B. TECH 1st SEMESTER	L	T	P	C
	3	-	-	3
16BS1T01: Proficiency Course in English -I				

COURSE OBJECTIVES

1. To improve the language proficiency of technical under graduates in English with emphasis on LSRW Skills.
2. To provide learning environment to practice Listening, Speaking, Reading and Writing Skills within and beyond the classroom environment.
3. To assist students to carry on the tasks and activities through guided instructions and materials.
4. To effectively integrate English language learning with employability skills and training.
5. To design the main course material and exercises with authentic materials drawn from everyday use to cater to everyday needs.
6. To provide hands-on experience through case –studies, mini –projects, group and individual presentations.

COURSE OUTCOMES

A) Reading Skills.
- Addressing explicit and implicit meaning of a text.
- Understanding the context.
- Learning new words and phrases.
- Using words and phrases in different contexts.

B) Writing Skills:
- Using the basic structure of a sentence.
- Applying relevant writing formats to create paragraphs, essays, letters, e-mails, reports and presentations.
- Retaining a logical flow while writing.
- Planning and executing an assignment creatively.

C) Interactive skills:
- Analyzing a topic of discussion and relating to it.
- Participating in discussions and influencing them.
- Communicating ideas effectively.
- Presenting ideas coherently within a stipulated time.

D) Grammar in context
- Enable the skills of grammar using in a situation
- Identifying the needs of apt grammar in life related situation
- Promoting discourse with grammar effectively

Syllabus:

S No	Content	Hours
UNIT –I	The Power of Prayer One word substitutes Nouns – Pronouns	8
UNIT -II	Is progress real? Commonly Confused words Verbs	8
UNIT-III	Secret of Work Collocations Adjectives ,Adverbs and Articles	8
UNIT-IV	An Astrologer's Day GRE words Prepositions and Sentences	8
UNIT-IV	Marriage Proposal Idioms Conjunctions and Interjections	8
UNIT-VI	The Road not Taken Phrasal Verbs Tenses	8
		48

Text Book: Proficiency Course in English, Semester –I by Maruti Publications.

B. TECH 1st SEMESTER	L	T	P	C
	3	-	-	3
16MA1T01: Differential Equations and Laplace Transforms				

Prerequisites

Knowledge of differentiation, integration, logarithms, hyperbolic functions, and trigonometry is necessary**.** Concept of functions and their types, partial differentiation is also needed.

COURSE OBJECTIVES

1. The study of differential equations is introduced to make the students how to solve the problems in first order and first degree differential equations.
2. The study of second and higher order differential equations with constant coefficients.
3. To transform a given problem from one domain into another so that solving the corresponding problem becomes easier, Laplace transforms are introduced.
4. To know various physical and geometrical problems involving two or more independent variables, partial differential equations will be studied.

COURSE OUTCOMES

The students are able to

1. solve linear differential equations of all orders.
2. solve the first order partial differential equations.
3. apply the knowledge to find the expansions of functions using Taylors and Maclaurin's series.
4. solve many problems in engineering with the knowledge of Laplace transforms.

Syllabus:

UNIT -I Differential equations of first order and first degree

Linear – Bernoulli – Exact - Reducible to exact - Newton's Law of cooling-Law of natural growth and Decay - Orthogonal Trajectories.

UNIT -II Linear differential equations of higher order

Non-homogeneous equations of higher order with constant coefficients with RHS term of the type e^{ax}, Sin ax, cos ax, polynomials in x, $e^{ax}V(x)$, $xV(x)$.Method of Variation of parameters for solving second order linear differential equations.

UNIT -III Partial Derivatives

Taylor series and Maclaurin's series expansions of functions of single and two variables (without Proofs) - Jacobian, Functional dependence.

UNIT -IV Partial Differential Equations

Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions –solutions of first order linear (Lagrange) equation and nonlinear (standard type) equations-Solutions of Linear Partial differential equations with constant coefficients by the method of separation of Variables.

UNIT -V Laplace transforms

Laplace transforms of standard functions-Shifting Theorems, Transforms of derivatives and integrals – Unit step function –Dirac's delta function.

UNIT -VI Inverse Laplace transforms

Inverse Laplace transforms -Convolution theorem (without proof).

Application: Solutions of ordinary differential equations using Laplace transforms.

Books:

1. **B.S. GREWAL**, Higher Engineering Mathematics, 42nd Edition, Khanna Publishers.
2. **B.V. RAMANA**, Higher Engineering Mathematics, Tata McGraw Hill.

