REFERENCE BOOKS:**

1. A Text Book of Engineering Drawing by Dhawan R K, S. Chand
2. Engineering Graphics with Auto CAD by James D Bethune, Pearson Edu.
3. Engineering Graphics by K R Mohan, Dhanpat Rai.
4. Text book on Engineering Drawingby KL Narayana, P Kannaih, Scitech

**APPLIED PHYSICS LAB****I Year B.Tech. II Sem**

L	T	P	C
0	0	3	1.5

**Course Objectives:** The course enables the students to understand:

1. The band concept of semiconductors, characterization of solar cell and LED.
2. The magnetic field strength along the axis of an electromagnet and to study the Hall effect.
3. The Photoelectric effect and characterization of Lasers and Optical fibres.
4. Resonance due to electrical waves and time constant of RC circuit.

**Course Outcomes:** At the end of the course students will be able:

1. To gain the knowledge on photoelectronic devices such as semiconductors, solar cells and LED.
2. To understand the magnetic properties of electromagnets and combined effect of electric field and magnetic field on a semiconductor.
3. To understand the phenomena of photoelectric effect and principles of Lasers and Optical fibres.
4. To observe Resonance phenomena due to electrical waves using LCR circuits and to study the time constant of RC circuits using different resistor and capacitor combinations.

**LIST OF EXPERIMENTS:**

2. Energy gap of P-N junction diode: Determination of energy gap of a semiconductor diode.
3. Solar Cell: V-I Characteristics of solar cell.
4. Light emitting diode: V-I and P-I characteristics of light emitting diode.
5. Stewart – Gee’s experiment: Determination of magnetic field along the axis of a current-carrying coil.
6. Hall Effect: Determination of Hall co-efficient of a given semiconductor.
7. Photoelectric effect: Determination of work function of a given material.
8. LASER: Characteristics of LASER sources.
9. Optical fiber: Determination of the bending losses of Optical fibers.
10. LCR Circuit: Quality factor of LCR Circuit.
11. R-C Circuit: Time constant of R-C circuit.
12. BJT: Characteristics of NPN transistor.
13. Zener diode: To study the V-I Characteristics, zener effect - doping concentration

**Note: Any 8 experiments are to be performed by each student**

## BASIC ELECTRICAL ENGINEERING LAB

**I Year B.Tech. II Sem**

L	T	P	C
0	0	2	1

**Pre-requisites:** Basic Electrical Engineering

**Course Objectives:**

- To analyze a given network by applying various electrical laws and network theorems
- To know the response of electrical circuits for different excitations
- To calculate, measure and know the relation between basic electrical parameters.
- To analyze the performance characteristics of DC and AC electrical machines

**Course Outcomes:**

- Get an exposure to basic electrical laws.
- Understand the response of different types of electrical circuits to different excitations.
- Understand the measurement, calculation and relation between the basic electrical parameters
- Understand the basic characteristics of transformers and electrical machines.

**List of experiments/demonstrations:**

1. Verification of Ohms Law
2. Verification of KVL and KCL
3. Transient Response of Series RL and RC circuits for DC excitation
4. Transient Response of RLC Series circuit for DC excitation
5. Resonance in series RLC circuit
6. Calculations and Verification of Impedance and Current of RL, RC and RLC series circuits
7. Measurement of Voltage, Current and Real Power in primary and Secondary Circuits of a Single Phase Transformer
8. Load Test on Single Phase Transformer (Calculate Efficiency and Regulation)
9. Three Phase Transformer: Verification of Relationship between Voltages and Currents (Star-Delta, Delta-Delta, Delta-star, Star-Star)
10. Measurement of Active and Reactive Power in a balanced Three-phase circuit
11. Performance Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
12. Torque-Speed Characteristics of a Separately/Self Excited DC Shunt/Compound Motor
13. Performance Characteristics of a Three-phase Induction Motor
14. Torque-Speed Characteristics of a Three-phase Induction Motor
15. No-Load Characteristics of a Three-phase Alternator

**TEXT BOOKS:**

1. D. P. Kothari and I. J. Nagrath, “Basic Electrical Engineering”, Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, “Basic Electrical Engineering”, McGraw Hill, 2009.

**REFERENCES:**

1. L. S. Bobrow, “Fundamentals of Electrical Engineering”, Oxford University Press, 2011.
2. E. Hughes, “Electrical and Electronics Technology”, Pearson, 2010.
3. V. D. Toro, “Electrical Engineering Fundamentals”, Prentice Hall India, 1989.

## APPLIED PYTHON PROGRAMMING LAB

I Year B.Tech. II Sem

L T P C

0 1 2 2

## LIST OF EXPERIMENTS

## Cycle - 1

1. **Downloading and Installing Python and Modules**
  - a) **Python 3 on Linux**  
Follow the instructions given in the URL <https://docs.python-guide.org/starting/install3/linux/>
  - b) **Python 3 on Windows**  
Follow the instructions given in the URL <https://docs.python.org/3/using/windows.html>  
(Please remember that Windows installation of Python is harder!)
  - c) **pip3 on Windows and Linux**  
Install the Python package installer by following the instructions given in the URL <https://www.activestate.com/resources/quick-reads/how-to-install-and-use-pip3/>
  - d) **Installing numpy and scipy**  
You can install any python3 package using the command `pip3 install <packagename>`
  - e) **Installing jupyterlab**  
Install from pip using the command `pip install jupyterlab`
2. **Introduction to Python3**
  - a) Printing your biodata on the screen
  - b) Printing all the primes less than a given number
  - c) Finding all the factors of a number and show whether it is a *perfect* number, i.e., the sum of all its factors (excluding the number itself) is equal to the number itself
3. **Defining and Using Functions**
  - a) Write a function to read data from a file and display it on the screen
  - b) Define a boolean function *is palindrome*(<input>)
  - c) Write a function *collatz*(*x*) which does the following: if *x* is odd,  $x = 3x + 1$ ; if *x* is even, then  $x = x/2$ . Return the number of steps it takes for  $x = 1$
  - d) Write a function  $N(m, s) = \exp(-(x-m)^2/(2s^2))/\sqrt{2\pi}s$  that computes the Normal distribution
4. **The package numpy**
  - a) Creating a matrix of given order  $m \times n$  containing *random numbers* in the range 1 to 99999
  - b) Write a program that adds, subtracts and multiplies two matrices. Provide an interface such that, based on the prompt, the function (addition, subtraction, multiplication) should be performed
  - c) Write a program to solve a system of  $n$  linear equations in  $n$  variables using matrix inverse
5. **The package scipy and pyplot**
  - a) Finding if two sets of data have the same *mean* value
  - b) Plotting data read from a file
  - c) Fitting a function through a set a data points using *polyfit* function
  - d) Plotting a histogram of a given data set
6. **The strings package**
  - a) Read text from a file and print the number of lines, words and characters
  - b) Read text from a file and return a list of all  $n$  letter words beginning with a vowel
  - c) Finding a secret message hidden in a paragraph of text
  - d) Plot a histogram of words according to their length from text read from a file

## Cycle -2

7. Installing OS on Raspberry Pi
  - a) Installation using PiImager
  - b) Installation using image file
    - Downloading an Image
      - Writing the image to an SD card
        - using Linux
        - using Windows
      - Booting up

Follow the instructions given in the URL <https://www.raspberrypi.com/documentation/computers/getting-started.html>

8. Accessing GPIO pins using Python
  - a) Installing GPIO Zero library.  
First, update your repositories list:  
***sudo apt update***  
Then install the package for Python 3:  
***sudo apt install python3-gpiozero***
  - b) Blinking an LED connected to one of the GPIO pin
  - c) Adjusting the brightness of an LED

Adjust the brightness of an LED (0 to 100, where 100 means maximum brightness) using the in-built PWM wavelength.

9. Collecting Sensor Data
  - a) DHT Sensor interface
    - Connect the terminals of DHT GPIO pins of Raspberry Pi.
    - Import the DHT library using ***import Adafruit\_DHT***
    - Read sensor data and display it on screen.

## ELECTRONIC DEVICES AND CIRCUITS

**II Year B.Tech. I Sem**

**L T P C**  
**3 1 0 4**

**Pre-Requisites: Physics**

### Course Objectives

1. To introduce components such as diodes, BJTs and FETs.
2. To know the applications of components.
3. To know the switching characteristics of components.
4. To give understanding of various types of amplifier circuits.

### Course Outcomes

Upon completion of the Course, the students will be able to:

1. Acquire the knowledge of various semiconductor devices and their use on real life.
2. Understand the design aspects of biasing and keep them in active region of the device for functional circuits.
3. Acquire the knowledge about the role of special purpose devices and their applications.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	-	-	-	-	-	-	-	-	1	2	-
CO2	3	2	3	-	-	-	-	-	-	-	-	1	3	1
CO3	3	3	3	-	-	2	-	-	-	-	-	1	3	-

### UNIT I

**Diode and Applications:** Diode - Static and Dynamic resistances, Equivalent circuit, Diffusion and Transition Capacitances, Diode Applications: Switch-Switching times.

Rectifier - Half Wave Rectifier, Full Wave Rectifier, Bridge Rectifier, Rectifiers With Capacitive Filter, Clippers-Clipping at two independent levels, Clampers-Clamping Operation, types, Clamping Circuit Theorem, Comparators.

### UNIT II

**Bipolar Junction Transistor (BJT):** Principle of Operation and characteristics - Common Emitter, Common Base, Common Collector Configurations, Operating point, DC & AC load lines, Transistor Hybrid parameter model, Determination of h-parameters from transistor characteristics, Conversion of h-parameters.

### UNIT III

**Transistor Biasing and Stabilization :** Bias Stability, Fixed Bias, Collector to Base bias, Self Bias, Bias Compensation using Diodes and Transistors.

**Analysis and Design of Small Signal Low Frequency BJT Amplifiers:** Analysis of CE, CC, CB Amplifiers and CE Amplifier with emitter resistance, low frequency response of BJT Amplifiers, effect of coupling and bypass capacitors on CE Amplifier.

### UNIT IV

**Junction Field Effect Transistor:** Construction, Principle of Operation, Pinch-Off Voltage, Volt-Ampere Characteristic, Comparison of BJT and FET, Biasing of FET, FET as Voltage Variable Resistor, MOSFET Construction and its Characteristics in Enhancement and Depletion modes.

## UNIT V

**FET Amplifiers:** Small Signal Model, Analysis of CS, CD, CG JFET Amplifiers.

**Special Purpose Devices:** Zener Diode - Characteristics, Voltage Regulator; Principle of Operation - SCR, Tunnel diode, UJT, Varactor Diode.

## TEXTBOOKS

1. Electronic Devices and Circuits - Jacob Millman, McGraw Hill Education.
2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11<sup>th</sup> Edition, Pearson, 2009.

## REFERENCES

1. The Art of Electronics , Horowitz, 3<sup>rd</sup> Edition Cambridge University Press, 2018
2. Electronic Devices and Circuits, David A. Bell – 5<sup>th</sup> Edition, Oxford.
3. Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 2 Ed., McGraw Hill, 2008.
4. Electronic Devices and Circuits, S. Salivahanan, N.Suresh Kumar, A Vallvaraj, 2<sup>nd</sup> Edition, TMH.

## NETWORK ANALYSIS AND TRANSMISSION LINES

**II Year B.Tech. I Sem**

**L T P C**  
**3 0 0 3**

**Pre-Requisites: Nil**

**Course Objectives**

1. To understand the basic concepts on RLC circuits.
2. To know the behavior of the steady states and transients states in RLC circuits.
3. To understand the two port network parameters.
4. To study the propagation, reflection and transmission of plane waves in bounded and unbounded media.

**Course Outcomes**

Upon successful completion of the course, students will be able to:

1. Gain the knowledge on basic RLC circuits behavior.
2. Analyze the Steady state and transient analysis of RLC Circuits.
3. Characterization of two port network parameters.
4. Analyze the Design aspect of transmission line parameters and configurations.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	1	-	-	-	1	-	-	-	-	1	3	1
CO2	2	3	2	-	-	-	1	-	-	-	-	1	3	1
CO3	3	2	1	-	-	-	-	-	-	-	-	1	3	1
CO4	2	3	3	-	-	-	1	-	-	-	-	1	3	1

**UNIT I**

Network Topology, Basic cutset and tie set matrices for planar networks, Magnetic Circuits, Self and Mutual inductances, dot convention, impedance, reactance concept, Impedance transformation and coupled circuits, co-efficient of coupling, equivalent T for Magnetically coupled circuits, Ideal Transformer.

**UNIT II**

Transient and Steady state analysis of RC, RL and RLC Circuits, Sinusoidal, Step and Square responses. 2<sup>nd</sup> order series and parallel RLC Circuits, Root locus, damping factor, over damped, under damped, critically damped cases, quality factor and bandwidth for series and parallel resonance, resonance curves.

**UNIT III**

Two port network parameters, Z, Y, ABCD, h and g parameters, Characteristic impedance, Image transfer constant, image and iterative impedance, network function, driving point and transfer functions – using transformed (S) variables, Poles and Zeros. Standard T,  $\pi$ , L Sections, Characteristic impedance, image transfer constants, Design of Attenuators, impedance matching network.

**UNIT IV**

**Transmission Lines - I:** Types, Parameters, Transmission Line Equations, Primary & Secondary Constants, Equivalent Circuit, Characteristic Impedance, Propagation Constant, Phase and Group Velocities, Infinite Line Concepts, Lossless / Low Loss Characterization, Types of Distortion, Condition for Distortion less line, Minimum Attenuation, Loading - Types of Loading.

## UNIT V

**Transmission Lines – II:** Input Impedance Relations, SC and OC Lines, Reflection Coefficient, VSWR.  $\lambda/4$ ,  $\lambda/2$ ,  $\lambda/8$  Lines – Impedance Transformations, Smith Chart – Configuration and Applications, Single Stub Matching.

## TEXT BOOKS

1. Network Analysis – Van Velken Burg, 3<sup>rd</sup> Ed., Pearson, 2016
2. Networks, Lines and Fields - JD Ryder, PHI, 2<sup>nd</sup> Edition, 1999.

## REFERENCES

1. Electric Circuits – J. Edminister and M.Nahvi – Schaum's Outlines, MCGRAW HILL EDUCATION, 1999.
2. Engineering Circuit Analysis – William Hayt and Jack E Kemmerly, MGH, 8<sup>th</sup> Edition, 1993.
3. Electromagnetics with Applications – JD. Kraus, 5<sup>th</sup> Ed., TMH
4. Transmission Lines – Richard Collier, Cambridge University Press, 2013.

## SIGNALS AND SYSTEMS

**II Year B.Tech. I Sem**

**L T P C**  
**3 0 0 3**

**Pre-Requisites:** Mathematics

### Course Objectives

This subject gives the basics of Signals and Systems required for all Electrical Engineering related courses. The objectives of this subject are to:

1. Classify signals and systems and their analysis in time and frequency domains.
2. Study the concepts of distortion less transmission through LTI systems, convolution and correlation properties.
3. Understand Laplace and Z-transforms their properties for analysis of signals and systems.
4. Identify the need for sampling of CT signals, types and merits and demerits of each type.

### Course Outcomes

Upon completing this course, the student will be able to:

1. Characterize various signals, systems and their time and frequency domain analysis, using transform techniques.
2. Identify the conditions for transmission of signals through systems and conditions for physical realization of systems.
3. Understand the significance of sampling theorem for baseband and band pass signals for various types of sampling and for different duty cycles.
4. Understand the concept of correlation and PSD functions and their applications.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	-	-	-	-	-	-	-	-	1	3	1
CO2	3	3	2	-	-	-	-	-	-	-	-	1	3	1
CO3	3	3	2	2	-	-	-	-	-	-	-	1	3	1
CO4	3	3	2	2	-	-	-	-	-	-	-	1	3	1

### UNIT I

#### Signal Analysis

Analogy between Vectors and Signals, Orthogonal Signal Space, Signal approximation using Orthogonal functions, Mean Square Error, Closed or complete set of Orthogonal functions, Orthogonality in Complex functions, Classification of Signals and systems, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit Step function, Signum function.

### UNIT II

#### Fourier series

Representation of Fourier series, Continuous time periodic signals, Properties of Fourier Series, Dirichlet's conditions, Trigonometric Fourier Series and Exponential Fourier Series, Complex Fourier spectrum.

#### Fourier Transforms

Deriving Fourier Transform from Fourier series, Fourier Transform of arbitrary signal, Fourier Transform of standard signals, Fourier Transform of Periodic Signals, Properties of Fourier Transform, Fourier Transforms involving Impulse function and Signum function, Introduction to Hilbert Transform.

### UNIT III

#### Signal Transmission through Linear Systems

Linear System, Impulse response, Response of a Linear System, Concept of convolution in Time domain and Frequency domain, Graphical representation of Convolution. Extraction of Signal from Noise by Filtering. Linear Time Invariant (LTI) System, Linear Time Variant (LTV) System, Transfer function of a LTI System, Filter characteristic of Linear System, Distortion less transmission through a system, Signal bandwidth, System Bandwidth, Ideal LPF, HPF, and BPF characteristics, Causality and Paley-Wiener criterion for physical realization, Relationship between Bandwidth and rise time. Extraction of Signal from Noise by Filtering

### UNIT IV

#### Laplace Transforms

Laplace Transforms (L.T), Inverse Laplace Transform, Concept of Region of Convergence (ROC) for Laplace Transforms, Properties of L.T, Relation between L.T and F.T of a signal, Laplace Transform of certain signals using waveform synthesis.

#### Correlation

Auto Correlation and Cross Correlation Functions, Relation between Convolution and Correlation, Properties of Correlation Functions, Energy Density Spectrum, Power Density Spectrum, Relation between Autocorrelation Function and Energy/Power Spectral Density Function, Parseval's Theorem, Detection of Periodic Signals in the presence of Noise by Correlation.

### UNIT V

#### Sampling theorem

Graphical and analytical proof of Sampling Theorem for Base band/Band Limited and Band Pass Signals, Types of Sampling: Impulse Sampling, Natural and Flat top Sampling, Reconstruction of signal from its samples, Effect of under sampling – Aliasing,

#### Z-Transforms

Concept of Z- Transform of a Discrete Sequence, Distinction between Laplace, Fourier and Z Transforms, Region of Convergence in Z-Transform, Constraints on ROC for various classes of signals, Inverse Z-transform, Properties of Z-transforms.

### TEXT BOOKS

1. Signals, Systems & Communications - B.P. Lathi, BSP, 2013.
2. Signals and Systems - A.V. Oppenheim, A.S. Willsky and S.H. Nawabi, 2 Ed.

### REFERENCES

1. Signals and Systems – Simon Haykin and Van Veen , Wiley 2 Ed.,
2. Signals and Systems – A. Rama Krishna Rao, 2008, TMH
3. Fundamentals of Signals and Systems - Michel J. Robert, 2008, MGH International Edition.
4. Signals, Systems and Transforms - C. L. Philips, J.M.Parr and Eve A.Riskin, 3 Ed., 2004, PE.

## SWITCHING THEORY AND LOGIC DESIGN

**II Year B.Tech. I Sem**

**L T P C**  
**3 1 0 4**

**Pre-Requisites:** Engineering Mathematics

### Course Objectives

1. To understand common forms of number representation in logic circuits.
2. To learn basic techniques for the design of digital circuits and fundamental concepts used in the design of digital systems.
3. To understand the concepts of combinational logic circuits and sequential circuits.
4. To understand the Realization of Logic Gates Using Diodes & Transistors.

### Course Outcomes

Upon completing this course, the student will be able to

1. Acquire the knowledge on numerical information in different forms and Boolean Algebra theorems.
2. Define Postulates of Boolean algebra and to minimize combinational functions, and design the combinational circuits.
3. Design and analyze sequential circuits for various cyclic functions.
4. Characterize logic families and analyze them for the purpose of AC and DC parameters.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	2	1	-	-	-	-	-	2	3	1
CO2	3	2	2	1	2	1	-	-	-	-	-	2	3	1
CO3	2	3	3	2	2	1	-	-	-	-	-	1	3	1
CO4	3	2	1	1	1	-	-	-	-	-	-	-	3	1

### UNIT I

#### Number Systems

Number systems, Conversion and Complements Codes- Weighted and Non-weighted codes and their Properties, Parity check code and Hamming code.

#### Boolean Algebra

Basic Theorems and Properties, Switching Functions- Canonical and Standard Forms, Function Simplification using Theorems, Digital Logic Gates, EX-OR gates, Universal Gates, Two level NAND/NOR realization of Boolean Function, Multilevel realization of Boolean Function.

### UNIT II

#### Minimization with Theorems

Karnaugh Map Method - Up to five Variables, Don't Care Map Entries, Tabular Method,

#### Combinational Logic Circuit Design and Applications

Adders, Subtractors, comparators, Multiplexers, Demultiplexers, Encoders, Decoders and Codeconverters, Hazards and Hazards Free Relations. Practical aspects related to Combinational Logic Design- Fan-in and Fan-out, Propagation Delay.

### UNIT III

#### Sequential Circuits Fundamentals

Architectural difference of Combinational and Sequential circuits, SR Latch, Types of Traditional Clocked Flip Flops: SR, JK, JK Master Slave, D and T Type Flip Flops, Excitation Tables of all Flip Flops, Timing and Triggering Consideration, Conversion from one type of Flip-Flop to another.

### **Design and Application of Registers and Counters**

Shift Registers – Left, Right and Bidirectional Shift Registers, Counters-Ring and Twisted Ring Counter, Frequency Divider, Pseudo Random Sequence generator, Operation of Asynchronous and Synchronous Counters.

### **UNIT IV**

#### **Sequential Machines**

Finite State Machines, State Diagram, Analysis of Synchronous Sequential Circuits, Design Steps of Synchronous Sequential Circuits. Synthesis of Synchronous Sequential Circuits- Serial Binary Adder, Sequence Detector, Parity-bit Generator, Synchronous Modulo -N Counters. State minimization capabilities and limitations, Mealy and Moore models.