Reference Books:

1. **ERWIN KREYSZIG**, Advanced Engineering Mathematics, 9th Edition, Wiley-India

B. TECH 1st SEMESTER	L	T	P	C
	3	-	-	3
16MA1T02: Numerical Methods and Integral Transforms				

PREREQUISITES

The two year intermediate course of Mathematics.

COURSE OBJECTIVES

1. To give a good training to the student in each topic and method.
2. To get the good results of the student in competitive examinations like GRE, GATE etc., by training in this context.
3. To develop the skills of the student to solve the different mathematical methods efficiently to meet the needs of solving the different mathematical models involving in real world process and engineering.
4. To motivate the student for innovating ideas by learning mathematical methods in the context of the real world applications and the need of the world.
5. To produce the competent engineers and professional, to meet the needs of industries in the context scenario.

COURSE OUTCOMES

Students are able to

1. solve the algebraic and transcendental equations by different methods and also know the different interpolation formulae to find a polynomial or the value of the polynomial at a given point.
2. find the quadrature, the solutions of ODEs by different formulae.
3. solve the problems on Z-transforms and Fourier transforms.
4. interpret a function as a Fourier series.

Syllabus

UNIT-I

Solution of Algebraic and Transcendental Equations: Introduction - Bisection Method - Method of False Position - Iteration Method - Newton Raphson Method.

UNIT-II

Interpolation: Introduction - Finite differences - Forward Differences Backward differences - Central differences - Symbolic relations, Differences of a polynomial - Newton's formulae for interpolation - Lagrange's Interpolation formula for unevenly spaced points.

UNIT-III

Numerical integration and solution of ordinary differential equations: Numerical Integration: Trapezoidal rule - Simpson's 1/3 rule - Simpson's 3/8 rule.

Numerical Solution of Ordinary Differential Equations: Solution by Taylor's series method - Euler's Method - Euler's Modified Method - IV order Runge Kutta Method

UNIT-IV

Z-Transform: Introduction - properties - Damping rule - Shifting rule - Initial and final value theorems - Inverse z transform- -Convolution theorem.

Applications: Solution of difference equations by Z-transforms.

UNIT–V

Fourier Series: Introduction- Determination of Fourier coefficients - even and odd functions - change of interval - Half-range sine and cosine series

UNIT – VI

Fourier Transforms: Fourier integral theorem (statement only) - Fourier Transforms, Fourier sine and cosine transforms - properties - inverse transforms - Finite Fourier transforms.

Text Books:

1. **B.S. GREWAL**, Higher Engineering Mathematics, 42nd Edition, Khanna Publishers.
2. **B.V. RAMANA**, Higher Engineering Mathematics, Tata McGraw Hill.

Reference Books:

1. S. S. Sastri (PHI), Introductory Methods of Numerical Analysis 5^{th} Edition.
2. ERWIN KREYSZIG, Advanced Engineering Mathematics, 9th Edition, Wiley-India

B. TECH 1st SEMESTER	L	T	P	C
	3	-	-	3
16BS1T02: Engineering Chemistry				

COURSE OBJECTIVES

1. For prospective engineers knowledge about water used in industries (boilers etc) and for drinking purposes is useful hence chemistry of hard water, boiler troubles and modern methods of softening hard water is introduced.
2. Knowledge of galvanic cells , electrode potentials is necessary for engineers to understand corrosion problem and its control, also this knowledge helps in understanding modern bio-sensors, fuel cells improve them.
3. The problem associated with corrosion are well known and the engineers must be aware of these problems and also how to counter them.
4. A board understanding of the more important fuels employed on a large scale is necessary for engineer to understand energy – related problems and solve them.
5. Plastics are materials used very widely an engineering materials. An understanding of properties particularly physical and mechanical properties of polymers / plastics/elastomers helps in selecting suitable materials for different purpose.
6. With the knowledge available now, future engineers should know at least some of the Engineering materials that are becoming available. Hence some of them are introduced here.

COURSE OUTCOMES

1. Student able to understand how to produce soft water & potable water by various methods.
2. Student can learn about nature and working various electrodes and cells.
3. Student can able to understand how to protect metals from the environment
4. Student can understand the importance of fuels and characteristics and HCV & LCV.
5. Student can understand the properties of polymers & their applications in our day today life.
6. Student can understand the building materials, solar materials and nanomaterials and principles of green chemistry.