### **UNIT V**

#### **Realization of Logic Gates Using Diodes & Transistors**

AND, OR and NOT Gates using Diodes and Transistors, DCTL, RTL, DTL, TTL and CML Logic Families and its Comparison, Classification of Integrated Circuits. Transfer characteristics of TTL, Various forms of TTL family LS, H, S, Open Collector logic, Tristate logic.

### **TEXT BOOKS**

1. Switching and Finite Automata Theory - Zvi Kohavi & Niraj K. Jha, 3rd Edition, Cambridge, 2010.
2. Modern Digital Electronics – R. P. Jain, 3<sup>rd</sup> edition, Tata McGraw-Hill, 2007.

### **REFERENCE**

1. Digital Design- Morris Mano, PHI, 4th Edition, 2006
2. Introduction to Switching Theory and Logic Design – Fredriac J. Hill, Gerald R. Peterson, 3rd Ed, John Wiley & Sons Inc.
3. Fundamentals of Logic Design- Charles H. Roth, Cengage Learning, 5th, Edition, 2004.
4. Switching Theory and Logic Design – A Anand Kumar, PHI, 2013
5. An Engineering approach to Digital Design-William I. Fletcher, PHI, 2013.

**PROBABILITY THEORY AND STOCHASTIC PROCESSES**

**II Year B.Tech. I Sem**

**L T P C**  
**3 1 0 4**

**Pre-requisite: Mathematics**

**Course Objectives**

1. This gives basic understanding of random variables and operations that can be performed on them.
2. To know the Spectral and temporal characteristics of Random Process.
3. To Learn the Basic concepts of Information theory Noise sources and its representation for understanding its characteristics.

**Course Outcomes**

Upon completing this course, the student will be able to

1. Perform operations on single and multiple Random variables.
2. Determine the Spectral and temporal characteristics of Random Signals.
3. Characterize LTI systems driven by stationary random process by using ACFs and PSDs.
4. Understand the concepts of Noise and Information theory in Communication systems.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	-	2	-	-	-	-	-	-	-	-	3	-
CO2	3	3	-	2	-	-	-	-	-	-	-	-	3	-
CO3	3	3	3	2	-	-	-	-	-	-	-	-	3	-
CO4	3	3	3	2	-	-	-	-	-	-	-	-	3	-

**UNIT I**

**Probability & Random variables:** Probability introduced through Sets and Relative Frequency: Experiments and Sample Spaces, Discrete and Continuous Sample Spaces, Events, Probability Definitions and Axioms, Joint Probability, Conditional Probability, Total Probability, Bay’s Theorem, Independent Events.

**Random Variables-** Definition, Conditions for a Function to be a Random Variable, Discrete, Continuous and Mixed Random Variable, Distribution and Density functions, Properties, Binomial, Poisson, Uniform, Gaussian, Exponential, Rayleigh, Methods of defining Conditioning Event, Conditional Distribution, Conditional Density and their Properties.

**Operations on single Random Variable:** Expected Value of a Random Variable, Function of a Random Variable, Moments about the Origin, Central Moments, Variance and Skew, Chebychev’s Inequality, Characteristic Function, Moment Generating Function, Transformations of a Random Variable - Monotonic and Non-monotonic Transformations of Continuous and Discrete Random Variable, Computer generation of a Random Variable of a given PDF/CDF.

**UNIT II**

**Multiple random variables and Operations on Multiple random variables:** Vector Random Variables, Joint Distribution Function and its Properties, Marginal Distribution Functions, Conditional Distribution and Density – Point and Interval conditioning, Statistical Independence, Sum of Two and more Random Variables, Central Limit Theorem, Equal and Unequal Distribution ( Proof not expected).

Expected Value of a Function of Random Variables- Joint Moments about the Origin, Joint Central Moments, Joint Characteristic Functions, Jointly Gaussian Random Variables: Two Random Variables case, N Random Variable case, Properties, Transformations of Multiple Random Variables, Linear Transformations of Gaussian Random Variables.

### UNIT III

**Random processes – Temporal characteristics:** The Random Process Concept, Classification of Processes, Deterministic and Nondeterministic Processes, Distribution and Density Functions, concept of Stationarity and Statistical Independence. First-Order Stationary Processes, Second- Order and Wide- Sense Stationarity, (N-Order) and Strict-Sense Stationarity, Time Averages and Ergodicity, Mean- Ergodic Processes, Correlation-Ergodic Processes, Autocorrelation Function and Its Properties, Cross- Correlation Function and Its Properties, Covariance Functions, Gaussian Random Processes, Poisson Random Process. Random Signal Response of Linear Systems: System Response – Convolution, Mean and Mean-squared Value of System Response, autocorrelation Function of Response, Cross-Correlation Functions of Input and Output.

### UNIT IV

**Random processes – Spectral characteristics:** The Power Spectrum: Properties, Relationship between Power Spectrum and Autocorrelation Function, The Cross-Power Density Spectrum, Properties, Relationship between Cross-Power Spectrum and Cross-Correlation Function. Spectral Characteristics of System Response: Power Density Spectrum of Response, Cross-Power Density Spectrums of Input and Output.

### UNIT V

**Noise sources:** Resistive/Thermal Noise Source, Arbitrary Noise Sources, Effective Noise Temperature, Noise equivalent bandwidth, Average Noise Figures, Average Noise Figure of cascaded networks, Narrow Band noise, Quadrature representation of narrow band noise & its properties.

**Information theory:** Entropy, Information rate, Source coding: Huffman coding, Shannon Fano coding, Mutual information, Channel capacity of discrete channel, Shannon-Hartley law; Trade -off between bandwidth and SNR.

### TEXT BOOKS

1. Probability, Random Variables & Random Signal Principles - Peyton Z. Peebles, TMH, 4<sup>th</sup> Edition, 2001.
2. Principles of Communication systems by Taub and Schilling (TMH),2008

### REFERENCES

1. Probability, Random Variables and Stochastic Processes – Athanasios Papoulis and S. Unnikrishna Pillai, PHI, 4th Edition, 2002.
2. Random Processes for Engineers-Bruce Hajck, Cambridge unipress,2015
3. Probability Theory and Stochastic Processes for Engineers -K.N. Hari Bhat, K. Anitha Sheela and Jayanti Ganguly, Pearson Publishers, 1<sup>st</sup> Edition, 2011

**ELECTRONIC DEVICES AND CIRCUITS LAB**

**II Year B.Tech. I Sem**

**L T P C**  
**0 0 2 1**

CO1: Acquire the knowledge of various semiconductor devices and their use in real life.

CO2: Understand the design aspects of biasing and keep them in active region of the device for functional circuits

CO3: Acquire the knowledge about the role of special purpose devices and their applications.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	2	-	3	-	-	3	3	-	-	1	1	2
CO2	1	-	2	-	3	-	-	3	3	-	-	1	1	2
CO3	1	-	2	-	3	-	-	3	3	-	-	1	1	2

**List of Experiments (Twelve experiments to be done):**

Design and Simulation following using Multisim or Pspice or Equivalent Simulation Software and verify Through experiment,

1. Draw the VI Characteristics of given PN Junction diode. Determine the Static and Dynamic resistance the Diode.
2. Determine the VI Characteristics of Zener diode and also Design voltage Regulator Circuit for the given voltage.
3. Determine the Ripple factor, %Regulation PIV and TUF of the given Rectifier with & without filter.
4. Obtain the I/O Characteristics of CE, CB, CC configurations of BJT. Calculate h-parameters from the Characteristics.
5. Obtain the Drain and Transfer characteristics of CD,CS configuration of JFET. Calculate gm, rd from the Characteristics.
6. Determine the VI Characteristics of SCR. Calculate Breakover voltage from the Characteristics.
7. Obtain the VI Characteristics of UJT and identify the negative resistance region.
8. Perform an experiment to choose Q-point for a Transistor that operate in active region and Observe the affect of external Load resistance on Q-point.
9. Design a Self bias Circuit and determine the Q-point of the Transistor and its Stability factor by both simulation and realization with hardware components.
10. Design and Simulate a Common Drain Amplifier with voltage divider bias and determine the Stability factor.
11. By experiment prove that the voltage gain of Emitter Follower Circuit is one.
12. Design a Common Emitter Amplifier with a gain of 30db and Bandwidth of 10KHZ and plot the frequency response practically.

## DIGITAL LOGIC DESIGN LAB

II Year B.Tech. I Sem

L T P C  
0 0 2 1

### Course Outcomes

Upon completing this course, the student will be able to

1. Acquire the knowledge on numerical information in different forms and Boolean Algebra theorems.
2. Define Postulates of Boolean algebra and to minimize combinational functions, and design the combinational circuits.
3. Design and analyze sequential circuits for various cyclic functions.
4. Characterize logic families and analyze them for the purpose of AC and DC parameters.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	1	2	1	-	-	1	-	-	2	3	1
CO2	3	2	2	1	2	1	-	-	1	-	-	2	3	1
CO3	2	3	3	2	2	1	-	-	1	-	-	1	3	1
CO4	3	2	1	1	1	-	-	-	-	-	-	-	3	1

### List of Experiments

The experiments with designing procedure should be simulated using HDL before hardware verification.  
From experiments 1 to 7 should be completed in 5 classes

1. Realization of Logic circuit to generate r's Complement using Logic Gates.
2. Realization of given Boolean function using universal gates and minimizing the same. Compare the gate count before and after minimization.
3. Design and realize Full Adder circuit using gates/universal gates. Implement Full Subtractor using full adder.
4. Designing a 2 – bit Comparator using AND, OR and NOT gates. Realize 4 – bit Comparator using 2 – bit Comparators.
5. Realize 2:1 MUX using the given gates and Design 8:1 using 2:1 MUX.
6. Implement the given Boolean function using the given MUX(ex: code converters).
7. Realize a 2x4 Decoder using logic gates and implement 3x8 Decoder using 2x4 Decoder.
8. Implement the given Boolean function using given Decoders.
9. Convert Demultiplexer to Decoder and vice versa.
10. Verification of truth tables of flipflops using different clocks (level triggering, positive and negative edge triggering) also convert the given flipflop from one type to other.
11. Designing of Universal n-bit shift register using flipflops and Multiplexers. Draw the timing diagram of the Shift Register.
12. Design of Synchronous binary counter using D-flipflop/given flipflop.
13. Designing of counter for the given sequence using given flipflops.
14. Designing of MOD 8 Counter using JK flipflops.
15. Designing of sequence detecting State Machine with minimal states using the given flipflops.
16. Designing of Parity Bit(even/odd) generator using the given flipflops.
17. Realize all logic gates with TTL logic.
18. Realize all logic gates with DTL logic.

**MODELLING & SIMULATION LAB**

**II Year B.Tech. I Sem**

**L T P C**  
**0 0 2 1**

**Note:**

- All the experiments are to be simulated using MATLAB or equivalent software
- Minimum of 12 experiment are to be completed/Simulated.

CO1: Will be able to design an App for generating, analyzing and performing various operations on Signals/Sequences both in time and Frequency domain

CO2: Will be able to design an App for Analyzing and Characterizing Continuous and Discrete Time Systems both in Time and Frequency domain along with the concept of Sampling

CO3: Will be able to design an App for generating different Random Signals and analyze their Characteristics by finding different higher order Moments

CO4: Will be able to design an App for applying the Concepts of Deterministic and Random Signals for Noise removal Applications and on other Real Time Signals

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	3	3	3	2	-	-	3	1	-	1	2	3
CO2	3	2	3	3	3	2	-	-	3	1	-	1	2	3
CO3	3	2	3	3	3	2	-	-	3	1	-	1	2	3
CO4	3	2	3	3	3	2	-	-	3	1	-	1	2	3

**List of Experiments:**

1. Design and App for generating various standard viz: Periodic and Aperiodic, Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc and Non standard Signals and Sequences generated from these standard signals /sequences using Waveform synthesis. Also for perform different operations viz: Addition, Multiplication, Scaling, Shifting, Folding, Computation of Energy and Average Power on them.
2. Design an App for finding the Even and Odd parts of Signal/Sequence and Real and Imaginary parts of Signal.
3. Design an App for finding the output of a System for a given input and Impulse Response
4. Design an App for finding Auto Correlation and Cross Correlation of Signals/sequences
5. Design an App for Verifying whether a given Continuous/ Discrete System is Linear, Time Invariant, Stable and Physically Realizable
6. Design an App for obtaining Sinusoidal response from the Impulse response of a given Continuous/ Discrete LTI System. Plot the Real and Imaginary part and Magnitude and Phase Plot of the response
7. Design an App for finding and plotting the Magnitude and Phase Spectrum of any given Signal by finding its Fourier Transform by using the properties where ever required.
8. Design an App for finding and plotting the Magnitude and Phase Spectrum of any given Signal by finding its Laplace Transform by using the properties where ever required. Also plot pole-zero diagram in S-plane
9. Design an App for finding and plotting the Magnitude and Phase Spectrum of any given Sequence by finding its Z- Transform by using the properties where ever required. Also plot pole-zero diagram in Z-plane
10. Design a Simulink or equivalent model for solving Differential Equations
11. Design a Simulink or equivalent model for finding the response of any RLC Circuit with different

- initial Conditions for AC and DC inputs and plot the corresponding responses
12. Design an App for generating various Random Variables with different CDFs/PDFs
  13. Design an App for generating Gaussian noise and for finding its mean, Skewness, Kurtosis, PDF and PSD.
  14. Design an App for Verifying Sampling theorem for different sampling rates, Sampling types and Duty Cycles and for plotting the sampled and reconstructed Signals.
  15. Design an App for Removal of noise from the signal using Cross correlation.
  16. Design an App for Extraction of Periodic Signal masked by noise using AutoCorrelation

### **Application on Real Time signals**

1. Application of Autocorrelation: GPS

Synchronization Satellite communication toolbox is required

for this experiment.

Generate the GPS signal. Visualize the GPS signal. Plot of autocorrelation of C/A code and visualize the spectrum of GPS signals. For exact steps, go through the following page:

<https://www.mathworks.com/help/satcom/ug/gps-waveform-generation.html>

2. Sampling of Speech Signals

Record and play speech in Matlab. For steps, go through the following page:

[https://in.mathworks.com/help/matlab/import\\_export/record-and-play-audio.html](https://in.mathworks.com/help/matlab/import_export/record-and-play-audio.html)

Change the sampling rate of the recorded speech signal and play back to see the effect of aliasing. For steps, go through the following page:

<https://in.mathworks.com/help/signal/ug/changing-signal-sample-rate.html>

## CONSTITUTION OF INDIA

II Year B.Tech. I Sem

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2	0	0	0

### Course Objectives:

Students will be able to:

1. Understand the premises informing the twin themes of liberty and freedom from a civil rights perspective.
2. To address the growth of Indian opinion regarding modern Indian intellectuals' constitutional role and entitlement to civil and economic rights as well as the emergence of nationhood in the early years of Indian nationalism.
3. To address the role of socialism in India after the commencement of the Bolshevik Revolution in 1917 and its impact on the initial drafting of the Indian Constitution.

### Course Outcomes:

Students will be able to:

1. Discuss the growth of the demand for civil rights in India for the bulk of Indians before the arrival of Gandhi in Indian politics.
2. Discuss the intellectual origins of the framework of argument that informed the conceptualization of social reforms leading to revolution in India.
3. Discuss the circumstances surrounding the foundation of the Congress Socialist Party [CSP] under the leadership of Jawaharlal Nehru and the eventual failure of the proposal of direct elections through adult suffrage in the Indian Constitution
4. Discuss the passage of the Hindu Code Bill of 1956.

### UNIT I

History of Making of the Indian Constitution- History of Drafting Committee - Philosophy of the Indian Constitution- Preamble Salient Features

### UNIT II

Contours of Constitutional Rights & Duties - Fundamental Rights

- Right to Equality
- Right to Freedom
- Right against Exploitation
- Right to Freedom of Religion
- Cultural and Educational Rights
- Right to Constitutional Remedies
- Directive Principles of State Policy
- Fundamental Duties.

### UNIT III

Organs of Governance: Parliament, Composition, Qualifications and Disqualifications, Powers and Functions, Executive, President, Governor, Council of Ministers, Judiciary, Appointment and Transfer of Judges, Qualifications, Powers and Functions

### UNIT IV

Local Administration: District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation. Panchayat raj: Introduction, PRI: Zila Panchayat. Elected officials and their roles, CEO Zila Panchayat: Position and role. Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

### UNIT V

Election Commission: Election Commission: Role and Functioning. Chief Election Commissioner and Election Commissioners. State Election Commission: Role and Functioning. Institute and Bodies for the welfare of SC/ST/OBC and women.

### Suggested Reading

1. The Constitution of India, 1950 (Bare Act), Government Publication.
2. Dr. S. N. Busi, Dr. B. R. Ambedkar framing of Indian Constitution, 1st Edition, 2015.
3. M. P. Jain, Indian Constitution Law, 7th Edn., Lexis Nexis, 2014.
4. D.D. Basu, Introduction to the Constitution of India, Lexis Nexis, 2015.

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## NUMERICAL METHODS ,COMPLEX VARIABLES AND GRAPHS

**II Year B.Tech. II Sem**

L	T	P	C
3	1	0	4

**Pre-requisites:** Mathematics courses of first year of study.

**Objectives:** To learn

The student is made to learn the basic concepts of graph theory.

Various methods to the find roots of an equation

Concept of finite differences and to estimate the value for the given data using interpolation.

Evaluation of integrals using numerical techniques

Solving ordinary differential equations of first order using numerical techniques.

Differentiation and integration of complex valued functions.

Evaluation of integrals using Cauchy's integral formula and Cauchy's residue theorem.

Expansion of complex functions using Taylor's and Laurent's series.

### **UNIT-I: Numerical Methods-I**

**10 L**

Solution of polynomial and transcendental equations: Bisection method, Iteration Method, Newton-Raphson method and Regula-Falsi method. Jacobi and Gauss-Seidal iteration methods for solving linear systems of equations.

Finite differences: forward differences, backward differences, central differences, symbolic relations and separation of symbols; Interpolation using Newton's forward and backward difference formulae. Central difference interpolation: Gauss's forward and backward formulae; Lagrange's method of interpolation.

### **UNIT-II: Numerical Methods-II**

**8 L**

Numerical integration: Trapezoidal rule and Simpson's 1/3rd and 3/8 rules.

Ordinary differential equations: Taylor's series; Picard's method; Euler and modified Euler's methods; Runge-Kutta method of fourth order for first order ODE.

### **UNIT-III: Complex Differentiation**

**10 L**

Limit, Continuity and Differentiation of Complex functions. Cauchy-Riemann equations (without proof), Milne- Thomson methods, analytic functions, harmonic functions, finding harmonic conjugate; elementary analytic functions (exponential, trigonometric, logarithm) and their properties. (All theorems without Proofs)

### **UNIT-IV: Complex Integration**

**10 L**

Line integrals, Cauchy's theorem, Cauchy's Integral formula, zeros of analytic functions, singularities, Taylor's series, Laurent's series; Residues, Cauchy Residue theorem.

Conformal mappings, Mobius transformations and their properties. (All theorems without Proofs)

### **UNIT-V: Graphs:**

**10 L**

Basic concepts, Isomorphism and sub graphs, Trees and their properties, Spanning trees, Directed trees, Binary trees, Planner graphs, Euler's formula.

### **Text Books**

1. Joe L. Mott, A. Kendal and T.P. Baker, Discrete Mathematics for Computer Scientists and Mathematicians, 2<sup>nd</sup> Edition, Kiston.
2. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36<sup>th</sup> Edition, 2010.
3. S.S. Sastry, Introductory methods of numerical analysis, PHI, 4th Edition, 2005.
4. J. W. Brown and R. V. Churchill, Complex Variables and Applications, 7th Ed., Mc-Graw Hill, 2004.

### **References**

1. M. K. Jain, SRKIyengar, R.K. Jain, Numerical methods for Scientific and Engineering Computations , New Age International publishers.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.

## ELECTROMAGNETIC FIELDS AND WAVES

**II Year B.Tech. II Sem**

**L T P C**  
**3 0 0 3**

**Pre-requisite: Mathematics**

### Course Objectives

1. To learn the Basic Laws, Concepts and proofs related to Electrostatic Fields and Magnetostatic Fields, and apply them to solve physics and engineering problems.
2. To distinguish between static and time-varying fields, and understand the significance and utility of Maxwell's Equations and Boundary Conditions, and gain ability to provide solutions to communication engineering problems.
3. To analyze the characteristics of Uniform Plane Waves (UPW), determine their propagation parameters and estimate the same for dielectric and dissipative media.
4. To conceptually understand the waveguides and to determine the characteristics of rectangular waveguides, microstrip lines .

### Course Outcomes

Upon completing this course, the student will be able to

1. Acquire the knowledge of Basic Laws, Concepts and proofs related to Electrostatic Fields and Magnetostatic Fields.
2. Characterize the static and time-varying fields, establish the corresponding sets of Maxwell's Equations and Boundary Conditions.
3. Analyze the Wave Equations and classify conductors, dielectrics and evaluate the UPW Characteristics for several practical media of interest.
4. Determine the analysis of rectangular waveguides, their mode characteristics, and design waveguides for solving practical problems.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	-	1	-	-	-	1	-	-	3	1
CO2	3	3	2	1	-	1	-	-	-	1	-	-	3	1
CO3	3	3	2	1	-	1	-	-	-	1	-	-	3	1
CO4	3	3	2	1	-	1	-	-	-	1	-	-	3	1

### UNIT I

#### Electrostatics

Coulomb's Law, Electric Field Intensity – Fields due to Different Charge Distributions, Electric Flux Density, Gauss Law and Applications, Electric Potential, Relation between E and V, Maxwell's Two Equations for Electrostatic Fields, Energy Density, Convection and Conduction Currents, Dielectric Constant, Isotropic and Homogeneous Dielectrics, Continuity Equation, Relaxation Time, Poisson's and Laplace's Equations, Capacitors – Parallel Plate, Coaxial, Spherical.

### UNIT II

#### Magnetostatics

Biot-Savart's Law, Ampere's Circuit Law and Applications, Magnetic Flux Density, Maxwell's Two Equations for Magnetostatic Fields, Magnetic Scalar and Vector Potentials, Forces due to Magnetic Fields, Ampere's Force Law.

### UNIT III

#### Maxwell's Equations (Time Varying Fields)

Faraday's Law, Transformer and Motional EMF, Inconsistency of Ampere's Law and Displacement Current Density, Maxwell's Equations in Different Forms, Conditions at a Boundary Surface - Dielectric- Dielectric and Dielectric-Conductor Interfaces.

#### **UNIT IV**

##### **EM Wave Characteristics**

Wave Equations for Conducting and Perfect Dielectric Media, Uniform Plane Waves – Definitions, Relation between E & H, Sinusoidal Variations, Wave Propagation in Lossless and Conducting Media, Conductors & Dielectrics – Characterization, Wave Propagation in Good Conductors and Good Dielectrics, Polarization. Reflection and Refraction of Plane Waves – Normal and Oblique Incidences for both Perfect Conductor and Perfect Dielectrics, Brewster Angle, Critical Angle and Total Internal Reflection, Surface Impedance, Poynting Vector and Poynting Theorem.

#### **UNIT V**

##### **Waveguides**

Electromagnetic Spectrum and Bands. Rectangular Waveguides – Solution of Wave Equations in Rectangular Coordinates, TE/TM mode analysis, Expressions for Fields, Characteristic Equation and Cut-off Frequencies, Dominant and Degenerate Modes, Sketches of TE and TM mode fields in the cross-section, Phase and Group Velocities, Wavelengths and Impedance Relations, Equation of Power Transmission, Impossibility of TEM Mode. Microstrip Lines –  $Z_0$  Relations, Effective Dielectric Constant.

#### **TEXT BOOKS**

1. Engineering Electromagnetics – William H. Hayt Jr. and John A. Buck, 8<sup>th</sup> Ed., McGrawHill, 2014
2. Principles of Electromagnetics – Matthew N.O. Sadiku and S.V. Kulkarni, 6<sup>th</sup> Ed., Oxford University Press, Aisan Edition, 2015.

#### **REFERENCES**

1. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, 2<sup>nd</sup> Ed., PHI, 2000.
2. Engineering Electromagnetics – Nathan Ida, 2<sup>nd</sup> Ed., Springer (India) Pvt. Ltd., New Delhi, 2005.
3. Electromagnetic Field Theory Fundamentals – Bhag Singh Guru and Huseyin R. Hiziroglu, Cambridge University Press, 2<sup>nd</sup> Ed., 2006.

## ANALOG AND DIGITAL COMMUNICATIONS

**II Year B.Tech. II Sem**

**L T P C**  
**3 1 0 4**

**Pre-requisite:** Signals and Systems

### Course Objectives

1. To develop ability to analyze system requirements of analog and digital communication systems.
2. To understand the generation, detection of various analog and digital modulation techniques.
3. To acquire theoretical knowledge of each block in AM, FM transmitters and receivers.
4. To understand the concepts of baseband transmissions.

### Course Outcomes

Upon completing this course, the student will be able to

1. Design and analyze various Analog Modulation and Demodulation techniques.
2. Understand the effect of noise present in continuous wave Modulation techniques.
3. Understand the concept of Superhetrodyne Receiver and Pulse Modulation Techniques
4. Analyze and design the various Digital Modulation Techniques and Base band Transmission.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	3	1	-	3	2	-	-	-	-	1	2	2
CO2	3	3	3	1	-	2	2	-	-	-	-	1	2	2
CO3	3	3	3	1	-	2	2	-	-	-	-	1	2	2
CO4	3	3	3	1	-	3	2	-	-	-	-	1	2	2

### UNIT I

#### Amplitude Modulation

Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, COSTAS Loop, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, Vestigial side band modulation – Time and Frequency domain description. Noise in AM, DSB and SSB Systems.

### UNIT II

#### Angle Modulation

Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves- Armstrong Method, Detection of FM Waves: Balanced slope detector, Phase locked loop, Comparison of FM and AM. , Noise in Angle Modulation System, Threshold effect in Angle Modulation System, Pre-emphasis and de-emphasis.

### UNIT III

#### Transmitters & Receivers

Radio Transmitter Block diagram, **Radio Receiver** - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, AGC, Amplitude limiting, FM Receiver, Comparison with AM Receiver.

### **Pulse Modulation**

Types of Pulse modulation- PAM, PWM and PPM. Comparison of FDM and TDM.

### **Pulse Code Modulation**

PCM Generation and Reconstruction, T D M P C M h i e r a r c h y , Quantization Noise, Non Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

## **UNIT IV**

**DETECTION AND ESTIMATION:** Model of Digital Communication Systems, Geometric Interpretation of Signals, Gram-Schmidt Orthogonalization, Response of Bank of correlators to Noisy Input, Detection of Known Signals in Noise, Probability of error, Optimum Receivers Using Coherent Detection: Matched filter Receiver and its Properties, Correlation receiver, Detection of signals with unknown Phase in Noise

**BASE BAND SHAPING FOR DATA TRANSMISSION:** Requirements of a line encoding format, various line encoding formats- Unipolar, Polar, Bipolar, Discrete PAM signals, Inter symbol interference, Nyquist's criterion, Correlation coding: Duobinary signalling, Modified Duobinary technique, Generalized form of correlation coding, Eye pattern[3].

## **UNIT V**

**DIGITAL MODULATION TECHNIQUES:** Digital Modulation formats, Coherent binary modulation techniques (BPSK, BFSK), Coherent quadrature modulation techniques (QPSK), Non-Coherent binary modulation techniques (BFSK, DPSK), QAM, M-ary modulation techniques (PSK, FSK, QAM), Comparison of M-ary digital modulation techniques, power spectra, bandwidth efficiency[3].

### **TEXTBOOKS**

1. Electronics Communication Systems-Fundamentals through Advanced-Wayne Tomasi, 5<sup>th</sup> Edition, PHI, 2009.
2. Principles of Communication Systems - Herbert Taub, Donald L Schilling, Goutam Saha, 3<sup>rd</sup> Edition, Mcgraw-Hill, 2008.
3. Digital Communications – Simon Haykin, John Wiley, 2005.

### **REFERENCES**

1. Electronic Communications – Dennis Roddy and John Coolean , 4<sup>th</sup> Edition , PEA, 2004
2. Electronics & Communication System – George Kennedy and Bernard Davis , TMH, 2004
3. Analog and Digital Communication – K. Sam Shanmugam, Willey ,2005

## LINEAR AND DIGITAL INTEGRATED CIRCUITS

**II Year B.Tech. II Sem**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre-requisite:** Switching Theory and Logic Design.

### Course Objectives

The main objectives of the course are:

1. To introduce the basic building blocks of linear integrated circuits.
2. To introduce the theory and applications of analog multipliers and PLL.
3. To introduce the concepts of waveform generation and introduce some special function ICs.
4. To understand and implement the working of basic digital circuits.

### Course Outcomes

Upon completing this course, the student will be able to

1. A thorough understanding of operational amplifiers with linear integrated circuits.
2. Attain the knowledge of functional diagrams and design applications of IC 555 and IC 565.
3. Acquire the knowledge and design the Data converters.
4. Understanding of the different families of digital integrated circuits and their characteristics.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	3	2	1	-	-	-	-	-	-	-	-	2	2
CO2	3	3	3	1	-	-	-	-	-	-	-	-	2	2
CO3	3	3	3	1	-	-	-	-	-	-	-	-	2	2
CO4	3	3	2	1	-	-	-	-	-	-	-	-	2	2

### UNIT I

#### Operational Amplifier

Ideal and Practical Op-Amp, Op-Amp Characteristics, DC and AC Characteristics, Features of 741 Op-Amp, Modes of Operation - Inverting, Non-Inverting, Differential, Instrumentation Amplifier, AC Amplifier, Differentiators and Integrators, Comparators, Schmitt Trigger, Introduction to Voltage Regulators, Features of 723 Regulator, Three Terminal Voltage Regulators.

### UNIT II

#### Op-Amp, IC-555 & IC 565 Applications

Introduction to Active Filters, Characteristics of Band pass, Band reject and All Pass Filters, Analysis of 1st order LPF & HPF Butterworth Filters, Waveform Generators – Triangular, Sawtooth, Square Wave, IC555 Timer - Functional Diagram, Monostable and Astable Operations, Applications, IC565 PLL - Block Schematic, principle and Applications.

### UNIT III

#### Data Converters

Introduction, Basic DAC techniques, Different types of DACs-Weighted resistor DAC, R-2R ladder DAC, Inverted R-2R DAC, Different Types of ADCs - Parallel Comparator Type ADC, Counter Type ADC, Successive Approximation ADC and Dual Slope ADC, DAC and ADC Specifications.

### UNIT IV

#### Combinational Logic ICs

Specifications and Applications of TTL-74XX & CMOS 40XX Series ICs - Code Converters, Decoders, LED & LCD Decoders with Drivers, Encoders, Priority Encoders, Multiplexers, Demultiplexers, Priority Generators/Checkers, Parallel Binary Adder/Subtractor, Magnitude Comparators.

## **UNIT V**

### **Sequential Logic IC's and Memories**

Familiarity with commonly available 74XX & CMOS 40XX Series ICs – All Types of Flip-flops, Synchronous Counters, Decade Counters, Shift Registers.

Memories - ROM Architecture, Types of ROMS & Applications, RAM Architecture, Static & Dynamic RAMs.

### **TEXT BOOKS**

1. Op-Amps & Linear ICs – Ramakanth A. Gayakwad, PHI, 2003.
2. Digital Fundamentals – Floyd and Jain, Pearson Education, 8<sup>th</sup> Ed., 2005.

### **REFERENCES**

1. Linear Integrated Circuits –D. Roy Chowdhury, New Age International (p) Ltd, 2<sup>nd</sup> Ed., 2003.
2. Digital Design Principles and Practices – John. F. Wakerly, Pearson 3<sup>rd</sup> Ed., 2009.
3. Linear Integrated Circuits and Applications – Salivahana, TMH, 2008.
4. Operational Amplifiers with Linear Integrated Circuits, 4<sup>th</sup> Ed., William D.Stanley, Pearson Education India, 2009.

## ANALOG AND PULSE CIRCUITS

**II Year B.Tech. II Sem**

**L T P C**  
**3 1 0 4**

**Pre-requisite:** Electronic Devices and Circuits

### Course Objectives

1. Learn the concepts of high frequency analysis of transistors.
2. To give understanding of various types of amplifier circuits such as small signal, cascaded, large signal and tuned amplifiers.
3. To familiarize the Concept of feedback in amplifiers so as to differentiate between negative and positive feedback.
4. To construct various multivibrators using transistors and sweep circuits.

### Course Outcomes

Upon completing this course, the student will be able to

1. Design the multistage amplifiers and understand the concepts of High Frequency Analysis of Transistors.
2. Utilize the Concepts of negative feedback to improve the stability of amplifiers and positive feedback to generate sustained oscillations.
3. Design and realize different classes of Power Amplifiers and tuned amplifiers useable for audio and Radio applications.
4. Design multivibrators and sweep circuits for various applications.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	3	3	2	-	-	-	-	-	-	-	1	2	2
CO2	2	3	3	2	-	-	-	-	-	-	-	1	2	2
CO3	2	3	3	2	-	-	-	-	-	-	-	1	2	2
CO4	2	3	3	2	-	-	-	-	-	-	-	1	2	2

### UNIT I

#### Multistage Amplifiers

Classification of Amplifiers, Distortion in amplifiers, Different coupling schemes used in amplifiers, Frequency response and Analysis of multistage amplifiers, Cascode amplifier, Darlington pair.

#### Transistor at High Frequency

Hybrid -  $\pi$  model of Common Emitter transistor model,  $f_{\alpha}$ ,  $\beta$  and unity gain bandwidth, Gain-bandwidth product.

### UNIT II

#### Feedback Amplifiers

Concepts of feedback – Classification of feedback amplifiers – General characteristics of Negative feedback amplifiers – Effect of Feedback on Amplifier characteristics – Voltage series, Voltage shunt, Current series and Current shunt Feedback configurations.

### UNIT III

#### Oscillators

Condition for Oscillations, RC type Oscillators-RC phase shift and Wien-bridge Oscillators, LC type Oscillators –Generalized analysis of LC Oscillators, Hartley and Colpitts Oscillators, Frequency and amplitude stability of Oscillators, Crystal Oscillator.

#### **UNIT IV**

##### **Large Signal Amplifiers**

Class A Power Amplifier- Series fed and Transformer coupled, Conversion Efficiency, Class B Power Amplifier- Push Pull and Complimentary Symmetry configurations, Conversion Efficiency, Principle of operation of Class AB and Class C Amplifiers.

##### **Tuned Amplifiers**

Single Tuned Amplifiers – Q-factor, frequency response of tuned amplifiers, Concept of stagger tuning and synchronous tuning.

#### **UNIT V**

##### **Multivibrators**

Types of Triggering, Analysis and Design of Bistable, Monostable, Astable Multivibrators and Schmitt trigger using Transistors.

##### **Time Base Generators**

General features of a Time base Signal, Methods of Generating Time Base Waveform, concepts of Transistor Miller and Bootstrap Time Base Generator, Methods of Linearity improvement.

#### **TEXT BOOKS**

1. Integrated Electronics, Jacob Millman, Christos C Halkias, McGraw Hill Education, 2<sup>nd</sup> Ed., 2010
2. Electronic Devices Conventional and current version -Thomas L. Floyd, Pearson, 2015.

#### **REFERENCES**

1. Electronic Devices and Circuits, David A. Bell – 5<sup>th</sup> Ed., Oxford, 1986.
2. Electronic Devices and Circuits theory– Robert L. Boylestead, Louis Nashelsky, 11<sup>th</sup> Ed., Pearson, 2009.
3. Millman's Pulse, Digital and Switching Waveforms –J. Millman, H. Taub and Mothiki S. Prakash Rao, 2 Ed., TMH, 2008.
4. Pulse, Switching and Digital Circuits –David A. Bell, 5<sup>th</sup> Ed, Oxford, 2015.

**ANALOG AND DIGITAL COMMUNICATIONS LAB**

**II Year B.Tech. II Sem**

**L T P C**  
**0 0 2 1**

CO1: Will be able to design and implement various Analog modulation and demodulation Techniques and observe the time and frequency domain characteristics of these modulated Signals

CO2: Will be able to design and implement various Pulse modulation and demodulation Techniques and observe the time and frequency domain characteristics of these modulated Signals

CO3: Will be able to understand the concept of aliasing and different types of Sampling with various Sampling rates and duty Cycles by implementing practically

CO4: Will be able to design and implement various Digital modulation and demodulation Techniques and observe the waveforms of these modulated Signals practically

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	-	3	1	2	2	-	2	3	2	-	1	2	2
CO2	1	-	3	1	2	2	-	2	3	2	-	1	2	2
CO3	1	-	3	1	2	2	-	2	3	2	-	1	2	2
CO4	1	-	3	1	2	2	-	2	3	2	-	1	2	2

**Note:**

- Minimum 12 experiments should be conducted.
- All these experiments are to be simulated first either using MATLAB, Commsim or any other simulation package and then to be realized in hardware

1. Practically generate Amplitude modulated Signal and demodulate it by designing and implementing the corresponding Demodulator for different modulation indices. Plot the corresponding waveforms and their spectrum. Also calculate theoretically and practically the modulation index in each case. Plot the effect of modulating Signal frequency and Amplitude on the modulation index.
2. Practically generate and demodulate Frequency modulated Signal for different modulation indices. Plot the corresponding waveforms and their spectrum. Also calculate theoretically and practically the modulation index in each case. Plot the effect of modulating Signal frequency and Amplitude on the modulation index.
3. Practically generate and demodulate DSB-SC modulated Signal for different modulation indices and plot the corresponding waveforms and their spectrum. Also calculate theoretically and practically the modulation index in each case
4. Practically generate and demodulate SSB-SC modulated Signal (Phase Shift Method) for different modulation indices and plot the corresponding waveforms and their spectrum. Also calculate theoretically and practically the modulation index in each case
5. Demonstrate the Frequency Division Multiplexing & De multiplexing practically by transmitting atleast 4 different signals simultaneously with respect to time and recovering without distortion.
6. Verify Sampling theorem for different sampling rates, Sampling types and Duty Cycles and Plot the sampled and reconstructed Signals. From the practical observations derive the conclusions for each case.
7. Design and implement a Pulse Amplitude Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
8. Design and implement a Pulse Width Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
9. Design and implement a Pulse Position Modulator & Demodulator Circuit using 555 timer and plot the corresponding waveforms from the practical observations
10. Generate practically PCM Modulated Signal and demodulate it by designing and implementing the

- corresponding Demodulator. Plot the corresponding waveforms from practical observations
11. Generate practically Delta Modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
  12. Generate practically FSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
  13. Generate practically Binary PSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
  14. Generate practically DPSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.
  15. Generate practically QPSK modulated Signal and demodulate it by designing and implementing the corresponding Demodulator. Plot the corresponding waveforms from practical observations.

**LINEAR AND DIGITAL INTEGRATED CIRCUITS LAB****II Year B.Tech. II Sem****L T P C**  
**0 0 2 1**

CO1: Design and implementation of various analog circuits using 741

ICs. CO2: Design and implementation of various Multivibrators using

555 timer. CO3: Design and implement various circuits using digital ICs

CO4: Design and implement ADC, DAC and voltage regulators.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	0	3	3	3	-	-	-	3	3	-	1	1	2
CO2	1	0	3	3	3	-	-	-	3	3	-	1	1	2
CO3	1	0	3	3	3	-	-	-	3	3	-	1	1	2
CO4	1	0	3	3	3	-	-	-	3	3	-	1	1	2

**Note:**

- Minimum 12 experiments should be conducted.
- Verify the functionality of the IC in the given application.

**Design and Implementation of:**

1. Design an Inverting and Non-inverting Amplifier using Op Amp and calculate gain.
2. Design Adder and Subtractor using Op Amp and verify addition and subtraction process.
3. Design a Comparator using Op Amp and draw the comparison results of  $A=B$ ,  $A<B$ ,  $A>B$ .
4. Design an Integrator and Differentiator Circuits using IC 741 and derive the required condition practically..
5. Design an Active LPF, HPF cutoff frequency of 2KHZ and find the roll off of it.
6. Design a Circuit using IC 741 to generate sine/square/triangular wave with period of 1KHZ and draw the output waveform.
7. Construct Mono-stable Multivibrator using IC 555 and draw its output waveform.
8. Construct Astable Multivibrator using IC 555 and draw its output waveform and also find its duty cycle.
9. Design a Schmitt Trigger Circuit and find its LTP and UTP.
10. Design Frequency modulator and demodulator circuit and draw the respective waveforms.
11. Design Voltage Regulator using IC 723, IC 7805/7809/ 7912 and find its load regulation factor.
12. Design R-2R ladder DAC and find its resolution and write a truth table with respective voltages.
13. Design Parallel comparator type/counter type/successive approximation ADC and find its efficiency.
14. Design a Gray code converter and verify its truth table.
15. Design an even priority encoder using IC 74xx and verify its truth table.
16. Design a 8x1 multiplexer using digital ICs.
17. Design a 4-bit Adder/subtractor using digital ICs and Add/Sub the following bits. (i)1010 (ii)0101 (iii)1011  
010 0 0010 1001.
18. Design a Decade counter and verify its truth table and draw respective waveforms.
19. Design an Up/down counter using IC 74163 and draw read/write waveforms.
20. Design a Universal shift register using IC 74194/195 and verify its shifting operation.
21. Design a 16x4 RAM using 74189 and draw its read/write operation.

22. Design a 8x3 encoder/3x8 decoder and verify its truth table.

### ANALOG AND PULSE CIRCUITS LAB

II Year B.Tech. II Sem

L T P C  
0 0 2 1

CO1: Design and implement various types of feed forward and feed back

amplifiers. CO2: Design and implement various oscillators .

CO3: Design and implement various multivibrators and sweep circuits.

CO4: Design and implement power amplifiers and study its

characteristics.

Course	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	0	3	3	3	-	-	-	3	3	-	1	1	2
CO2	1	0	3	3	3	-	-	-	3	3	-	1	1	2
CO3	1	0	3	3	3	-	-	-	3	3	-	1	1	2
CO4	1	0	3	3	3	-	-	-	3	3	-	1	1	2

#### List of Experiments:

1. Design a two stage RC Coupled amplifier and prove that gain is increased and analyze the effects of coupling capacitance.
2. Practically prove that the Darlington pair have high input impedance.
3. Draw the high frequency response of common emitter transistor amplifier and calculate  $f_a$ ,  $f_b$  and gain bandwidth product.
4. Design four topologies of feedback amplifiers and draw the frequency response of them with and without feedback.
5. Design an RC phase shift oscillator circuit and derive the gain condition for oscillations practically for given frequency.
6. Design a Colpitts oscillator circuit for the given frequency and draw the output waveform.
7. Design transformer coupled class A power amplifier and draw the input and output waveforms ,find its efficiency.
8. Design class B power amplifier and draw the input and output waveforms ,find 2<sup>nd</sup> order and above harmonics.
9. Prove that the complementary pushpull amplifier eliminate cross over distortion.
10. Design a single tuned amplifier and determine the Q of its tuned circuit practically.
11. Design a Bistable Multivibrator and analyze the effect of commutating capacitors and draw the wave forms at base and collector of transistors.
12. Design a Astable Multivibrator and draw the wave forms at base and collector of transistors.
13. Draw the response of Schmitt trigger for gain of greater than and less than one.
14. Design a Bootstrap sweep circuit using BJT and draw its output time base waveform.
15. Design a Miller sweep circuit using BJT and draw its output time base waveform.