Syllabus

UNIT I

WATER TECHNOLOGY

Hard Water – Estimation of Hardness By EDTA Method – **Potable Water**- Sterilization and Disinfection – Boiler Feed Water – **Boiler Troubles** – Priming And Foaming , Scale Formation, Boiler Corrosion, Caustic Embrittlement – **Softening of Water** - By Lime Soda, Zeolite Processes – Ion Exchange Process – Desalination Process by - Reverse Osmosis – Electro Dialysis.

UNIT II

ELECTRO CHEMISTRY

Electro Potential –Determination of single electrode potential –Standard electrode potential - Nernst Equation(problems)–Electro Chemical cell (Galvanic Cell) -**Reference Electrodes**-Standard Hydrogen Electrode, Calomel Electrode Determination of pH and conductivity – Applications (Strong Acid Vs Strong Base) - **Batteries** – Primary Cell: Dry Cell – Secondary Cell: Lead Acid Accumulator, Lithium Ion Battery – **Fuel Cells** – Hydrogen – Oxygen Fuel Cell, Methanol – Oxygen Fuel Cell.

UNIT III
CORROSION
Introduction - **Theories of Corrosion**(i) Dry Corrosion (Pilling Bed worth rule) (ii) Wet Corrosion – Galvanic Series – **Types of Corrosion**: Galvanic Corrosion, Differential Aeration Corrosion, Pitting Corrosion, Stress Corrosion – Factors Influencing Corrosion – Nature of The Metal , Nature of The Environment – **Corrosion Control**: Material Selection & Design –Cathodic Protection-Surface Coatings – Methods of Applications on Metals -Hot Dipping , Electroplating, Electroless Plating – Paints – Their Constituents & Their Function.

UNIT-IV
FUELS
Introduction to Fuels – Classification – **Solid Fuels** Merits & Demerits - Calorific Value – HCV and LCV – Bomb Calorimeter - Problems Based on Calorific Values – Analysis of Coal (Proximate and Ultimate Analysis) – Numerical Problems Based on Analysis – **Liquid Fuels** Merits & Demerits – Petroleum – Refining – Cracking(types) –Petrol – Diesel Knocking – Octane Number, Cetane Number - **Gaseous Fuels** Merits & Demerits – Natural Gas – LPG, CNG.

UNIT-V
POLYMERS SCIENCES & TECHNOLOGY
POLYMERS- introduction – Types of Polymers – Mechanism of Polymerization (Addition and Condensation) – Determination of Molecular weight by weight and number average methods - Individual Polymers (Preparation Properties and uses of PS, PVC and Bakelite) – Biodegradable polymers – Ziegler Natta Catalysis.
PLASTICS – Types – Compounding of Plastics – Moulding (Four Types) - Bullet Proof Plastics – Engineering Applications.
RUBBER &ELASTOMERS: Introduction –Preparation – Vulcanization – Compounding of Rubber – Preparation, Properties Uses of Buna-S, Buna-N and Thiokol-Engineering Applications.

UNIT VI
ENGINEERING MATERIALS, GREEN AND NANO CHEMISTRY
Refractories (Types, Properties Applications) – **Cement**-Hardening and Setting-Deteriorations of cement concrete – **Solar Energy Materials –** Introduction - Advantages and Disadvantages – Construction and Working of Photovoltaic cell – Solar Reflectors - **Carbon Nano tubes** - Preparation (Arc discharge, Laser Ablation, Chemical Vapor Deposition (CVD) methods), Properties & Applications – **Green Chemistry** – Principles -Engineering Applications.

Text Books:
1. N. Y. S. Murthy, V. Anuradha, K Ramana Rao" A Text Book of Engineering Chemistry", Matuthi.
2. K.Sesha Maheswaramma and Mridula chugh (2013) A Text Book of Engineering Chemistry, Pearson Publications.

Reference Books:
1. Shashi Chawal "A Text Book of Engineering Chemistry, Dhanpat Rai Publishing company Ltd.
2. S. S. Dara (2013) Text Book of Engineering Chemistry, S. Chand Technical Series.

B. TECH 1st SEMESTER	L	T	P	C
	3	-	-	3
16CS1T01: Fundamentals of Computers and C Programming				

Prerequisites
Basic Mathematical Problems and their Solutions

COURSE OBJECTIVES
1) To enable the student to learn about the major components of a computer system.
2) To introduce the basic structure of the Algorithm and Flowchart.
3) To know the concepts of conditional & loop statements.
4) To implement the different user defined and pre-defined functions.
5) To know the pointers, structures and unions concept used in various areas.
6) To provide practical, hands-on training in C programming.