## ENVIRONMENTAL SCIENCE

II Year B.Tech II Sem

L T P C  
2 0 0 0

Course Objectives:

- Understanding the importance of ecological balance for sustainable development.
- Understanding the impacts of developmental activities and mitigation measures.
- Understanding the environmental policies and regulations

Course Outcomes:

- Based on this course, the Engineering graduate will understand /evaluate / develop technologies on the basis of ecological principles and environmental regulations which in turn helps in sustainable development

### UNIT-I

**Ecosystems:** Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Flow of energy, Biogeochemical cycles, Bioaccumulation, Biomagnification, ecosystem value, services and carrying capacity. Structural features, Biotic structure, Abiotic structure, Ecological succession, Types of Ecosystems, Field visits.

### UNIT-II

**Natural Resources: Classification of Resources:** Living and Non-Living resources, **water resources:** use and over utilization of surface and ground water, floods and droughts, Dams: benefits and problems. **Mineral resources:** use and exploitation, environmental effects of extracting and using mineral resources, **Land resources:** Forest resources, **Energy resources:** growing energy needs, renewable and non renewable energy sources, use of alternate energy source, case studies. **Food resources:** Desertification, Equitable use of resource for sustainable use style.

### UNIT-III

**Biodiversity And Biotic Resources:** Introduction, Definition, genetic, species and ecosystem diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional values. India as a mega diversity nation, Hot spots of biodiversity. Field visit. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex- situ conservation. National Biodiversity Act.

### UNIT-IV

**Environmental Pollution and Control Technologies: Environmental Pollution:** Classification of pollution, **Air Pollution:** Primary and secondary pollutants, Automobile and Industrial pollution, Ambient air quality standards. **Water pollution:** Sources and types of pollution, drinking water quality standards. **Soil Pollution:** Sources and types, Impacts of modern agriculture, degradation of soil. Landslides, floods, cyclones. **Noise Pollution:** Sources and Health hazards, standards, **Thermal pollution:** Introduction, causes and consequences. **Solid waste:** Municipal Solid Waste management, composition and characteristics of e-Waste and its management. **Pollution control technologies:** Wastewater Treatment methods: Primary, secondary and Tertiary.

Overview of air pollution control technologies, Concepts of bioremediation. **Global Environmental Issues and Global Efforts:** Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS). Deforestation and desertification. International conventions / Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC-GoI Initiatives.

## UNIT-V

**Environmental Policy, Legislation & EIA:** Environmental Protection act, Legal aspects Air Act- 1981, Water Act, Forest Act, Wild life Act, Municipal solid waste management and handling rules, biomedical waste management and handling rules, hazardous waste management and handling rules. EIA: EIA structure, methods of baseline data acquisition. Overview on Impacts of air, water, biological and Socio-economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP). **Towards Sustainable Future:** Concept of Sustainable Development Goals, Population and its explosion, Crazy Consumerism, Environmental Education, Urban Sprawl, Human health, Environmental Ethics, Concept of Green Building, Ecological Foot Print, Life Cycle assessment (LCA), Low carbon life style.

### TEXT BOOKS:

- 1 Textbook of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
- 2 Environmental Studies by R. Rajagopalan, Oxford University Press.

### REFERENCE BOOKS:

1. Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHI Learning Private Ltd. New Delhi.
2. Environmental Engineering and science by Gilbert M. Masters and Wendell P. Ela. 2008 PHI Learning Pvt. Ltd.
3. Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition.
4. Environmental Studies by Anubha Kaushik, 4<sup>th</sup> Edition, New age international publishers.
5. Text book of Environmental Science and Technology - Dr. M. Anji Reddy 2007, BS Publications.
6. Introduction to Environmental Science by Y. Anjaneyulu, BS Publications.

**DIGITAL SIGNAL PROCESSING**

III Year B.Tech. ECE I Semester

L	T	P	C
3	1	0	4

**Prerequisite:** Signals and Systems**Course Objectives:**

The course objectives are:

1. To provide background and fundamental concepts for the analysis and processing of digital signals.
2. To understand the fast computation of DFS and DFT.
3. To design digital filters and their realization structures.
4. To acquaint in Multi-rate signal processing techniques and finite word length effects.

**Course Outcomes**

Upon completion of this course, the student will be able to:

1. Realize various digital filters
2. Find DFS, DFT and FFT of Digital Signal and System.
3. Design IIR and FIR digital filters from prototype approximations.
4. Implement Multirate processing system and analyze finite word length effects in DSP applications.

**UNIT I****Introduction**

Introduction to Digital Signal Processing: Discrete Time Signals & Sequences, conversion of continuous to discrete signal, Normalized Frequency, Linear Shift Invariant Systems, Stability, and Causality, linear differential equation to difference equation, Linear Constant Coefficient Difference Equations, Frequency Domain Representation of Discrete Time Signals and Systems.

**Realization of Digital Filters**

Applications of Z – Transforms, Solution of Difference Equations of Digital Filters, System Function, Stability Criterion, Frequency Response of Stable Systems, Realization of Digital Filters – Direct, Canonic, Cascade and Parallel Forms.

**UNIT II****Discrete Fourier series**

Fourier Series, Fourier Transform, Laplace Transform and Z-Transform relation, DFS Representation of Periodic Sequences, Properties of Discrete Fourier Series, Discrete Fourier Transforms: Properties of DFT, Linear Convolution of Sequences using DFT, Computation of DFT: Over-Lap Add Method, Over-Lap Save Method, Relation between DTFT, DFS, DFT and Z-Transform.

**Fast Fourier Transforms**

Fast Fourier Transforms (FFT) - Radix-2 Decimation-in-Time and Decimation-in-Frequency FFT Algorithms, Inverse FFT.

### **UNIT III**

#### **IIR Digital Filters**

Analog filter approximations – Butterworth and Chebyshev, Design of IIR Digital Filters from Analog Filters, Step and Impulse Invariant Techniques, Bilinear Transformation Method, Spectral Transformations.

### **UNIT IV**

#### **FIR Digital Filters**

Characteristics of FIR Digital Filters, Frequency Response. Design of FIR Filters: Fourier Method, Digital Filters using Window Techniques, Frequency Sampling Technique, Comparison of IIR & FIR filters.

### **UNIT V**

#### **Multirate Digital Signal Processing**

Introduction, Down Sampling, Decimation, Up sampling, Interpolation, Sampling Rate Conversion.

#### **Finite Word Length Effects**

Limit cycles, Overflow Oscillations, Round-off Noise in IIR Digital Filters, Computational Output Round Off Noise, Methods to Prevent Overflow, Trade Off Between Round Off and Overflow Noise, Measurement of Coefficient Quantization Effects through Pole-Zero Movement, Dead Band Effects.

### **TEXT BOOKS**

1. Discrete Time Signal Processing – A. V. Oppenheim and R.W. Schaffer, PHI, 2009
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.

### **REFERENCES**

1. Digital Signal Processing – Fundamentals and Applications – Li Tan, Elsevier, 2008
2. Fundamentals of Digital Signal Processing using MATLAB – Robert J. Schilling, Sandra L. Harris, Thomson, 2007
3. Digital Signal Processing – K. Deerga Rao and M. N. S. Swamy, Springer, 2018.
4. Digital Signal Processing - A Practical approach, Emmanuel C. Ifeachor and Barrie W. Jervis, 2<sup>nd</sup> Edition, Pearson Education, 2009

**MICROPROCESSORS AND CONTROLLERS**

III Year B.Tech. ECE I Semester

L	T	P	C
3	1	0	4

**Pre-requisite:****Course Objectives**

1. To familiarize the architecture of microprocessors and micro controllers
2. To provide the knowledge about interfacing techniques of bus & memory.
3. To provide the concepts of ARM architecture
4. To emphasize the basic concepts of Advanced ARM processors

**Course Outcomes**

Upon completing this course, the student will be able to

1. To explore the internal architecture, organization and assembly language programming of 8086 processors for designing memory and I/O interfaces.
2. To explore the internal architecture, organization and assembly language programming of 8051/controllers to design micro controller based SDK blocks.
3. To explore the internal architecture of ARM processors and basic concepts of advanced ARM processor based systems.

**UNIT I****8086 Architecture**

8086 Architecture-Functional diagram, Register Organization, Memory Segmentation, Programming Model, Memory addresses, Physical Memory Organization, Architecture of 8086, Signal descriptions of 8086, interrupts of 8086.

**Instruction Set and Assembly Language Programming of 8086**

Instruction formats, Addressing modes, Instruction Set, Assembler Directives, Macros, and Simple Programs involving Logical, Branch and Call Instructions, Sorting, String Manipulations.

**UNIT II****Introduction to Microcontrollers**

Overview of 8051 Microcontroller, Architecture, I/O Ports, Memory Organization, Addressing Modes and Instruction set of 8051.

**8051 Real Time Control**

Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Programming 8051 Timers and Counters

**UNIT III****I/O And Memory Interface**

LCD, Keyboard, External Memory RAM, ROM Interface, ADC, DAC Interface to 8051.

**Serial Communication and Bus Interface**

Serial Communication Standards, Serial Data Transfer Scheme, On board  
Communication Interfaces-I2C Bus, SPI Bus, UART; External Communication  
Interfaces-RS232,USB

## **UNIT IV**

### **ARM Architecture**

ARM Processor fundamentals, ARM Architecture – Register, CPSR, Pipeline, exceptions and interrupts interrupt vector table, ARM instruction set – Data processing, Branch instructions, load store instructions, Software interrupt instructions, Program status register instructions, loading constants, Conditional execution, Introduction to Thumb instructions.

## **UNIT V**

### **ARM Processors**

Introduction to CORTEX Processor and its architecture, OMAP Processor and its Architecture.

### **TEXT BOOKS**

1. Advanced Microprocessors and Peripherals – A. K. Ray and K.M. Bhurchandani, TMH, 2<sup>nd</sup> Ed., 2006.
2. ARM System Developers guide, Andrew N Sloss, Dominic Symes, Chris Wright, Elsevier, 2012

### **REFERENCES**

1. The 8051 Microcontroller, Kenneth. J. Ayala, Cengage Learning, 3<sup>rd</sup> Ed, 2004.
2. Microprocessors and Interfacing, D. V. Hall, TMGH, 2<sup>nd</sup> Edition 2006.
3. The 8051Microcontrollers, Architecture and Programming and Applications - K.Uma Rao, Andhe Pallavi, Pearson, 2009.
4. Digital Signal Processing and Applications with the OMAP-L138 Experimenter, Donald Reay, WILEY 2012.

## CONTROL SYSTEMS

III Year B.Tech. ECE I Semester

L	T	P	C
3	1	0	4

**Pre-requisite:** Network Analysis & Transmission lines

**Course Objectives:** Objectives of course are

1. To introduce the principles and applications of control systems in everyday life
2. To introduce the basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems
3. To understand different aspects of stability analysis of systems in frequency domain and time domain.

**Course Outcomes:**

After completing this course, the student will be able to

1. Knowledge on Open and closed loop and also modeling and transfer function derivations of translational and rotational systems.
2. Represent transfer functions through block diagrams and signal flow graphs.
3. Designing control systems using time domain and frequency domain techniques.
4. Time response analysis, stability analysis, frequency response analysis of different ordered systems through their characteristic equation and time-domain specifications.

### UNIT I

#### Introduction

Concepts of Control Systems- Open Loop and closed loop control systems and their differences- examples of control systems- Classification of control systems, Feed-Back Characteristics, Effects of feedback.

Mathematical models – Differential equations, Impulse Response and transfer functions - Translational and Rotational mechanical systems.

#### Transfer Function Representation

Transfer Function of DC Servo motor - AC Servo motor- Synchro transmitter and Receiver, Block diagram representation of systems considering electrical systems as examples -Block diagram algebra – Representation by Signal flow graph - Reduction using mason's gain formula.

### UNIT II

#### Time Response Analysis

Standard test signals - Time response of first order systems – Characteristic Equation of Feedback control systems, Transient response of second order systems - Time domain specifications – Steady state response - Steady state errors and error constants – Effects of proportional derivative, proportional integral systems.

### **UNIT III**

#### **Stability Analysis**

The concept of stability - Routh stability criterion – qualitative stability and conditional stability.

#### **Root Locus Technique**

The root locus concept - construction of root loci-effects of adding poles and zeros to  $G(s)H(s)$  on the root loci.

#### **Frequency Response Analysis**

Introduction, Frequency domain specifications-Bode diagrams-Determination of Frequency domain specifications and transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots.

### **UNIT IV**

#### **Stability Analysis In Frequency Domain**

Polar Plots, Nyquist Plots and applications of Nyquist criterion for stability –Effects of adding poles and zeros.

#### **Classical Control Design Techniques**

Compensation techniques – Lag, Lead, and Lead-Lag Controllers design in frequency Domain, PID Controllers.

### **UNIT V**

#### **State Space Analysis Of Continuous Systems**

Concepts of state, state variables and state model, derivation of state models from block diagrams, Diagonalization, Solving the Time invariant state Equations, State Transition Matrix and its Properties.

### **TEXT BOOKS**

1. Control Systems Engineering – by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 2<sup>nd</sup> edition.
2. Modern Control Engineering – by Katsuhiko Ogata – Prentice Hall of India Pvt. Ltd., 3<sup>rd</sup> edition, 1998.

### **REFERENCES**

1. Control Systems by N.K.Sinha, New Age International (P) Limited Publishers, 3<sup>rd</sup> Edition, 1998.
2. Automatic Control Systems 8th edition– by B. C. Kuo 2003– John wiley and son's.,
3. Control Systems Engg. by NISE 3<sup>rd</sup> Edition – John wiley
4. Control Systems by S.Kesavan , Hitech Publications.
5. “Modeling & Control Of Dynamic Systems” by Narciso F. Macia George J. Thaler, Thomson Publishers.

## OPERATING SYSTEMS (PE 1)

III Year B.Tech. ECE I Semester

L	T	P	C
3	0	0	3

**Prerequisites:** Computer Programming and Data Structures

### Course Objectives

1. Provide an introduction to operating system concepts (i.e., processes, threads, scheduling, synchronization, deadlocks, memory management, file and I/O subsystems and protection).
2. Introduce the issues to be considered in the design and development of operating system.
3. To know the basic Unix commands, system call interface for process management, interprocess communication and I/O in Unix.

### Course Outcomes

After completing this course, the student will be able to

1. Gain practical knowledge of operating systems and architectures interact.
2. Knowledge on Scheduling, deadlocks, process management and synchronization.
3. Acquaintance to Memory Management and Virtual Memory.
4. Ability to recognize and resolve user problems with standard operating environments.

### UNIT I

**Operating System Introduction**, Structures - Simple Batch, Multi-programmed, Time- shared, Personal Computer, Parallel, Distributed Systems, Real-Time Systems, System components, Operating System services, System Calls.

### UNIT II

**Process and CPU Scheduling** - Process concepts and scheduling, Operations on processes, Cooperating Processes, Threads, and Interposes Communication, Scheduling Criteria, Scheduling Algorithms, Multiple -Processor Scheduling.

**System call interface for process management**-fork, exit, wait, waitpid, exec

### UNIT – III

**Deadlocks** - System Model, Deadlocks Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, and Recovery from Deadlock.

**Process Management and Synchronization** - The Critical Section Problem, Synchronization Hardware, Semaphores, and Classical Problems of Synchronization, CriticalRegions, Monitors.

**Interprocess Communication Mechanisms:** IPC between processes on a single computer system, IPC between processes on different systems, using pipes, FIFOs, message queues, shared memory.

#### **UNIT IV**

**Memory Management and Virtual Memory** - Logical versus Physical Address Space, Swapping, Contiguous Allocation, Paging, Segmentation, Segmentation with Paging, Demand Paging, Page Replacement, Page Replacement Algorithms.

#### **UNIT V**

**File System Interface and Operations** -Access methods, Directory Structure, Protection, File System Structure, Allocation methods, Free-space Management. Usage of open, create, read, write, close, lseek, stat, ioctl, system calls.

#### **TEXT BOOKS**

1. Operating System Principles- Abraham Silberchatz, Peter B. Galvin, Greg Gagne 7<sup>th</sup> Edition, John Wiley.
2. Advanced programming in the Unix environment, W.R.Stevens, Pearson education.

#### **REFERENCE**

1. Operating Systems – Internals and Design Principles Stallings, 5th Ed., Pearson Education/PHI, 2005.
2. Operating System A Design Approach-Crowley, TMH.
3. Modern Operating Systems, Andrew S Tanenbaum, 2nd Ed., Pearson/PHI.
4. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education.
5. Unix Internals The New Frontiers, U.Vahalia, Pearson Education.

## OBJECT ORIENTED PROGRAMMING THROUGH JAVA (PE 1)

III Year B.Tech. ECE I Semester

L	T	P	C
3	0	0	3

**Prerequisites:** Computer Programming & Data Structures

### Course Objectives

1. Introduces object oriented programming concepts using the Java language.
2. To know the principle of inheritance and polymorphism and demonstrates how they relate to the design of abstract classes
3. Able to implement packages, interfaces, exception handling, event handling and multithreading
4. To design of Graphical User Interface using applets and swings

### Course Outcomes

After completing this course, the student will be able to

1. Learn the object oriented concepts using the JAVA programming
2. Understand benefits of inheritance, creating packages and implement of interfaces
3. Differentiate between multi threading and multitasking.
4. Understand the concepts of Exception, Event handling, Applets and Swing.

### UNIT I

**Object oriented thinking and Java Basics-** Need for oop paradigm, summary of oop concepts, coping with complexity, abstraction mechanisms. A way of viewing world – Agents, responsibility, messages, methods, History of Java, Java buzzwords, data types, variables, scope and life time of variables, arrays, operators, expressions, control statements, type conversion and casting, simple java program, concepts of classes, objects, constructors, methods, access control, this keyword, garbage collection, overloading methods and constructors, method binding, inheritance, overriding and exceptions, parameter passing, recursion, nested and inner classes, exploring string class.

### UNIT II

**Inheritance, Packages and Interfaces** – Hierarchical abstractions, Base class object, subclass, subtype, substitutability, forms of inheritance- specialization, specification, construction, extension, limitation, combination, benefits of inheritance, costs of inheritance. Member access rules, super uses, using final with inheritance, polymorphism- method overriding, abstract classes, the Object class.

Defining, Creating and Accessing a Package, Understanding CLASSPATH, importing packages, differences between classes and interfaces, defining an interface, implementing interface, applying interfaces, variables in interface and extending interfaces.

Exploring java.io.

### UNIT III

**Exception handling and Multithreading--** Concepts of exception handling, benefits of exception handling, Termination or resumptive models, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating own exception sub classes.

String handling, Exploring java.util. Differences between multi threading and multitasking, threadlife cycle, creating threads, thread priorities, synchronizing threads, interthread communication, thread groups, daemon threads.

Enumerations, autoboxing, annotations, generics.

### UNIT IV

**Event Handling:** Events, Event sources, Event classes, Event Listeners, Delegation event model, handling mouse and keyboard events, Adapter classes.

The AWT class hierarchy, user interface components- labels, button, canvas, scrollbars, text components, check box, check box groups, choices, lists panels – scrollpane, dialogs, menubar, graphics, layout manager – layout manager types – border, grid, flow, card and grid bag.

### UNIT V

**Applets** – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

**Swing** – Introduction, limitations of AWT, MVC architecture, components, containers, exploring swing- JApplet, JFrame and JComponent, Icons and Labels, text fields, buttons – The JButton class, Check boxes, Radio buttons, Combo boxes, Tabbed Panes, Scroll Panes, Trees, and Tables.

### TEXT BOOKS

1. Java the complete reference, 7<sup>th</sup> editon, Herbert Schildt, TMH.
2. Understanding OOP with Java, updated edition, T. Budd, Pearson Eduction.

### REFERENCES

1. An Introduction to programming and OO design using Java, J.Nino and F.A. Hosch, John Wiley & sons.
2. Introduction to Java programming, Y. Daniel Liang, Pearson Education.
3. An introduction to Java programming and object oriented application development,

R.A. Johnson- Thomson.

**DATA  
ANALYTICS  
(PE 1)**

III Year B.Tech. ECE I Semester

L	T	P	C
3	0	0	3

**Course Objectives**

1. To gain the knowledge in data management, Processing and Analytics.
2. To know the concepts of Regression and its models.
3. To know the concepts of Segmentation and its models.
4. To gain the knowledge on Data Visualization and its techniques.

**Course Outcomes**

After completing this course, the student will be able to

1. Know the data management and its processing.
2. Capable to model the data using tools.
3. Differentiate between regression and Segmentation of data.
4. Learn various Visualization techniques.

**UNIT – I**

**Data Management:** Design Data Architecture and manage the data for analysis, understand various sources of Data like Sensors/Signals/GPS etc. Data Management, Data Quality (noise, outliers, missing values, duplicate data) and Data Processing.

**UNIT – II**

**Data Analytics:** Introduction to Analytics, Introduction to Tools and Environment, Application of Modeling in Business, Databases & Types of Data and variables, Data Modeling Techniques, Missing Imputations etc. Need for Business Modeling.

**UNIT – III**

**Regression** – Concepts, Blue property assumptions, Least Square Estimation, Variable Rationalization, and Model Building etc.

**Logistic Regression:** Model Theory, Model fit Statistics, Model Construction, Analytics applications to various Business Domains etc.

**UNIT – IV**

**Object Segmentation:** Regression Vs Segmentation – Supervised and Unsupervised Learning, Tree Building – Regression, Classification, Overfitting, Pruning and Complexity, Multiple Decision Trees etc.

**Time Series Methods:** Arima, Measures of Forecast Accuracy, STL approach, Extract features from generated model as Height, Average Energy etc and Analyze for prediction

**UNIT – V**

**Data Visualization:** Pixel-Oriented Visualization Techniques, Geometric Projection Visualization Techniques, Icon-Based Visualization Techniques, Hierarchical Visualization Techniques, Visualizing Complex Data and Relations.

### **TEXT BOOKS**

1. Student's Handbook for Associate Analytics – II, III.
2. Data Mining Concepts and Techniques, Han, Kamber, 3<sup>rd</sup> Edition, Morgan Kaufmann Publishers.

### **REFERENCES**

1. Introduction to Data Mining, Tan, Steinbach and Kumar, Addison Wesley, 2006.
2. Data Mining Analysis and Concepts, M. Zaki and W. Meira
3. Mining of Massive Datasets, Jure Leskovec Stanford Univ. Anand RajaramanMilliway

**NETWORK SECURITY AND  
CRYPTOGRAPHY (PE - 2)**

III Year B.Tech. ECE I Semester

L	T	P	C
3	0	0	3

**Pre-requisite: Nil****Course Objectives**

1. Understand the basic requirement of in providing security in Networks.
2. To understand the threats/vulnerabilities in networks and countermeasures.
3. To understand Authentication functions with Message Authentication Codes and Hash Functions.
4. To provide familiarity in Intrusion detection and protection measures.

**Course Outcomes**

Upon completing this course, the student will be able to

1. Describe network security fundamental concepts and principles.
2. Encrypt and decrypt messages using standard block ciphers management.
3. Analyze key algorithms and identify their weaknesses.
4. Identify and assess different types of threats, malware, spyware, viruses, vulnerabilities and then decide firewall design principles.

**UNIT I**

Security Services, Mechanisms and Attacks, A Model for Internetwork security, Classical Techniques: Conventional Encryption model, Steganography, Classical Encryption Techniques. **Modern Techniques** Simplified DES, Block Cipher Principles, Data Encryption standard, Strength of DES, Block Cipher Design Principles.

**UNIT II****Encryption**

Triple DES, International Data Encryption algorithm, Blowfish, RC5, Characteristics of Advanced Symmetric block Ciphers. Placement of Encryption function, Traffic confidentiality, Key distribution, Random Number Generation.

**UNIT III****Public Key Cryptography**

Principles, RSA Algorithm, Key Management, Diffie-Hellman Key exchange, Elliptic Curve Cryptography.

**Number Theory**

Prime and Relatively prime numbers, Modular arithmetic, Fermat's and Euler's theorems, Testing for primality, Euclid's Algorithm, the Chinese remainder theorem, Discrete logarithms.

## **UNIT IV**

### **Message Authentication and Hash Functions**

Authentication requirements and functions, Message Authentication, Hash functions, Security of Hash functions and MACs.

#### **Hash and Mac Algorithms**

MD-5, Message digest Algorithm, Secure Hash Algorithm.

Digital signatures and Authentication protocols: Digital signatures, Authentication Protocols, Digital signature standards.

#### **Authentication Applications**

Kerberos, Electronic Mail Security: Pretty Good Privacy, SIME/MIME.

## **UNIT V**

### **IP Security**

Overview, Architecture, Authentication, Encapsulating Security Payload, Key Management. Web Security: Web Security requirements, Secure sockets layer and Transport layer security, Secure Electronic Transaction.

#### **Intruders, Viruses and Worms**

Intruders, Viruses and Related threats. **Fire Walls**

Fire wall Design Principles, Trusted systems.

## **TEXT BOOKS**

1. Cryptography and Network Security - Principles and Practice - William Stallings, Pearson Education.
2. Network Security - The complete reference, Robert Bragg, Mark Rhodes, TMH, 2004.

## **REFERENCES**

1. Network Security Essentials (Applications and Standards) by William Stallings Pearson Education.
2. Fundamentals of Network Security by Eric Maiwald (Dreamtech press).
3. Principles of Information Security, Whitman, Thomson.
4. Introduction to Cryptography, Buchmann, Springer.

**ARTIFICIAL NEURAL NETWORKS AND DEEP LEARNING****(PE-2)****B.Tech.III Year I Semester**

LT	P	C
3	0	0
		3

**UNIT-I :****Fundamental Concepts, Models & Learning Rules of Artificial Neural Systems**

**Artificial Neuron Models:** Biological Neuron, Mcculloch-pitts Neuron Model, Activation Functions, Boltzman Neuron Model, Models of Artificial Neural Networks : Feed forward Network, Feedback Network, Neural Processing, Learning and Adaption : Supervised, Unsupervised and Reinforcement Learning.

**Neural Network Learning Rules:** Hebbian Learning Rule, Perception Learning Rule, Delta Learning Rule Widrow –Hoff Rule, Correlation Learning Rule, Winner –Take – All Learning Rule, Outstar Learning Rule, Summary of Learning Rules.

**Single Layer Feed Forward Networks:**

Classification Model, Features and Decision Regions, Discriminant Functions, linear Machine and Minimum Distance Classification, Non – Parametric Training Concept, Training and Classification Using the Discrete Perceptron: Algorithm and Examples. Single Layer Continuous Perceptron Networks for Linearly Separable Classification, Perceptron Convergence Theorem, Multi Category Single Layer Perceptron Networks.

**UNIT –II****Multi Layer Feed Forward Networks:**

Linearly Non- Separable, Pattern Classification, Delta Learning Rule for Multi Perception, Generalized Delta Learning Rule. Feed Forward Recall and Error Back Propagation Training ; Examples of Error Back Propagation, Training Errors, Learning Factors ; Initial Weights Cumulative Weight Adjustment Versus Incremental Updating, Steepness of Activation Function, Learning Constant, Momentum Method, Network Architecture Versus Data Representation, Necessary Number of Hidden Neurons. Application of Back Propagation Networks in Pattern Recognition and Image Processing.

**UNIT –III :****Associative Memories:**

Basic Concepts of Linear Associative, Basic Concepts of Dynamical Systems, Mathematical Foundation of Discrete Time Hop field Networks. Mathematical Foundation of Gradient- Type Hop Field Networks, Transient Response of Continuous Time Networks, Example Solution of Optimization Problems; Summing Networks with Digital Outputs, Minimization of the Traveling salesman tour length, Solving Simultaneous Linear Equations, Boltzman machines, Bidirectional Associative Memory; Multidirectional Associative Memory, Associative Memory of Spatio-temporal Patterns.

**UNIT – IV :****Matching and Self-Organizing Networks:**

Hamming net and MAXNET Unsupervised learning of clusters, Clustering and similarity measures Winner take all learning, recall mode, initializing of weights, separability limitations, Counter propagation networks, Feature mapping: Self organizing feature maps, Cluster discovery networks (ART1).

**UNIT – V :**

Introduction to Simple Deep Feed forward Neural Network, Hidden Units and their Activation Functions, Architecture Design, Regularization Methods for Deep learning: Early Stopping, Drop out.

**Convolutional Neural Networks:** Introduction to CNN, Convolution operation, Pooling, Normalization, Application in Computer Vision-Image Net, Sequence Modeling- VGG Net, LeNet.

**Recurrent Neural Networks:** RNN Topologies, Difficulty in Training RNN, Long Short Term Memory(LSTM):Architecture and Learning Strategy.

**TEXT BOOKS:**

1. Introduction to Artificial Neural Systems – J.M.Zurada, Jaico Publishers.
2. Ian Good fellow, Yoshva Bengio, Aaron Courville, Deep Learning, MIT Press, 2016.
3. Introduction Neural Networks using MATLAB 6.0 – S.N. Shivanandam, S. Sumathi, S. N.Deepa, 1/e, TMH, New Delhi

**REFERENCE BOOKS:**

1. Elements of Artificial Neural Networks – Kishan Mehrotra, Chelkuri K. Mohan, Sanjay Ranka, Penram International.
2. Artificial Neural Network – Simon Haykin, 2<sup>nd</sup> Ed., Pearson Education
3. Artificial Neural Networks – Dr.B. Yagananarayana, 1999, PHI, New Delhi.
4. Fundamental of Neural Networks- Laurene Fausett.

**III Year B.Tech. ECE I Semester**

L	T	P	C
3	0	0	3

**Pre-requisite:** Basic Electrical and Electronics Engineering

**Course Objectives**

It provides an understanding of various measuring system functioning and metrics for performance analysis.

1. Provides understanding of principle of operation, working of different electronic instruments viz. signal generators, signal analyzers, recorders and measuring equipment.
2. Understanding the concepts of various measuring bridges and their balancing conditions.
3. Provides understanding of use of various measuring techniques for measurement of different physical parameters using different classes of transducers.

**Course Outcomes**

Upon completing this course, the student will be able to

1. Measure electrical parameters with different meters and understand the basic definition of measuring parameters.
2. Use various types of signal generators, signal analyzers for generating and analyzing various real-time signals.
3. Operate an Oscilloscope to measure various signals.
4. Measure various physical parameters by appropriately selecting the transducers.

**UNIT I****Block Schematics of Measuring Systems**

Performance Characteristics, Static Characteristics, Accuracy, Precision, Resolution, Types of Errors, Gaussian Error, Root Sum Squares formula, Dynamic Characteristics, Repeatability, Reproducibility, Fidelity, Lag ;Measuring Instruments: DC Voltmeters, D' Arsonval Movement, DC Current Meters, AC Voltmeters and Current Meters, Ohmmeters, Multimeters, Meter Protection, Extension of Range, True RMS Responding Voltmeters, Specifications of Instruments.

**UNIT II****Signal Analyzers**

AF, HF Wave Analyzers, Harmonic Distortion, Heterodyne wave Analyzers, Spectrum Analyzers, Power Analyzers, Capacitance-Voltage Meters, Oscillators. Signal Generators: AF, RF Signal Generators, Sweep Frequency Generators, Pulse and Square wave Generators, Function Generators, Arbitrary Waveform Generator, Video Signal Generators, and Specifications

**UNIT III****Oscilloscopes**

CRT, Block Schematic of CRO, Time Base Circuits, Lissajous Figures, CRO Probes, High Frequency CRO Considerations, Delay lines, Applications: Measurement of Time, Period and Frequency Specifications.

### **Special Purpose Oscilloscopes**

Dual Trace, Dual Beam CROs, Sampling Oscilloscopes, Storage Oscilloscopes, Digital Storage CROs.

## **UNIT IV**

### **Transducers**

Classification, Strain Gauges, Bounded, unbounded; Force and Displacement Transducers, Resistance Thermometers, Hotwire Anemometers, LVDT, Thermocouples, Synchros, Special Resistance Thermometers, Digital Temperature sensing system, Piezoelectric Transducers, Variable Capacitance Transducers, Magneto Strictive Transducers, gyroscopes, accelerometers.

## **UNIT V**

### **Bridges**

Wheat Stone Bridge, Kelvin Bridge, and Maxwell Bridge.

### **Measurement of Physical Parameters**

Flow Measurement, Displacement Meters, Liquid level Measurement, Measurement of Humidity and Moisture, Velocity, Force, Pressure – High Pressure, Vacuum level, Temperature - Measurements, Data Acquisition Systems.

## **TEXT BOOKS**

1. Electrical And Electronic Measurement And Measuring Instruments – A K Sawhney, Dhanpat Rai & Sons, 2013.
2. Electronic Instrumentation: H.S.Kalsi – TMH, 2<sup>nd</sup> Ed., 2004.

## **REFERENCES**

1. Modern Electronic Instrumentation and Measurement Techniques: A.D. Helbins, W.D. Cooper: PHI 5th Ed., 2003.
  2. Electronic Instrumentation and Measurements – David A. Bell, Oxford Univ. Press, 1997.
  3. Industrial Instrumentation: T.R. Padmanabham Springer 2009.
- Electronic Measurements and Instrumentation – K. Lal Kishore, Pearson Education 2010.

**MICROPROCESSORS AND CONTROLLERS LABORATORY**

III Year B.Tech. ECE I Semester

L	T	P	C
0	0	3	1.5

**Cycle 1: Using 8086 Processor Kits and/or Assembler (5 Weeks)**

- Assembly Language Programs to 8086 to Perform
  1. Arithmetic, Logical, String Operations on 16 Bit and 32 Bit Data.
  2. Bit level Logical Operations, Rotate, Shift, Swap and Branch Operations.

**Cycle 2: Using Microcontroller Kit (6 weeks)**

- Introduction to IDE
  1. Assembly Language Programs to Perform Arithmetic (Both Signed and Unsigned) 16 Bit Data Operations, Logical Operations (Byte and Bit Level Operations), Rotate, Shift, Swap and Branch Instructions
  2. Time delay Generation Using Timers of Microcontroller
  3. Serial Communication from / to Microcontroller to / from I/O devices.
  4. Program Using Interrupts to Generate Square Wave 10 KHZ Frequency.
  5. Using Timer Microcontroller in 8bit Auto reload Mode and Connect a 1HZ Pulse to Interrupt pin and Display on GPIO. Assume Crystal Frequency as 11.0592MHZ

**Cycle 3: Interfacing I/O Devices to Microcontroller (5 Weeks)**

1. 7 Segment Display to Microcontroller and display digit 0 to 9.
2. 4\*4 Matrix Keypad to Microcontroller.
3. Sequence Generator Using Serial Interface in Microcontroller.
4. 8bit ADC Interface to Microcontroller for different analog signals.
5. Triangular, Square and Ramp Wave form Generator through DAC interfaces to Microcontroller.
6. Location identification through GPS interface.

**BOOKS**

1. Advanced Microprocessors And Peripherals by A K Ray, Tata McGraw-Hill Education, 2006
2. The 8051 *Microcontrollers*: Architecture, Programming & Applications by Dr. K. Uma Rao, Andhe Pallavi, Pearson, 2009.

## DIGITAL SIGNAL PROCESSING LABORATORY

### III Year B.Tech. ECE I Semester

- The Programs shall be implemented in Software (Using MATLAB / Lab View / C Programming/ Python Equivalent) and Hardware (Using TI / Analog Devices / Motorola

/ Equivalent DSP processors/Arduino/Raspberry pi).

- MATLAB or Equivalent Live Scripts are to be incorporated in conducting all simulations

1. Generation of Sinusoidal Waveform / Signal based on Recursive Difference Equations.
2. To find DFT / IDFT of given DT Signal.
3. To find Frequency Response of a System given in Transfer Function/ Differential equation form.
4. Implementation of FFT of given Sequence.
5. Determination of Power Spectrum of a given Signal(s).
6. Design and Implementation of LP FIR Filter for speech and audio signal.
7. Design and Implementation of HP IIR Filter for speech and audio signal.
8. Generation of Narrow Band Signal through Filtering.
9. Generation of DTMF Signals and Decoding of DTMF Signals using Spectrogram.
10. Implementation of Decimation & Interpolation Process.
11. Implementation of I/D Sampling Rate Converters on speech/audio signal using any of the above hardware.
12. Impulse Response of First order and Second Order Systems.
13. Implementation of Image Inversion, Edge Detection, Color replacement using any of the above hardware.

## **ADVANCED ENGLISH LANGUAGE AND COMMUNICATION SKILLS (AECS) LABORATORY**

### **III Year B.Tech. ECE I Semester**

#### **1. Introduction**

The introduction of the Advanced English Communication Skills Lab is considered essential at 3rd year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.

The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:

- Gathering ideas and information to organize ideas relevantly and coherently.
- Engaging in debates.
- Participating in group discussions.
- Facing interviews.
- Writing project/research reports/technical reports.
- Making oral presentations.
- Writing formal letters.
- Transferring information from non-verbal to verbal texts and vice-versa.
- Taking part in social and professional communication.

#### **2. Objective**

This Lab focuses on using multi-media instruction for language development to meet the following targets:

- To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.
- Further, they would be required to communicate their ideas relevantly and coherently in writing.
- To prepare all the students for their placements.

#### **3. Syllabus:**

The following course content to conduct the activities is prescribed for the Advanced English Communication Skills (AECS) Lab:

##### **1. Activities on Fundamentals of Inter-personal Communication and Building Vocabulary**

- Starting a conversation – responding appropriately and relevantly – using the right body language

– Role Play in different situations & Discourse Skills- using visuals - Synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, study of word origin, business vocabulary, analogy, idioms and phrases, collocations & usage of vocabulary.

2. **Activities on Reading Comprehension** –General Vs Local comprehension, reading for facts, guessing meanings from context, scanning, skimming, inferring meaning, critical reading & effective googling.
3. **Activities on Writing Skills** – Structure and presentation of different types of writing – *letter writing/Resume writing/ e-correspondence/Technical report writing/* – planning for writing – improving one’s writing.
4. **Activities on Presentation Skills** – Oral presentations (individual and group) through JAM sessions/seminars/**PPTs** and written presentations through posters/projects/reports/e- mails/assignments etc.
5. **Activities on Group Discussion and Interview Skills** – Dynamics of group discussion, intervention, summarizing, modulation of voice, body language, relevance, fluency and organization of ideas and rubrics for evaluation- Concept and process, pre-interview planning, opening strategies, answering strategies, interview through tele-conference & video-conference and Mock Interviews.

#### 4. Minimum Requirement:

**The Advanced English Communication Skills (AECS) Laboratory shall have the following infrastructural facilities to accommodate at least 35 students in the lab:**

- **Spacious room with appropriate acoustics.**
- **Round Tables with movable chairs**
- **Audio-visual aids**
- **LCD Projector**
- **Public Address system**
- **P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ**
- **T. V, a digital stereo & Camcorder**
- **Headphones of High quality**

#### 5. Suggested Software:

The software consisting of the prescribed topics elaborated above should be procured and used.

- **Oxford Advanced Learner’s Compass, 7<sup>th</sup> Edition**
- **DELTA’s key to the Next Generation TOEFL Test: Advanced Skill Practice.**
- **Lingua TOEFL CBT Insider, by Dreamtech**
- **TOEFL & GRE( KAPLAN, AARCO&BARRONS, USA, Cracking GRE by CLIFFS)**

## 6. Books Recommended:

1. **Effective Technical Communication** by M Asharaf Rizvi. McGraw Hill Education (India) Pvt. Ltd. 2<sup>nd</sup> Edition
2. **Academic Writing: A Handbook for International Students** by Stephen Bailey, Routledge, 5<sup>th</sup> Edition
3. **Learn Correct English – A Book of Grammar, Usage and Composition** by Shiv K. Kumar and Hemalatha Nagarajan. Pearson 2007
4. **Professional Communication** by Aruna Koneru, McGraw Hill Education (India) Pvt. Ltd, 2016.
5. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
6. **Technical Communication** by Paul V. Anderson. 2007. Cengage Learning pvt. Ltd. New Delhi.
7. **English Vocabulary in Use** series, Cambridge University Press 2008.
8. **Handbook for Technical Communication** by David A. McMurrey & Joanne Buckley. 2012. Cengage Learning.
9. **Communication Skills** by Leena Sen, PHI Learning Pvt Ltd., New Delhi, 2009.
10. **Job Hunting** by Colm Downes, Cambridge University Press 2008.
11. **English for Technical Communication for Engineering Students**, Aysha Vishwamohan, Tata Mc Graw-Hil 2009.

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**Prerequisites: NIL****Course objectives:**

- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
- To study the defensive techniques against these attacks

**Course Outcomes:** The students will be able to understand cyber-attacks, types of cybercrimes, cyber laws and also how to protect themselves and ultimately the entire Internet community from such attacks.

## UNIT-I

**Introduction to Cyber Security:** Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

## UNIT-II

**Cyberspace and the Law & Cyber Forensics:** Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy.

Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

## UNIT-III

**Cybercrime: Mobile and Wireless Devices:** Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops.

## UNIT-IV

**Cyber Security: Organizational Implications:** Introduction, cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

**Cybercrime and Cyber terrorism:** Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes, the psychology, mindset and skills of hackers and other cybercriminals.

## UNIT-V

Privacy Issues: **Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains-medical, financial, etc Cybercrime: Examples and Mini-Cases**

**Examples:** Official

Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mails spoofing instances.

**Mini-Cases:** The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Fraud

dsin CyberDomain.

**TEXTBOOKS:**

1. NinaGodboleandSunitBelpure,CyberSecurityUnderstandingCyberCrimes,ComputerForensicsand LegalPerspectives,Wiley
2. B.B.Gupta,D.P.Agrawal,Haoxiang Wang,ComputerandCyberSecurity:Principles,Algorithm,Applications,andPerspectives,CRCPress,ISBN9780815371335,2018.

**REFERENCES:**

1. CyberSecurityEssentials, JamesGraham, RichardHowardandRyanOtson, CRCPress.
2. IntroductiontoCyberSecurity,Chwan-Hwa(john)Wu,J.DavidIrwin,CRCPressT&FGroup.

**BUSINESS ECONOMICS AND FINANCIAL ANALYSIS****III Year B.Tech. ECE II Semester**

L	T	P	C
3	0	0	3

**Course Objective:**

To prepare engineering students to analyze cost/ revenue/ financial data and to make economic and financial analysis in decision making process and to examine the performance of companies engaged in engineering.

**Course Outcome:**

To perform and evaluate present and future worth of the alternate projects and to appraise projects by using traditional and DCF Methods. To carry out cost benefit analysis of projects and to calculate BEP of different alternative projects.

**Unit- I: Introduction to Engineering Economics-** Basic Principles and Methodology of Engineering Economics– Fundamental Concepts - Demand – Demand Determinants - Law of Demand- Demand Forecasting and Methods - Elasticity of Demand - Theory of Firm – Supply- Elasticity of Supply.

**Unit- II: Macro Economic Concepts:** National Income Accounting - Methods of Estimation- Various Concepts of National Income - Inflation – Definition – Causes of Inflation and Measures to Control Inflation - New Economic Policy 1991 (Industrial policy, Trade policy, and Fiscal policy) Impact on Industry.