COURSE OUTCOMES

The student will be proficient in the following:
1) Identification and Usage of each part of a computer system.
2) The Evolution and Purpose of Programming.
3) Mastering in basic programming concepts and logic implementations.
4) Knowledge in file I/O operations (i.e. open, close, read, write, seek)
5) Ability to identify and implement appropriate Solution for a given Problem.
6) Know the terms "Structured Programming", “Algorithm” ,”Flowchart” ,"Data Types", “Control Statements”, “Arrays”, “Functions” , “Pointers”, “Structures”, “Unions”, ” File I/O” and where they are applicable.

Syllabus
UNIT-I
COMPUTER FUNDAMENTALS
Computer System:definition, block diagram,**Hardware:**components, mother board layout,block diagram of mother board,**Software:**definition,types of software, **Algorithm:** definition, properties of algorithm, algorithms on basic problems,**Flowchart:** definition, symbols used in flow charts, flow charts for basic problems,types of computer Languages, bits, bytes,binary system.

UNIT-II
FUNDAMENTALS OF C LANGUAGE
Character Set, Tokens, Identifiers,Constants,Basic Data Types and Sizes,Arithmetic Operators, Relational Operators, Logical Operators, Conditional Operator, Increment and Decrement Operators, Assignment Operators, Bit-wise Operators, Special Operators, Expressions, Operator Precedence and Order of Evaluation, Evaluation of Expressions, Type Conversions: Implicit and Explicit, Structure of C Program.

UNIT-III
CONTROL STRUCTURES
Selection Statements: Simple if, if-else Statement, Nested ifStatement, else-ifLadder, switch Statement.
Iterative Statements: while, do-while and for loops, break and continue statements, goto statement.

ARRAYS
Array definition, declaration, initialization and accessing array elements of 1-D and2-D arrays.
STRINGS
String definition, declaration, initialization and accessing, string handling functions in **string.h**

UNIT-IV
FUNCTIONS
Introduction to Function, Types of Functions, Return Statement,Declaration, Definition and Calling a Function, Parameter Passing Techniques,Storage Classes, Passing 1-D Array to Functions.
Recursion: Types of recursion, rules of recursion, recursive solutions for factorial of a number, Fibonacci Series and GCD of two numbers.
C Preprocessors: File Inclusion and Macro Substitution.

UNIT-V
POINTERS
Pointer Definition, Declaration, Initialization and Accessing a Pointer, void pointer, null pointer, Pointer Arithmetic, Pointer to Pointer, Dynamic Memory Management Functions.

STRUCTURES AND UNIONS
Definition, Declaration and Initialization of Structures, Accessing Structures, Nested structures, Array of Structures, Pointer to structures
Definition, Declaration and Initialization of Unions, difference between structures and unions

UNIT-VI
FILES
Introduction to Files, File I/O functions, File opening modes, sequential and random accessing files, file operations.

Text Books

1. Programming in ANSI C	E. Balagurusamy	TMH

Reference Books

1. Programming with ANSI and Turbo C	Ashok N. Kamthane	Pearson
2. Let us C	YashwantKanetkar	BPB
3. The C Programming Language	Kernighan & Ritchie	PHI
4. Programming in C	PradipDey&ManasGhosh	Oxford

B. TECH 1st SEMESTER	L	T	P	C
	3	-	-	3
16BS1T04: Environmental Science				

COURSE OBJECTIVES

The objectives of the course is to impart

1. Overall understanding of the natural resources.
2. Basic understanding of the ecosystem and its diversity.
3. Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
4. An understanding of the environmental impact of developmental activities.
5. Awareness on the social issues, environmental legislation and global treaties.

COURSE OUTCOMES

After completion of the course student able to understand:

1. The natural resources and their importance for the sustenance of the life and recognize the need to conserve the natural resources.
2. The concepts of the ecosystem and its function in the environment. The need for protecting the producers and consumers in various ecosystems and their role in the food web.
3. The biodiversity of India and the threats to biodiversity, and conservation practices to protect the biodiversity.
4. Various attributes of the pollution and their impacts and measures to reduce or control the pollution along with waste management practices.
5. Social issues both rural and urban environment and the possible means to combat the challenges.
6. The environmental legislations of India and the first global initiatives towards sustainable development.
7. About environmental assessment and the stages involved in EIA and the environmental audit.