**UNIT- III: Production, Cost, Market Structures & Pricing:**

Production Analysis: Factors of Production, Production Function, Production Function with one variable input, two variable inputs, Returns to Scale, Different Types of Production Functions. Cost analysis: Types of Costs, Short run and Long run Cost Functions. Market Structures: Nature of Competition, Features of Perfect competition, Monopoly, Oligopoly, and Monopolistic Competition. Pricing: Types of Pricing, Product Life Cycle based Pricing, Break Even Analysis, Cost Volume Profit Analysis.

**Unit- IV: Capital Budgeting Techniques:** Significance of Capital Budgeting - cash flows- Time Value of Money- Choosing between alternative investment proposals- Methods of Appraisal Techniques- Pay Back Period - Average Rate of Return – Net Present Value- Internal Rate of Return – Profitability Index.

**Unit- V: Introduction to Accounting:** Accounting Principles (GAPP), concepts, conventions- - Double entry system of Book keeping – Accounting rules- Journal- ledger- Trial balance- Trading and Profit and Loss account- Balance Sheet. ( Simple Problems).

**Suggested Readings:**

1. Henry Malcom Steinar-Engineering Economics, Principles, McGraw Hill Pub.
2. D.D.Chaturvedi, S.L.Gupta, Business Economics - Theory and Applications, International Book House Pvt. Ltd. 2013.
3. Jain and Narang” Accounting, Kalyani Publishers.
4. Arora, M.N.” Cost Accounting, Vikas Publication.
5. S.N.Maheshwari, Financial Management, Vikas Publishing House.

**ANTENNAS AND PROPAGATION****III Year B.Tech. ECE II Semester**

L	T	P	C
3	1	0	4

**Pre-requisite:** Network Analysis and Transmission Lines, Electromagnetic Fields and Waves**Course Objectives**

The course objectives are:

1. To understand the significance of antenna parameters, to derive and analyze the radiation characteristics of various antennas
2. To analyze the characteristics and design relations of UHF, VHF and Microwave Antennas and to identify the antenna array requirements, to determine the characteristics of various Antenna Arrays.
3. To understand the concepts and set-up requirements for microwave measurements, and familiarize with the procedure to enable antenna measurements.
4. To define and distinguish between different phenomenon of wave propagation (ground wave, space wave and sky wave), their frequency dependence, and estimate their characteristics, identifying their profiles and parameters involved.

**Course Outcomes**

Upon completing this course,

1. Should be able to Characterize the antennas based on frequency and geometrical configuration
2. Should be able to plot the radiation patterns of VHF, UHF and Microwave antennas and also antenna arrays.
3. Specify the requirements for microwave measurements and arrange a setup to carry out the antenna far zone pattern and gain measurements in the laboratory.
4. Classify the different wave propagation mechanisms, determine the characteristic features of different wave propagations, and estimate the parameters involved.

**UNIT I****Antenna Basics**

Basic Antenna Parameters – Radiation Patterns, Beam Area, Beam width, Radiation Intensity, Beam Efficiency, Directivity, Gain, Resolution, Antenna Aperture, Effective Height. Antenna Theorems, Retarded Potentials, Helmholtz Theorem.

**Thin Linear Wire Antennas**

Radiation From- Hertzian Dipole, Small thin Dipole, Infinitesimally thin Linear Antenna, Half Wave Dipole and Quarter Wave Monopole – Current Distributions, Field Components- Far Field and Near Field, Radiated Power, Radiation Resistance, Beam Width, Directivity, Gain, Effective Area and Effective Height. Loop Antennas - Small Loop, Comparison of Far Fields of Small Loop and Short Dipole, Radiation Resistances and Directivities of Small Loops (Qualitative Treatment).

## UNIT II

### Antenna Arrays

Point Sources – Definition, Patterns, and arrays of two Isotropic Sources - Different Cases. Principle of Pattern Multiplication, Uniform Linear Arrays – Broadside Arrays, End fire Arrays,

EFA with Increased Directivity, Derivation of their Characteristics and Comparison, BSA with Non- uniform Amplitude Distributions – General Considerations, and Binomial Arrays.

#### Antenna Measurements

Introduction, Concepts - Reciprocity, Near and Far Fields, Coordinate System, Sources of Errors. Patterns to be Measured, Directivity Measurement, Gain Measurements (by Comparison, Absolute and 3-Antenna Methods).

## UNIT III

### VHF, UHF and Microwave Antennas - I

Arrays with Parasitic Elements, Yagi-Uda Array, Folded Dipoles and their Characteristics. Helical Antennas – Helical Geometry, Helix Modes, Practical Design Considerations for Monofilar Helical Antenna in Axial and Normal Modes. Horn Antennas – Types, Fermat's Principle, Optimum Horns, Design Considerations of Pyramidal Horns.

## UNIT IV

### VHF, UHF and Microwave Antennas – II

Microstrip Antennas – Introduction, Features, Advantages and Limitations. Rectangular Patch Antennas – Geometry and Parameters, Characteristics of Microstrip Antennas. Reflector Antennas – Introduction, Flat Sheet and Corner Reflectors, Paraboloidal Reflectors – Geometry, Pattern Characteristics, Feed Methods, Reflector Types – Related Features.

## UNIT V

### Propagation

Definitions, Categorizations and General Classifications, Different Modes of Wave Propagation, Ray/Mode Concepts. **Ground Wave Propagation** - Plane Earth Reflections, Space and Surface Waves, Wave Tilt, Curved Earth Reflections. **Space Wave Propagation** - Field Strength Variation with Distance and Height, Effect of Earth's Curvature, Absorption, Super Refraction, M-Curves and Duct Propagation, Scattering Phenomena, Troposphere Propagation. **Sky Wave Propagation** - Structure of Ionosphere, Refraction and Reflection of Sky Waves by Ionosphere, Ray Path, Critical Frequency, MUF, LUF, OF, Virtual Height and Skip Distance, Relation between MUF and Skip Distance, Multi-hop Propagation.

## TEXT BOOKS

1. Antennas and Wave Propagation – J.D. Kraus, R.J. Marhefka and Ahmad S. Khan, TMH, New Delhi, 4th ed., (Special Indian Edition), 2010.
2. Electromagnetic Waves and Radiating Systems – E.C. Jordan and K.G. Balmain, PHI, 2nd ed., 2000.

## REFERENCES

1. Antenna Theory - C.A. Balanis, John Wiley & Sons, 3<sup>rd</sup> Ed., 2005.
2. Antennas and Wave Propagation – K.D. Prasad, Satya Prakashan, Tech India Publications, New Delhi, 2001.
3. Radio Engineering Handbook- Keith henney, 3<sup>rd</sup> edition TMH.
4. Antenna Engineering Handbook –John Leonidas Volakis, 3<sup>rd</sup> edition,2007

## COMPUTER NETWORKS

III Year B.Tech. ECE II Semester

L	T	P	C
3	1	0	4

**Pre-requisite:** Digital Communications

### Course Objectives

1. To understand the source and channel coding schemes.
2. To introduce the fundamental various types of computer networks.
3. To demonstrate the TCP/IP and OSI models with merits and demerits.
4. To introduce the concepts of various layers.

### Course Outcomes

Upon completing this course, the student will be able to

1. Compare network models, network types and transmission media.
2. Analyze the Data link layer Protocols, And Routing algorithms
3. Utilizing the connection oriented and connectionless service, and web applications
4. Design a wireless networks using IEEE standards.

### UNIT I

#### Computer Networks and the Internet

Internet, Network Edge, the Network Core, Delay and Loss in Packet-Switched Networks, Protocol Layers and Their Service Models.

#### Network Models

Layered Tasks, OSI Model, Layers in OSI Model, TCP/IP Protocol Suite, Addressing.

#### Transmission Media

Guided Media, Unguided Media- Wireless.

### UNIT II

#### Data Link Layer

Channel coding- Hamming coding, Block Coding, Cyclic Codes, Checksum, Framing, Flow and Error Control, Noiseless Channels, Noisy Channels, HDLC, Point-to-Point Protocol (PPP), Random Access, Controlled Access, Channelization.

### UNIT III

#### Network Layer

Introduction Virtual Circuit and Datagram Networks, Internet Protocols-IPv4 and IPv6, Router, Routing Algorithms, Broadcast and Multicasting Routing.

## **UNIT IV**

### **Transport Layer**

Transport-Layer Services, Multiplexing and Demultiplexing, Connectionless Transport - UDP, Principles of Reliable Data Transfer, Connection-Oriented Transport-TCP, Principles of Congestion Control.

### **Application Layer**

Principles of Network Applications, WWW and HTTP, FTP, Electronic Mail in the Internet, DNS— The Internet's Directory Service, Peer-to-Peer Applications, Socket Programming, Creating Network Applications.

## **UNIT V**

### **Wireless and Mobile Networks**

Introduction, Wireless Links and Network Characteristics, Wi-Fi, IEEE 802.11 Wireless LANs, IEEE 802.15, IEEE 802.16, Concept of OFDM with Block Diagram.

## **TEXT BOOKS**

1. Data Communications and Networking – Behrouz A. Forouzan, 4<sup>th</sup> & 5<sup>th</sup> Ed., TMH, 2006.
2. Computer Networks -- Andrew S Tanenbaum, 3<sup>th</sup> Ed., Pearson Education, 1999.

## **REFERENCES**

1. Computer and Communication Networks, Nader F. Mir, Pearson Education, 2010.
2. Computer Networking: A Top-Down Approach Featuring the Internet, James F.Kurose, K.W.Ross, 3<sup>rd</sup> Ed., Pearson Education, 2010.
3. Data and Computer Communications, G.S.Hura and M.Singhal, CRC Press, Taylor and Francis Group, 2010.
4. Data Communications and Computer Networks, P.C.Gupta, PHI, 2<sup>nd</sup> Ed., 2010.

**VLSI DESIGN****III Year B.Tech. ECE II Semester**

L	T	P	C
3	1	0	4

**Prerequisite:** Analog and Pulse circuits; Switching Theory and Logic Design**Course Objectives**

The objectives of the course are to:

1. Give exposure to different steps involved in the fabrication of ICs.
2. Explain electrical properties of MOS and BiCMOS devices to analyze the behavior of inverters with various loads.
3. Give exposure to the design rules to be followed to draw the layout of any logic circuit.
4. Provide design concepts to design building blocks of data path of any system using gates.
5. Understand basic programmable logic devices and testing of CMOS circuits.

**Course Outcomes**

Upon completing this course, the student will be able to

1. Acquire qualitative knowledge about the fabrication process MOS ICs.
2. Draw the layout of any logic circuit to understand and estimate parasitic effect of any logic circuit.
3. Design building blocks of data path systems, memories and simple logic circuits using PLA, PAL, FPGA and CPLD.
4. Understand different types of faults that can occur in a system and learn the concept of testing.

**UNIT I****Introduction**

Introduction to IC Technology – MOS, PMOS, NMOS, CMOS &amp; BiCMOS

**Basic Electrical Properties**Basic Electrical Properties of MOS and BiCMOS Circuits:  $I_{ds}$ - $V_{ds}$  relationships, MOS transistor threshold Voltage,  $g_m$ ,  $g_{ds}$ , Figure of merit; Pass transistor, NMOS Inverter, Various pull ups, CMOS Inverter analysis and design, Bi-CMOS Inverters.**UNIT II****VLSI Circuit Design Processes**

VLSI Design Flow, MOS Layers, Stick Diagrams, Design Rules and Layout, Transistors Layout Diagrams for NMOS and CMOS Inverters and Gates, Scaling of MOS circuits.

**UNIT III****Gate Level Design**

Logic Gates and Other complex gates, Switch logic, Alternate gate circuits, Time delays, Driving large capacitive loads, Wiring capacitance, Fan – in, Fan – out.

## **UNIT IV**

### **Data Path Subsystems**

Subsystem Design, Shifters, Adders, ALUs, Multipliers, Parity generators, Comparators, Zero/One Detectors, Counters.

### **Array Subsystems**

SRAM, DRAM, ROM, Serial Access Memories.

## **UNIT V**

### **Programmable Logic Devices**

Design Approach – PLA, PAL, Standard Cells FPGAs, CPLDs.

### **CMOS Testing**

CMOS Testing, Test Principles, Design Strategies for test, Chip level Test Techniques.

## **TEXT BOOKS**

1. Essentials of VLSI circuits and systems – Kamran Eshraghian, Eshraghian Douglas and A. Pucknell, PHI, 2005.
2. CMOS VLSI Design – A Circuits and Systems Perspective, Neil H. E Weste, David Harris, Ayan Banerjee, 3<sup>rd</sup> Ed., Pearson, 2009.

## **REFERENCES**

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011.
2. CMOS logic circuit Design - John .P. Uyemura, Springer, 2007.
3. Modern VLSI Design - Wayne Wolf, Pearson Education, 3rd Ed., 1997.

## **ELECTRONIC SENSORS (OE - 1)**

### **Course Objectives**

1. Learn the characteristics of sensors.
2. Know the working of Electromechanical, Thermal, Magnetic and radiation sensors.
3. Understand the concepts of Electro analytic and smart sensors.
4. Able to use sensors in different applications.

### **Course Outcomes**

Upon completing this course, the student will be able to

1. Learn about sensor Principle, Classification and Characterization.
2. Explore the working of Electromechanical, Thermal, Magnetic, radiation and Electro analytic sensors.
3. Understand the basic concepts of Smart Sensors.
4. Design a system with sensors.

### **UNIT I**

#### **Sensors / Transducers**

Principles, Classification, Parameters, Characteristics, Environmental Parameters (EP), Characterization

#### **Electromechanical Sensors**

Introduction, Resistive Potentiometer, Strain Gauge, Resistance Strain Gauge, Semiconductor Strain Gauges -Inductive Sensors: Sensitivity and Linearity of the Sensor –Types-Capacitive Sensors: Electrostatic Transducer, Force/Stress Sensors Using Quartz Resonators, Ultrasonic Sensors.

### **UNIT II**

#### **Thermal Sensors**

Introduction, Gas thermometric Sensors, Thermal Expansion Type Thermometric Sensors, Acoustic Temperature Sensor, Dielectric Constant and Refractive Index thermo sensors, Helium Low Temperature Thermometer, Nuclear Thermometer, Magnetic Thermometer, Resistance Change Type Thermometric Sensors, Thermo EMF Sensors, Junction Semiconductor Types, Thermal Radiation Sensors, Quartz Crystal Thermoelectric Sensors, NQR Thermometry, Spectroscopic Thermometry, Noise Thermometry, Heat Flux Sensors.

### **UNIT III**

#### **Magnetic sensors**

Introduction, Sensors and the Principles Behind, Magneto-resistive Sensors, Anisotropic Magneto resistive Sensing, Semiconductor Magneto resistors, Hall Effect and Sensors

, Inductance and Eddy Current Sensors, Angular/Rotary Movement Transducers, Synchros.

## **UNIT IV**

### **Radiation Sensors**

Introduction, Basic Characteristics, Types of Photo resistors/ Photo detectors, X-ray and Nuclear Radiation Sensors, Fibre Optic Sensors.

### **Electro analytical Sensors**

The Electrochemical Cell, The Cell Potential - Standard Hydrogen Electrode (SHE), Liquid Junction and Other Potentials, Polarization, Concentration Polarization, Reference Electrodes, Sensor Electrodes, Electro ceramics in Gas Media.

## **UNIT V**

### **Smart Sensors**

Introduction, Primary Sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Coding/Processing - Data Communication, Standards for Smart Sensor Interface, the Automation

### **Sensors Applications**

Introduction, On-board Automobile Sensors (Automotive Sensors), Home Appliance Sensors, Aerospace Sensors, Sensors for Manufacturing –Sensors for environmental Monitoring

## **TEXT BOOKS**

1. “Sensors and Transducers - D. Patranabis” –PHI Learning Private Limited., 2003.
2. Introduction to sensors- John veteline, aravind raghu, CRC press,2011

## **REFERENCES**

1. Sensors and Actuators , D. Patranabis ,2<sup>nd</sup> Ed., PHI, 2013.
2. Make sensors: Terokarvinen, kemo, karvinen and villey valtokari, 1st edition, maker media, 2014.
3. Sensors handbook- Sabrie soloman, 2<sup>nd</sup> Ed. TMH,2009.

**COMPUTER NETWORKS LAB**

III Year B.Tech. ECE II Semester

L	T	P	C
0	0	2	1

**Note:**

- A. Minimum of 12 Experiments have to be conducted
- B. All the Experiments may be Conducted using Network Simulation software like NS-2/NS 3/ NSG-2.1/Wire SHARK/ etc..

Note: For Experiments 2 to 10 Performance may be evaluated through simulation by using the parameters Throughput, Packet Delivery Ratio, Delay etc.

1. Writing a TCL Script to create two nodes and links between nodes
2. Writing a TCL Script to transmit data between nodes
3. Evaluate the performance of various LAN Topologies
4. Evaluate the performance of Drop Tail and RED queue management schemes
5. Evaluate the performance of CBQ and FQ Scheduling Mechanisms
6. Evaluate the performance of TCP and UDP Protocols
7. Evaluate the performance of TCP, New Reno and Vegas
8. Evaluate the performance of AODV and DSR routing protocols
9. Evaluate the performance of AODV and DSDV routing protocols
10. Evaluate the performance of IEEE 802.11 and IEEE 802.15.4
11. Evaluate the performance of IEEE 802.11 and SMAC
12. Capturing and Analysis of TCP and IP Packets
13. Simulation and Analysis of ICMP and IGMP Packets
14. Analyze the Protocols SCTP , ARP, NetBIOS, IPX VINES
15. Analysis of HTTP ,DNS and DHCP Protocols

\* Simulation of the above experiments to be conducted using NS-2, NSG 2.1, Wire Shark.

**VLSI DESIGN LAB**

III Year B.Tech. ECE II Semester

L	T	P	C
0	0	3	1.5

**Note:** Any **SIX** of the following experiments from each part are to be conducted (**Total 12**) **Part-I**

The following experiments are to be designed and simulated using HDL and implement using Zync/ Zed boards/ equivalent hardware. Simulate and synthesize at least four experiments to be implemented on FPGA boards.

1. Realization of all the logic gates.
2. Design of 8-to-3 encoder (without and with priority) and 2-to-4 decoder.
3. Design of 8-to-1 multiplexer and 1-to-8 demultiplexer.
4. Design of 4 bit binary to gray code converter.
5. Design of 4 bit comparator.
6. Design of Full adder using 3 modeling styles.
7. Design of flip flops: SR, D, JK, T.
8. Design of 4-bit binary, BCD counters ( synchronous/ asynchronous reset) or any sequence counter.
9. Design of Finite State Machines.

**Part-II**

Layout using any EDA  
tools.

1. Basic logic gates.
2. CMOS inverter.
3. CMOS NOR/ NAND gates.
4. CMOS XOR and MUX gates.
5. Static / Dynamic logic circuit (register cell).
6. Latch/ Flipflop.
7. Pass transistor.
8. Layout of any combinational circuit (complex CMOS logic gate).

## COMMUNICATION SYSTEMS LAB FOR IOT

III Year B.Tech. ECE II Semester

L	T	P	C
0	0	3	1.5

1. Introduction to NodeMCU on Arduino IDE and Serial Monitor interfacing
2. Digital and Analog Output taking on LED
3. Digital Input taken from push button
4. Analog Input taken from preset
5. LDR on NodeMCU
6. i2c Scanner for scanning all i2c devices
7. 16×2 LCD interfacing
8. Connecting to internet and Getting MAC address
9. DHT-11 Data upload on cloud (Thingspeak)
10. Weather Station (IOT)
11. RGB LED interfacing
12. Switching Using Transistor
13. IR Proximity and Color detection
14. Seven Segment Display interfacing
15. Servo Control and interfacing and Peizo Buzzer interfacing and control
16. DC motor switching and control through Relay

**INTRODUCTION TO ARTIFICIAL INTELLIGENCE****B.Tech.III Year II Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>2</b>	<b>0</b>	<b>0</b>	<b>0</b>

**Course Objectives:** To train the students to understand different types of AI agents, various AI search algorithms, fundamentals of knowledge representation, building of simple knowledge-based systems and to apply knowledge representation, reasoning. Study of Markov Models enable the student ready to step into applied AI.

**UNIT-I**

**Introduction:** AI problems, Agents and Environments, Structure of Agents, Problem Solving Agents  
**Basic Search Strategies:** Problem Spaces, Uninformed Search (Breadth-First, Depth-First Search, Depth-first with Iterative Deepening), Heuristic Search (Hill Climbing, Generic Best-First, A\*), Constraint Satisfaction (Backtracking, Local Search)

**UNIT-II**

**Advanced Search:** Constructing Search Trees, Stochastic Search, A\* Search Implementation, Minimax Search, Alpha-Beta Pruning  
**Basic Knowledge Representation and Reasoning:** Propositional Logic, First-Order Logic, Forward Chaining and Backward Chaining, Introduction to Probabilistic Reasoning, Bayes Theorem

**UNIT-III**

**Advanced Knowledge Representation and Reasoning:** Knowledge Representation Issues, Non-monotonic Reasoning, Other Knowledge Representation Schemes  
**Reasoning Under Uncertainty:** Basic probability, Acting Under Uncertainty, Bayes' Rule, Representing Knowledge in an Uncertain Domain, Bayesian Networks

**UNIT-IV**

**Learning:** What is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

**UNIT-V**

**Expert Systems:** Representing and Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

**TEXTBOOK:**

1. Russell, S. and Norvig, P., Artificial Intelligence: A Modern Approach, Third Edition, Prentice-Hall, 2010.

**REFERENCE BOOKS:**

1. Artificial Intelligence, Elaine Rich, Kevin Knight, Shivasankar B. Nair, The McGraw Hill publications, Third Edition, 2009.
2. George F. Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Pearson Education, 6th ed., 2009.

**MICROWAVE ENGINEERING****IV Year B.Tech. ECE I Semester**

L	T	P	C
2	0	0	2

**Pre-requisite:** Antennas and Propagation**Course Objectives**

1. To get familiarized with microwave frequency bands, their applications and to understand the limitations and losses of conventional tubes at these frequencies.
2. To distinguish between different types of microwave tubes, their structures and principles of microwave power generation.
3. To gain knowledge of Scattering Matrix, its formulation and utility, and establish the S- Matrix for various types of microwave components.
4. Understand the measurement concepts at microwave frequencies.

**Course Outcomes**

Upon completing this course, the student will be able to

1. Use microwave components for various applications.
2. Realize the need for solid state microwave sources and understand the principles of solid state devices.
3. Distinguish between the different types of waveguide and ferrite components, and select proper components for engineering applications.
4. Set up Microwave Bench for measurement of various microwave parameters.

**UNIT I****Waveguide Components**

Coupling Mechanisms – Probe, Loop, Aperture types. Waveguide Discontinuities – Waveguide Windows, Tuning Screws and Posts, Matched Loads. Waveguide Attenuators – Resistive Card and Rotary Vane type; Waveguide Phase Shifters – Dielectric and Rotary Vane type.

Scattering Matrix Properties - Waveguide Multiport Junctions - E plane and H plane Tees, Magic Tee, S- matrix. Directional Couplers – 2 Hole, Bethe Hole, S- matrix. Ferrites– Composition and Characteristics, Faraday rotation, Ferrite Components – Gyration, Isolator and Circulator, S- matrix. Cavity Resonators (qualitative treatment).

**UNIT II****Microwave Tubes**

Electromagnetic Spectrum and Microwave bands, Applications of microwaves, Limitations of conventional Tubes at Microwave Frequencies, Microwave Tubes –Classification.

**O-type Tubes** : 2 Cavity Klystron – Structure, Re-entrant Cavities, Velocity Modulation Process

and Applegate Diagram, Bunching Process, Expressions for O/P Power and Efficiency. Reflex Klystrons – Structure, Velocity Modulation and Applegate Diagram, Mathematical analysis of Bunching, Power Output, Efficiency, Oscillating Modes and O/P Characteristics.

### **UNIT III**

#### **Helix TWTs**

Types and Characteristics of Slow Wave Structures; Structure of TWT and Amplification Process (qualitative treatment), Suppression of Oscillations, Gain Considerations.

#### **M-Type Tubes**

Introduction, Cross-field Effects, Magnetrons – Different Types, Cylindrical Traveling Wave Magnetron – Hull Cut-off and Hartree Conditions, Modes of Resonance and PI-Mode Operation, Separation of PI-Mode, o/p characteristics,

### **UNIT IV**

#### **Microwave Solid State Devices**

Introduction, Classification, Applications. **TE Devices** – Introduction, Gunn Diodes – Principle, RWH Theory, Characteristics, Modes of Operation - Gunn Oscillation Modes, **ATT Devices**- IMPATT and TRAPATT. PIN diode, Schottky Barrier Diode.

### **UNIT V**

#### **Microwave Measurements**

Description of Microwave Bench – Different components and their Features, Errors and Precautions, Measurement of Attenuation, Frequency, Microwave Power using Bolometer Bridge, Calorimetric method, VSWR meter. Standing Wave Measurements, Measurement of Low and High VSWR, Cavity Q, Impedance Measurements.

### **TEXT BOOKS**

1. Microwave Engineering - David M. Pozar, John Wiley & Sons (Asia) Pvt Ltd., 1989, 3rd Ed., 2011 Reprint.
2. Microwave Devices and Circuits – Samuel Y. Liao, Pearson, 3rd Ed., 2003.
3. Microwave Engineering - Sushrut Das, Oxford University Press, India, 2015

### **REFERENCES**

1. Microwave Engineering - G.S. Raghuvanshi, Cengage Learning India Pvt. Ltd., 2012.
2. Microwave Engineering Passive Circuits- Peter A. Rizzi, PHI, 1999

**DIGITAL IMAGE  
PROCESSING  
(PE - 3)**

**IV Year B.Tech. ECE I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**Pre-requisite:** Digital Signal Processing

**Course Objectives**

The objectives of this course are:

1. To provide an approach towards image processing and introduction about 2D transforms.
2. To understand various enhancement methods in time, frequency domains and restoration techniques.
3. To understand the concepts of segmentation and Morphological operations on an image.
4. To explore the concepts of various compression techniques.

**Course Outcomes**

Upon completion of this course, the student will be able to:

1. Learn the fundamentals of image processing and important transformations used.
2. Perform spatial and frequency domain enhancement techniques.
3. Apply techniques for segmenting image and perform morphological operations.
4. Understand the need for compression and various compression techniques.

**UNIT I**

**Digital Image Fundamentals & Image Transforms**

Digital Image Fundamentals, Sampling and Quantization, Relationship between Pixels.

**Image Transforms**

FFT, Properties, Walsh Transform, Hadamard Transform, Discrete Cosine Transform, Haar Transform, Slant Transform, Hotelling Transform.

**UNIT II**

**Image Enhancement (Spatial Domain)**

Introduction, Image Enhancement in Spatial Domain, Enhancement through Point Processing, Types of Point Processing, Histogram equalization, Gray Level Transformations, Median Filter, Spatial Domain Low-pass and High-Pass Filtering.

**Image Enhancement (Frequency Domain)**

Filtering in Frequency Domain: Low Pass (Smoothing) and High Pass (Sharpening) Filters.

**UNIT III**

**Image Restoration**

Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration, Interactive Restoration.

## **UNIT IV**

### **Image Segmentation**

Detection of Discontinuities, Edge Linking And Boundary Detection, thresholding, RegionOriented Segmentation.

### **Morphological Image Processing**

Dilation and Erosion: Dilation, Structuring Element Decomposition, Erosion, CombiningDilation and Erosion, Opening and Closing, Hit or Miss Transformation.

## **UNIT V**

### **Image Compression**

Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy andLossless Predictive Coding, Transform Based Compression.

## **TEXT BOOKS**

1. Digital Image Processing - Rafael C. Gonzalez, Richard E. Woods, 4<sup>th</sup> Ed., Pearson, 2018.
2. Digital Image Processing- S Jayaraman, S Esakkirajan, T Veerakumar- TMH, 2010.

## **REFERENCES**

1. Digital Image Processing and Analysis - Human and Computer Vision Application with using CVIP Tools - Scotte Umbaugh, 2<sup>nd</sup> Ed., CRC Press, 2011.
2. Digital Image Processing using MATLAB – Rafael C. Gonzalez, Richard E Woods and Steven L. Eddings, 2<sup>nd</sup> Ed., TMH, 2010.
3. Digital Image Processing and Computer Vision – Somka, Hlavac, Boyle- Cengage Learning (Indian edition) 2008.
4. Introductory Computer Vision Imaging Techniques and Solutions- Adrian low, 2<sup>nd</sup> Ed., BS Publication, 2008.

## **SPEECH SIGNAL PROCESSING (PE - 3)**

**Pre-requisite:** Signals and Systems and Probability Theory and Stochastic Processes

### **Course Objectives**

The objectives of this course are to make the student

1. Understand the anatomy and Physiology of Speech Production system and perception model and to design an electrical equivalent of Acoustic model for Speech Production.
2. To analyze the speech in time domain and extract various time domain parameters which can be used for various applications like pitch extraction, end point detection, Speech Compression, Speech Synthesis etc.,
3. To study the concept of Homomorphic system and its use in extracting the vocal tract information from speech using Cepstrum which is a by product of Homomorphic processing of Speech.
4. To study various Speech Signal Processing applications viz: Speech Enhancement, Speech Recognition, Speaker Recognition.

### **Course Outcomes**

On completion of this course student will be able to

1. Model an electrical equivalent of Speech Production system.
2. Extract the LPC coefficients that can be used to Synthesize or compress the speech.
3. Design a Homomorphic Vocoder for coding and decoding of speech.
4. Enhance the speech and can design an Isolated word recognition system using HMM.
5. Extract the features for Automatic speaker recognition system which can used for classification.

### **UNIT I**

#### **Fundamentals of Digital Speech Processing**

Anatomy & Physiology of Speech Organs, The process of Speech Production, The Acoustic Theory of Speech Production – Uniform lossless tube model, effect of losses in vocal tract, effectif radiation at lips, Digital models for speech signals.

### **UNIT II**

#### **Time Domain Models for Speech Processing**

Introduction- Window considerations, Short time energy and average magnitude Short time average zero crossing rate, Speech vs Silence discrimination using energy and zero crossing, Pitch period estimation using a parallel processing approach. The short time autocorrelation function, The short time average magnitude difference function, Pitch period estimation using the autocorrelation function.

### UNIT III

#### Linear predictive Coding (LPC) Analysis

Basic principles of Linear Predictive Analysis : The Autocorrelation Method, The Covariance Method, Solution of LPC Equations: Cholesky Decomposition Solution for Covariance Method,

Durbin's Recursive Solution for the Autocorrelation Equation, comparison between the Method of Solution of the LPC Parameters: Pitch Detection using LPC Parameters, Formant Analysis using LPC Parameters.

### UNIT IV

#### Homomorphic Speech Processing

Introduction Homomorphic Systems for Convolution: Properties of the Complex Cepstrum, Computational Considerations, The Complex Cepstrum of Speech, pitch Detection, Formant Estimation, and The Homomorphic Vocoder.

**Speech Enhancement**-Nature of interfering sounds, Speech enhancement techniques: Single microphone Approach: spectral subtraction, Enhancement by re-synthesis, Comb filter, Wienerfilter, Multi microphone Approach.

### UNIT V

#### Automatic Speech & Speaker Recognition

Basic pattern recognition approaches, parametric representation of speech, evaluating the similarity of speech patterns, isolated digit Recognition System, Continuous digit Recognition System **Hidden Markov Model (HMM) for Speech**  
Hidden Markov Model (HMM) for speech recognition, Viterbi algorithm, Training and testing using HMMS.

#### **Speaker Recognition**

Recognition techniques, Features that distinguish speakers, Speaker Recognition Systems: Speaker Verification Systems, Speaker identification Systems.

### TEXT BOOKS

1. Digital Processing of Speech Signals – L.R. Rabiner S. W. Schafer. Pearson Education.
2. Speech Communication : Human & Machine – Douglas O' Shaughnessy, 2<sup>nd</sup> Ed., EEE Press.
3. Digital Processing of Speech Signals L.R Rabinar and RW Jhaung, 1978, PHI.

### REFERENCES

1. Discrete Time Speech Signal Processing: Principles and Practice – Thomas F. Quateri, 1<sup>st</sup> Ed., PE.
2. Speech & Audio Signal Processing – Ben Gold & Nelson Morgan, 1<sup>st</sup> Ed., Wiley.

## **BIOMEDICAL SIGNAL PROCESSING (PE-3)**

**Prerequisite:** Advanced Digital Signal Processing

### **Course Objectives**

The main objectives of the course are:

1. To use basic probability theory to model random signals in terms of Random Processes.
2. To understand various cardiological signal processing techniques and noise cancellation techniques.
3. To understand estimation of signals using Prony's and least square and linear prediction methods.
4. To comprehend EEG signals, modeling and sleep stages.

### **Course Outcomes**

After studying the course, each student is expected to be able to:

1. Use probability theory to model random processes.
2. Compare various lossless and lossy data compression techniques.
3. Compare various ECG processing and noise cancellation techniques.
4. Model and estimate EEG signals and various sleep stages.

### **UNIT -I**

**Random Processes:** Stationary random process, Ergodicity, Power spectral density and autocorrelation function of random processes. Noise power spectral density analysis, Noise bandwidth and noise figure of systems.

### **UNIT -II**

**Data Compression Techniques:** Lossy and Lossless data reduction Algorithms. ECG data compression using Turning point, AZTEC, CORTES, Huffman coding, vector quantisation, DICOM Standards

### **UNIT -III**

**Cardiological Signal Processing:** Pre-processing, QRS Detection Methods, Rhythm analysis, Arrhythmia Detection Algorithms, Automated ECG Analysis, ECG Pattern Recognition.

**Adaptive Noise Cancelling:** Principles of Adaptive Noise Cancelling, Adaptive Noise Cancelling with the LMS Adaptation Algorithm, Noise Cancelling Method to Enhance ECG Monitoring, Fetal ECG Monitoring.

### **UNIT -IV**

**Signal Averaging, Polishing:** Mean and trend removal, Prony's method, Prony's Method based on the Least Squares Estimate, Linear prediction, Yule – Walker (Y –W) equations, Analysis of Evoked Potentials.

## **UNIT -V**

**Neurological Signal Processing:** Modelling of EEG Signals, Detection of spikes and spindles  
Detection of Alpha, Beta and Gamma Waves. Auto Regressive (A.R.) modelling of seizure EEG.  
Sleep Stage analysis, Inverse Filtering, Least squares and polynomial modelling.

### **TEXT BOOKS**

1. Probability, Random Variables & Random Signal Principles – Peyton Z. Peebles, 4<sup>th</sup> Ed., TMH,2009.
2. Biomedical Signal Processing- Principles and Techniques - D. C. Reddy, TMH, 2005.

### **REFERENCES**

1. Digital Bio Digital Processing - Weitkumat R, Elsevier, 1991,.
2. Biomedical Signal Processing -Vol. I Time & Frequency Analysis - Cohen.A, , CRC Press, 1986.
3. Biomedical Digital Signal Processing: C-Language Experiments and Laboratory Experiments, Willis J.Tompkins, PHI, 1998.

**MICRO-CHIP FABRICATION TECHNIQUES**

**(PE-4)**

**IV Year B.Tech. ECE I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## LOW POWER VLSI (PE – 4)

IV Year B.Tech. ECE I Semester

L	T	P	C
3	0	0	3

**Pre-Requisite: VLSI Course**

### Objectives

The objectives of this course are to:

1. Identify sources of power in an IC.
2. Identify the power reduction techniques based on technology independent and technology dependent Power dissipation mechanism in various MOS logic style.
3. Identify suitable techniques to reduce the power dissipation.
4. Design adders, Multipliers and memory circuits with low power dissipation.

### Course Outcomes

Students able to

1. Understand the need of c VLSI designing.
2. Acquire a knowledge in consideration of various dissipations.
3. Design various low power adders,multipliers and memories.
4. Get knowledge in various design approaches.

## UNIT I

### Fundamentals

Need for Low Power Circuit Design, Sources of Power Dissipation – Switching Power Dissipation, Short Circuit Power Dissipation, Leakage Power Dissipation, Glitching Power Dissipation, Short Channel Effects –Drain Induced Barrier Lowering and Punch Through, Surface Scattering, Velocity Saturation, Impact Ionization, Hot Electron Effect.

## UNIT II

### Low-Power Design Approaches

Low-Power Design through Voltage Scaling – VTCMOS circuits, MTCMOS circuits, Architectural Level Approach –Pipelining and Parallel Processing Approaches.

### Switched Capacitance Minimization Approaches

System Level Measures, Circuit Level Measures, Mask level Measures.

## UNIT III

### Low-Voltage Low-Power Adders

Introduction, Standard Adder Cells, CMOS Adder's Architectures – Ripple Carry Adders, Carry Look-Ahead Adders, Carry Select Adders, Carry Save Adders, Low-Voltage Low-Power Design Techniques –Trends of Technology and Power Supply Voltage, Low-Voltage Low- Power Logic Styles.

## UNIT IV

### **Low-Voltage Low-Power Multipliers**

Introduction, Overview of Multiplication, Types of Multiplier Architectures, Braun Multiplier, Baugh-Wooley Multiplier, Booth Multiplier, Introduction to Wallace Tree Multiplier.

## **UNIT V**

### **Low-Voltage Low-Power Memories**

Basics of ROM, Low-Power ROM Technology, Future Trend and Development of ROMs, Basics of SRAM, Memory Cell, Precharge and Equalization Circuit, Low-Power SRAM Technologies, Basics of DRAM, Self-Refresh Circuit, Future Trend and Development of DRAM.

### **TEXT BOOKS**

1. CMOS Digital Integrated Circuits – Analysis and Design – Sung-Mo Kang, Yusuf Leblebici, TMH, 2011.
2. Low-Voltage, Low-Power VLSI Subsystems – Kiat-Seng Yeo, Kaushik Roy, TMH Professional Engineering.

### **REFERENCES**

1. Introduction to VLSI Systems: A Logic, Circuit and System Perspective – Ming-BO Lin, CRC Press, 2011.
2. Low Power CMOS Design – Anantha Chandrakasan, IEEE Press/Wiley International, 1998.
3. Low Power CMOS VLSI Circuit Design – Kaushik Roy, Sharat C. Prasad, John Wiley & Sons, 2000.
4. Practical Low Power Digital VLSI Design – Gary K. Yeap, Kluwer Academic Press, 2002

**TESTING AND TESTABILITY**  
**(PE – 4)**

**IV Year B.Tech. ECE I Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

## SYSTEM DESIGN THROUGH IOT (OE - 2)

### Course Objectives

The objectives of the course are to

1. To provide information on the concepts of Internet of Things and applications.
2. To learn how to use of Arduino and Raspberry Pi boards.
3. To know about data handling in SDN.

### Course Outcomes

Upon completing this course, the student will be able to

1. Explore various protocols of sensor networks.
2. Program and configure Arduino boards for real world connectivity.
3. Python programming and interfacing for Raspberry Pi.

### UNIT I

Introduction to Internet of Things, Characteristics of IoT, Physical design of IoT, Functional blocks of IoT, Sensing, Actuation, Basics of Networking, Communication Protocols, Sensor Networks.

### UNIT II

Machine-to-Machine Communications, Difference between IoT and M2M, Interoperability in IoT, Introduction to Arduino Programming, Integration of Sensors and Actuators with Arduino,

### UNIT III

Introduction to Python programming, Introduction to Raspberry Pi, Interfacing Raspberry Pi with basic peripherals, Implementation of IoT with Raspberry Pi

### UNIT IV

Implementation of IoT with Raspberry Pi, Introduction to Software defined Network (SDN), SDN for IoT, Data Handling and Analytics,

### UNIT V

Cloud Computing, Sensor-Cloud, Smart Cities and Smart Homes, Connected Vehicles, SmartGrid, Industrial IoT.

**Case Study-** Agriculture, Healthcare, Activity Monitoring.

### TEXT BOOKS

1. The Internet of Things: Enabling Technologies, Platforms, and Use Cases, by Pethuru Raj and Anupama C. Raman (CRC Press)
2. Make sensors: Terokarvinen, kemo, karvinen and villey valtokari, 1st Ed., Maker Media, 2014.

## REFERENCES

1. Internet of Things: A Hands-on Approach, by Arshdeep Bahga and Vijay Madisetti.
2. Fundamentals of Wireless Sensor Networks: Theory and Practice - Walteneus Dargie, Christian Poellabauer.
3. Beginning Sensor networks with Arduino and Raspberry Pi – Charles Bell, Apress, 201

## ANTENNAS AND MICROWAVE DEVICES LAB

IV Year B.Tech. ECE I Semester

L	T	P	C
0	0	2	1

**To setup Microwave Bench for any 10 of the following Experiments and obtain relevant measurement/characteristics.**

1. Reflex Klystron Characteristics.
2. Gunn Diode Characteristics.
3. Magic T Characteristics.
4. Circulator Characteristics.
5. Attenuation measurement.
6. Directional coupler Characteristics.
7. Scattering parameters of wave guide components.
8. Frequency measurement.
9. Direct Frequency measurement.
10. Slot Section Frequency measurement.
11. Impedance measurement.
12. VSWR measurement.
13. Characterization of Directional couplers/ T Junctions using Vector Network Analyzer
14. Design, simulate, fabricate and Testing using network analyzer of Horn Antenna

## MANAGEMENT FUNDAMENTALS FOR ENGINEERS

### IV Year B.Tech. ECE I Semester

L	T	P	C
3	0	0	3

**Course Objective:** To understand the Management Concepts, applications of Concepts in Practical aspects of business and development of Managerial Skills for Engineers.

**Course Outcome:** The students understand the significance of Management in their Profession. The various Management Functions like Planning, Organizing, Staffing, Leading, Motivation and Control aspects are learnt in this course. The students can explore the Management Practices in their domain area.

**Unit- I Introduction to Management:** Evolution of Management, Nature & Scope-Functions of Management-Role of Manager-levels of Management-Managerial Skills - Challenges-Planning-Planning Process-Types of Plans-MBO

**Unit-II Organization Structure & HRM:** Organization Design-Organizational Structure-Departmentation–Delegation-Centralization - Decentralization-Recentralization-Organizational Culture- Organizational climate- Organizational change  
Human Resource Management-HR Planning - Recruitment & Selection - Training & Development-Performance appraisal - Job satisfaction-Stress Management Practices

**Unit –III Operation Management:** Introduction to Operations Management-Principles and Types of Plant layout-Methods of production (Job Batch and Mass production) - Method study and Work measurement-Quality Management - TQM-Six sigma - Deming’s Contribution to Quality - Inventory Management – EOQ - ABC Analysis - JIT System-Business Process Re- engineering(BPR)

**Unit-IV Marketing Management:** Introduction to Marketing-Functions of Marketing- Marketing vs. Selling-Marketing Mix - Marketing Strategies - Product Life Cycle - Market Segmentation -Types of Marketing - Direct Marketing-Network Marketing - Digital Marketing- Channels of Distribution - Supply Chain Management (SCM)

**Unit-V Project Management:** Introduction to Project Management-steps in Project Management - Project Planning - Project Life Cycle-Network Analysis-Program Evaluation & Review Technique(PERT)-Critical Path Method(CPM) - Project Cost Analysis - Project Crashing - Project Information Systems

### Suggested Readings:

1. Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012.
2. Fundamentals of Management, Stephen P.Robbins, Pearson Education, 2009.
3. Essentials of Management, Koontz Kleihrich, Tata Mc - Graw Hill.
4. Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
5. Industrial Engineering and Management: Including Production Management, T.R.Banga, S.C Sharma , Khanna Publishers.

## RADAR SYSTEMS (PE -5)

IV Year B.Tech. ECE II Semester

L	T	P	C
3	0	0	3

**Pre-requisite** - Analog and Digital Communications

### Course Objectives

1. To explore the concepts of radar and its frequency bands.
2. To understand Doppler effect and get acquainted with the working principles of CW radar, FM-CW radar.
3. To impart the knowledge of functioning of MTI and Tracking Radars.
4. To explain the designing of a Matched Filter in radar receivers.

### Course Outcomes

Upon completing this course, the student will be able to

1. Derive the complete radar range equation.
2. Understand the need and functioning of CW, FM-CW and MTI radars.
3. Known various Tracking methods.
4. Derive the matched filter response characteristics for radar receivers.

### UNIT I

#### Basics of Radar

Maximum Unambiguous Range, Simple form of Radar Equation, Radar Block Diagram and Operation, Radar Frequencies and Applications. Prediction of Range Performance, Minimum Detectable Signal, Receiver Noise, Modified Radar Range Equation.

#### Radar Equation

SNR, Envelope Detector – False Alarm Time and Probability, Integration of Radar Pulses, Radar Cross Section of Targets, Transmitter Power, PRF and Range Ambiguities, System Losses (qualitative treatment).

### UNIT II

#### CW and Frequency Modulated Radar

Doppler Effect, CW Radar – Block Diagram, Isolation between Transmitter and Receiver, Non- zero IF Receiver, Receiver Bandwidth Requirements, Applications of CW radar.

#### FM-CW Radar

Range and Doppler Measurement, Block Diagram and Characteristics, FM-CW altimeter.

### UNIT III

#### MTI and Pulse Doppler Radar

Principle, MTI Radar - Power Amplifier Transmitter and Power Oscillator Transmitter, Delay Line

Cancellers – Filter Characteristics, Blind Speeds, Double Cancellation, Staggered PRFs. Range Gated Doppler Filters. MTI Radar Parameters, Limitations to MTI Performance, MTI versus Pulse Doppler Radar.

#### **UNIT IV**

##### **Tracking Radar**

Tracking with Radar, Sequential Lobing, Conical Scan, Mono pulse Tracking Radar – Amplitude Comparison Mono pulse (one- and two- coordinates), Phase Comparison Mono pulse, Tracking in Range, Acquisition and Scanning Patterns, Comparison of Trackers.

#### **UNIT V**

##### **Detection of Radar Signals in Noise**

Matched Filter Receiver – Response Characteristics and Derivation, Correlation Function and Cross-correlation Receiver, Efficiency of Non-matched Filters, Matched Filter with Non-white Noise.

##### **Radar Receivers**

Noise Figure and Noise Temperature, Displays – types. Duplexers – Branch type and Balanced type, Circulators as Duplexers. Introduction to Phased Array Antennas – Basic Concepts, Radiation Pattern, Beam Steering and Beam Width changes, Applications, Advantages and Limitations.

#### **TEXT BOOKS**

1. Introduction to Radar Systems – Merrill I. Skolnik, TMH Special Indian Edition, 2<sup>nd</sup>Ed.,2007.

#### **REFERENCES**

1. Radar: Principles, Technology, Applications – Byron Edde, Pearson Education, 2004.
2. Radar Principles – Peebles, Jr., P.Z., Wiley, New York, 1998.
3. Principles of Modern Radar: Basic Principles – Mark A. Richards, James A. Scheer, William A. Holm, Yesdee, 2013.
4. Radar Handbook - Merrill I. Skolnik, 3<sup>rd</sup> Ed., McGrawHill Education, 2008.

## SATELLITE COMMUNICATIONS

(PE-5)

IV Year B.Tech. ECE II Semester

L	T	P	C
3	0	0	3

**Pre-requisite** Analog and Digital Communications

### Course Objectives

1. To acquired foundation in orbital mechanics and launch vehicles for the satellites.
2. To provide basic knowledge of link design of satellite.
3. To understand multiple access systems and earth station technology.
4. To understand the concepts of satellite navigation and GPS.

### Course Outcomes

Upon completing this course, the student will be able to

1. Understand basic concepts and frequency allocations for satellite communication, orbital mechanics and launch vehicles.
2. Envision the satellite sub systems and design satellite links for specified C/N.
3. Understand the various multiple access techniques for satellite communication systems and earth station technologies.
4. Explore the LEO, GEO Stationary Satellite Systems and satellite navigation.

## UNIT I

### Introduction

Origin of Satellite Communications, Historical Back-ground, Basic Concepts of Satellite Communications, Frequency Allocations for Satellite Services, Applications, Future Trends of Satellite Communications.

### Orbital Mechanics and Launchers

Orbital Mechanics, Look Angle determination, Orbital Perturbations, Orbit determination, Launches and Launch vehicles, Orbital Effects in Communication Systems Performance.

## UNIT II

### Satellite Subsystems

Attitude and Orbit Control System, Telemetry, Tracking, Command And Monitoring, Power Systems, Communication Subsystems, Satellite Antennas, Equipment Reliability and SpaceQualification.

## UNIT III

### Satellite Link Design

Basic Transmission Theory, System Noise Temperature and G/T Ratio, Design of Down Links, Up Link Design, Design Of Satellite Links For Specified C/N, System Design Examples.

## **Multiple Access**

Frequency Division Multiple Access (FDMA), Inter modulation, Calculation of C/N, Time Division Multiple Access (TDMA), Frame Structure, Examples, Satellite Switched TDMA Onboard Processing, DAMA, Code Division Multiple Access (CDMA), Spread Spectrum Transmission and Reception.

## **UNIT IV**

### **Earth Station Technology**

Introduction, Transmitters, Receivers, Antennas, Tracking Systems, Terrestrial Interface, Primary Power Test Methods.

## **UNIT V**

### **Low Earth Orbit and Geo-Stationary Satellite Systems**

Orbit Considerations, Coverage and Frequency Consideration, Delay & Throughput Considerations, System Considerations, Operational NGSO Constellation Designs.

### **Satellite Navigation & Global Positioning System**

Radio and Satellite Navigation, GPS Position Location Principles, GPS Receivers and Codes, Satellite Signal Acquisition, GPS Navigation Message, GPS Signal Levels, GPS Receiver Operation, GPS C/A Code Accuracy, Differential GPS.

## **TEXT BOOKS**

1. Satellite Communications – Timothy Pratt, Charles Bostian and Jeremy Allnutt, WSE, Wiley Publications, 2nd Ed., 2003.
2. Satellite Communications Engineering – Wilbur L. Pritchard, Robert A Nelson and Henri G.Suyderhoud, 2nd Ed., Pearson Publications, 2003.

## **REFERENCES**

1. Satellite Communications: Design Principles – M. Richharia, BS Publications, 2<sup>nd</sup> Ed., 2003.
2. Satellite Communication - D.C Agarwal, Khanna Publications, 5<sup>th</sup> Ed.
3. Fundamentals of Satellite Communications – K.N. Raja Rao, PHI, 2004
4. Satellite Communications – Dennis Roddy, McGraw Hill, 4<sup>th</sup> Ed., 2009.

## OPTICAL COMMUNICATIONS

(PE - 5)

IV Year B.Tech. ECE II Semester

L	T	P	C
3	0	0	3

**Prerequisite:** Analog Communications and Digital Communications

### Course Objectives

The objectives of the course are:

1. To realize the significance of optical fiber communications.
2. To understand the construction and characteristics of optical fiber cable.
3. To develop the knowledge of optical signal sources, detectors and coupling into optical fibers.
4. To understand the design of optical systems and WDM.

### Course Outcomes

At the end of the course, the student will be able to:

1. Understand and analyze the constructional parameters of optical fibers.
2. Be able to design an optical system.
3. Estimate the losses due to attenuation, absorption, scattering and bending.
4. Compare various optical detectors and choose suitable one for different applications

### UNIT I

**Overview of Optical Fiber Communication:** - Historical development, The general system, Advantages of Optical Fiber Communications, Optical Fiber Wave Guides- Introduction, Ray Theory Transmission, Total Internal Reflection, Acceptance Angle, Numerical Aperture, Skew Rays, Cylindrical Fibers- Modes, Vnumber, Mode Coupling, Step Index Fibers, Graded Index Fibers.

**Single Mode Fibers-** Cut Off Wavelength, Mode Field Diameter, Effective Refractive Index, Fiber Materials Glass, Halide, Active Glass, Chalgenide Glass, Plastic Optical Fibers.

### UNIT II

**Signal Distortion in Optical Fibers:** Attenuation, Absorption, Scattering and Bending Losses, Core and Cladding Losses, Information Capacity Determination, Group Delay, Types of Dispersion - Material Dispersion, Wave-Guide Dispersion, Polarization Mode Dispersion, Intermodal Dispersion, Pulse Broadening, Optical Fiber Connectors- Connector Types, Single Mode Fiber Connectors, Connector Return Loss.

### UNIT III

**Fiber Splicing:** Splicing Techniques, Splicing Single Mode Fibers, Fiber Alignment and Joint Loss- Multimode Fiber Joints, Single Mode Fiber Joints.

**Optical Sources-** LEDs, Structures, Materials, Quantum Efficiency, Power, Modulation, Power Bandwidth Product, Injection Laser Diodes- Modes, Threshold Conditions, External Quantum Efficiency, Laser Diode Rate Equations, Resonant Frequencies, Reliability of LED & ILD.

**Source to Fiber Power Launching:** - Output Patterns, Power Coupling, Power Launching, Equilibrium Numerical Aperture, Laser Diode to Fiber Coupling.

#### UNIT IV

**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.

#### UNIT V

**Optical System Design:** Considerations, Component Choice, Multiplexing, Point-to- Point Links, System Considerations, Link Power Budget with Examples, Overall Fiber Dispersion in Multi-Mode and Single Mode Fibers, Rise Time Budget with Examples. Transmission Distance, Line Coding in Optical Links, WDM, Necessity, Principles, Types of WDM, Measurement of Attenuation and Dispersion, Eye Pattern.

#### TEXT BOOKS

1. Optical Fiber Communications – Gerd Keiser, TMH, 4<sup>th</sup> Edition, 2008.
2. Optical Fiber Communications – John M. Senior, Pearson Education, 3<sup>rd</sup> Edition, 2009.

#### REFERENCES

1. Fiber Optic Communications – D.K. Mynbaev , S.C. Gupta and Lowell L. Scheiner, Pearson Education, 2005.
2. Text Book on Optical Fibre Communication and its Applications – S.C.Gupta, PHI, 2005.
3. Fiber Optic Communication Systems – Govind P. Agarwal , John Wiley, 3rd Edition, 2004.
4. Introduction to Fiber Optics by Donald J.Sterling Jr. – Cengage learning, 2004.
5. Optical Communication Systems – John Gowar, 2<sup>nd</sup> Edition, PHI, 2001.

## WIRELESS COMMUNICATIONS AND NETWORKS (PE-6)

IV Year B.Tech. ECE II Semester

L	T	P	C
3	0	0	3

**Prerequisite:** Digital Communications

### Course objectives

The course objectives are:

1. To provide the students with the fundamental treatment about many practical and theoretical concepts that forms basic of wireless communications.
2. To equip the students with various kinds of wireless networks and its operations.
3. To provide an analytical perspective on the design and analysis of the traditional and emerging wireless networks, and to discuss the nature of, and solution methods to, the fundamental problems in wireless networking.
4. To train students to understand the architecture and operation of various wireless wide area networks.

### Course Outcomes

Upon completion of the course, the student will be able to:

1. Understand cellular system design concepts.
2. Analyze and estimate propagation path loss and fading.
3. Design Equalization and Diversity techniques.
4. Analyze and implement the WLAN, WPAN, 802.16 standards.

### UNIT -I

#### The Cellular Concept-System Design Fundamentals

Introduction, Frequency Reuse, Channel Assignment Strategies, Handoff Strategies- Prioritizing Handoffs, Practical Handoff Considerations, Interference and system capacity – Co channel Interference and system capacity, Channel planning for Wireless Systems, Adjacent Channel interference, Power Control for Reducing interference, Trunking and Grade of Service, Improving Coverage & Capacity in Cellular Systems- Cell Splitting, Sectoring.

### UNIT –II

#### Mobile Radio Propagation: Large-Scale Path Loss

Introduction to Radio Wave Propagation, Free Space Propagation Model, Relating Power to Electric Field, The Three Basic Propagation Mechanisms, Reflection-Reflection from Dielectrics, Brewster Angle, Reflection from perfect conductors, Ground Reflection (Two-Ray) Model, Diffraction-Fresnel Zone Geometry, Knife-edge Diffraction Model, Multiple knife-edge Diffraction, Scattering, Outdoor Propagation Models- Longley-Rice Model, Okumura Model, Hata Model, PCS Extension to Hata Model, Walfisch and Bertoni Model, Wideband PCS Microcell Model, Indoor Propagation Models- Partition losses (Same Floor), Partition losses between Floors, Log-distance path loss model, Ericsson Multiple Breakpoint Model, Attenuation Factor Model, Signal penetration into buildings, Ray Tracing and Site Specific Modeling.

### **UNIT –III**

#### **Mobile Radio Propagation: Small –Scale Fading and Multipath**

Small Scale Multipath propagation-Factors influencing small scale fading, Doppler shift, Impulse Response Model of a multipath channel- Relationship between Bandwidth and Received power, Small-Scale Multipath Measurements-Direct RF Pulse System, Spread Spectrum Sliding Correlator Channel Sounding, Frequency Domain Channels Sounding, Parameters of Mobile Multipath Channels-Time Dispersion Parameters, Coherence Bandwidth, Doppler Spread and Coherence Time, Types of Small-Scale Fading-Fading effects Due to Multipath Time Delay Spread, Flat fading, Frequency selective fading, Fading effects Due to Doppler Spread-Fast fading, slow fading, Statistical Models for multipath Fading Channels-Clarke's model for flat fading, spectral shape due to Doppler spread in Clarke's model, Simulation of Clarke and Gans Fading Model, Level crossing and fading statistics, Two-ray Rayleigh Fading Model.

### **UNIT -IV**

#### **Equalization and Diversity**

Introduction, Fundamentals of Equalization, Training A Generic Adaptive Equalizer, Equalizers in a communication Receiver, Linear Equalizers, Nonlinear Equalization-Decision Feedback Equalization (DFE), Maximum Likelihood Sequence Estimation (MLSE) Equalizer, Algorithms for adaptive equalization-Zero Forcing Algorithm, Least Mean Square Algorithm, Recursive least squares algorithm. Diversity Techniques-Derivation of selection Diversity improvement, Derivation of Maximal Ratio Combining improvement, Practical Space Diversity Consideration- Selection Diversity, Feedback or Scanning Diversity, Maximal Ratio Combining, Equal Gain Combining, Polarization Diversity, Frequency Diversity, Time Diversity, RAKE Receiver.

### **UNIT -V**

#### **Wireless Networks**

Introduction to wireless Networks, Advantages and disadvantages of Wireless Local Area Networks, WLAN Topologies, WLAN Standard IEEE 802.11, IEEE 802.11 Medium Access Control, Comparison of IEEE 802.11 a,b,g and n standards, IEEE 802.16 and its enhancements, Wireless PANs, Hiper Lan, WLL.

### **TEXT BOOKS**

1. Wireless Communications, Principles, Practice – Theodore, S. Rappaport, 2<sup>nd</sup> Ed., 2002, PHI.
2. Wireless Communications-Andrea Goldsmith, 2005 Cambridge University Press.
3. Principles of Wireless Networks – Kaveh Pah Laven and P. Krishna Murthy, 2002, PE
4. Mobile Cellular Communication – Gottapu Sasibhushana Rao, Pearson Education, 2012.

### **REFERENCES**

1. Wireless Digital Communications – Kamilo Feher, 1999, PHI.
2. Wireless Communication and Networking – William Stallings, 2003, PHI.

**ADAPTIVE SIGNAL  
PROCESSING  
(PE-6)**

**IV Year B.Tech. ECE II Semester**

L	T	P	C
3	0	0	3

**Prerequisite:** Digital Signal Processing

**Course Objectives**

The main objectives of the course are:

1. This course focuses on problems algorithms and solutions for processing signals in anmanner that is responsive to a changing environment.
2. To develop systems on recursive, model based estimation methods taking the advantage of the statistical properties of the received signals.
3. To analyze the performance of adaptive filters and considers the application of the theory to a variety of practical problems such as beam forming and echo cancellation signal.
4. To understand innovation process, Kalman filter theory and estimation of state using the innovation process, concept of Kalman Gain and Filtering.

**Course Outcomes**

After studying the course, the student is expected to be able to :

1. Design and apply optimal minimum mean square estimators and in particular linear estimators.
2. Understand and compute their expected performance and verify it.
3. Design, implement and apply Wiener Filters (FIR, non-casual, causal) and evaluate their performance.
4. To understand innovation process, Kalman filter theory and estimation of state using the Innovation Process, concept of Kalman Gain and Filtering.
5. Design, implement and apply LMS, RLS and Kalman filters to given applications.

**UNIT –I**

**Introduction to Adaptive Systems**

Definitions, Characteristics, Applications, Example of an Adaptive System. The Adaptive Linear Combiner - Description, Weight Vectors, Desired Response Performance function - Gradient & Mean Square Error.

**UNIT –II**

**Development of Adaptive Filter Theory & Searching the Performance surface**

Introduction to Filtering - Smoothing and Prediction – Linear Optimum Filtering, Problem statement, Principle of Orthogonally - Minimum Mean Square Error, Wiener- Hopf equations, Error Performance - Minimum Mean Square Error.



## **Steepest Descent Algorithms**

Searching the performance surface – Methods & Ideas of Gradient Search methods - Gradient Searching Algorithm & its Solution - Stability & Rate of convergence - Learning Curves Gradient Search by Newton's Method, Method of Steepest Descent, Comparison of Learning Curves.

## **UNIT –IV**

### **LMS Algorithm & Applications**

Overview - LMS Adaptation algorithms, Stability & Performance analysis of LMS Algorithms -LMS Gradient & Stochastic algorithms - Convergence of LMS algorithm.

**Applications:** Noise cancellation – Cancellation of echoes in long distance telephone circuits, Adaptive Beam forming.

## **UNIT –V**

### **Kalman Filtering**

Introduction to RLS Algorithm, Statement of Kalman filtering problem, The Innovation Process, Estimation of State using the Innovation Process- Expression of Kalman Gain, Filtering Examples using Kalman filtering.

## **TEXT BOOKS**

1. Adaptive Signal Processing - Bernard Widrow, Samuel D.Stearns, PE, 2005.
2. Adaptive Filter Theory - Simon Haykin-, 4<sup>th</sup> Ed., PE Asia 2002.

## **REFERENCES**

1. Optimum signal processing: An introduction - Sophocles.J.Orfamadis, 2 Ed., McGraw-Hill, Newyork, 1988.
2. Adaptive signal processing-Theory and Applications, S.Thomas Alexander, Springer –Verlag, 1986.
3. Signal analysis – Candy, Mc Graw Hill Int. Student Edition
4. James V. Candy, Signal Processing: A Modern Approach, McGraw-Hill, InternationalEdition, 1988.

**ANALOG IC  
DESIGN (PE-6)**

**IV Year B.Tech. ECE II Semester**

<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>

**PRINCIPLES OF  
COMMUNICATIONS  
(OE- 3)**

**IV Year B.Tech. ECE II Semester**

L	T	P	C
3	0	0	3

**Pre-requisite:** Nil

**Course Objectives**

1. Basic understanding of all communication systems
2. Introduce the basic definitions of different modulation techniques.
3. Known about satellite and optical communications.
4. Learn the fundamentals of wireless technologies.

**Course Outcomes**

Upon completing this course, the student will be able to

1. Understand the need of modulation and distinguish various modulation techniques.
2. Known the communication concepts using satellite and optical fiber.
3. Have a basic understanding of cellular, mobile and telephone communication systems.
4. Known fundamentals of wireless networks.

**UNIT I**

**Simple description on Modulation**

Need for Modulation, Electromagnetic spectrum, Analog Modulation-AM, FM, Pulse Modulation-PAM, PWM, PCM, Digital Modulation Techniques-ASK, FSK, PSK, QPSK modulation and demodulation schemes.

**UNIT II Satellite Communication**

Satellite Orbits, Ground Stations, Satellite Applications, basics of Global Positioning systems.

**UNIT III**

**Optical Communication**

Propagation mechanism, Types of optical fiber, LED source, PIN detector

**UNIT IV**

**Telecommunication Systems**

Telephone system, Paging systems, Internet Telephony.

**Networking and Local Area Networks**

Network fundamentals, Ethernet LANs, Token Ring LAN.

## **UNIT V**

### **Cellular and Mobile Communications**

Basic concepts of Cellular telephone systems, Evolution and standard - AMPS, GSM, CDMA, and WCDMA.

### **Wireless Technologies**

Fundamentals - Wireless LANs, PANs and MANs.

### **TEXT BOOKS**

1. Principles of Electronic Communication Systems, Louis E. Frenzel, 3e, McGraw Hill publications, 2008.
2. Kennedy, Davis, Electronic Communications systems, 4e, TMH, 1999.

### **REFERENCES**

1. Tarmo Anttalainen, Introduction to Telecommunications Network Engineering, Artech House Telecommunications Library.
2. Theodore Rappaport, Wireless Communications-Principles and practice, Printice Hall, 2002.
3. Roger L. Freeman, Fundamentals of Telecommunications, 2e, Wiley publications.  
Wayne Tomasi, Introduction to data communications and networking, Pearson Education, 2005.

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