Syllabus:

UNIT – I

Multidisciplinary nature of Environmental Science: Definition, Scope and Importance – Sustainability: Stockholm and Rio Summit–Global Environmental Challenges: Global warming and climate change, acid rains, ozone layer depletion.

UNIT - II

Natural Resources: Natural resources and associated problems

Forest resources – Use and over – exploitation, deforestation – Timber extraction – Mining, dams and other effects on forest and tribal people.

Water resources – Use and over utilization of surface and ground water – Floods, drought, conflicts over water, dams – benefits and problems

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources

Food resources: World food problems, changes caused by non-agriculture activities-effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity

Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources.

Land resources: Land as a resource, land degradation, Wasteland reclamation, man induced landslides, soil erosion and desertification.

Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT – III

Ecosystem and its conservation: Concept of an ecosystem. - Structure and function of an ecosystem. - Producers, consumers and decomposers. - Energy flow in the ecosystem - Ecological succession. - Food chains, food webs and ecological pyramids. - Introduction, types, characteristic features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems.

UNIT-IV

Biodiversity and its management: Definition: genetic, species and ecosystem diversity-classification - Value of biodiversity: consumptive use, productive use, social-Biodiversity at national and local levels. India as a mega-diversity nation - Hot-spots of biodiversity - Threats to biodiversity: habitat loss, man-wildlife conflicts. - Endangered and endemic species of India – Conservation of biodiversity: conservation of biodiversity.

UNIT –V

Environmental Pollution: Definition, Cause, effects and control measures of Air pollution, Water pollution, Soil pollution, Noise pollution, Nuclear hazards. Role of an individual in prevention of pollution. - Pollution case studies.

Solid Waste Management: Sources, classification, effects and control measures of urban and industrial solid wastes. Consumerism and waste products.

UNIT - VI

Social Issues: Population growth and explosion, effects. Water conservation, rain water harvesting. Role of information Technology in Environment and human health. Environmental Protection Act - Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act - Wildlife Protection Act -Forest Conservation Act – Motor Vehicle Act - Issues involved in enforcement of environmental legislation.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Field work: visit to an industrial area/ecosystem area (Forest, Grassland, Desert, and Aquatic)

Text Books:

1. Environmental Studies by K. V. S. G. Murali Krishna, VGS Publishers, Vijayawada
2. A text book of Environmental Studies by C. P. Kaushik & Anubha Kaushik, New Age International Publishers.

Reference Books:

1. Text Book of Environmental Studies by Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. A text book of Environmental Studies by Shaashi Chawla, TMH, New Delhi.

B. TECH 1st SEMESTER	L	T	P	C
	-	-	4	2
16BS1L01: English Proficiency Lab				

COURSE DESCRIPTION

Communicating in a language is also a skill. So a student has to look for an opportunity to practice English language in order to acquire proficiency in English. 'Strengthen your Communication Skills: Part - A' is designed to provide opportunities for engineering students to revise and consolidate the basic skills in listening, speaking, reading and writing in addition to giving ample practice in various communicative functions and Life skills.

PREREQUISITES

The student is expected to have basic knowledge in English language and must be able to write in English. He is also expected to possess fundamental knowledge of general English grammar and vocabulary.

COURSE OBJECTIVES

- To improve the language proficiency of technical under graduates in English with emphasis on LSRW Skills.
- To provide learning environment to practice Listening, Speaking, Reading and Writing Skills within and beyond the classroom environment.
- To assist students to carry on the tasks and activities through guided instructions and materials.
- To effectively integrate English language learning with employability skills and training.
- To design the main course material and exercises with authentic materials drawn from everyday use to cater to everyday needs.
- To provide hands-on experience through case-studies, mini-projects, group and individual presentations.

COURSE OUTCOMES

a) Reading Skills.
- Addressing explicit and implicit meaning of a text.
- Understanding the context.
- Learning new words and phrases.
- Using words and phrases in different contexts.

b) Writing Skills:
- Using the basic structure of a sentence.
- Applying relevant writing formats to create paragraphs, essays, letters, E-Mails, reports and presentations.
- Retaining a logical flow while writing.
- Planning and executing an assignment creatively.

c) Interactive skills:
- Analyzing a topic of discussion and relating to it.
- Participating in discussions and influencing them.
- Communicating ideas effectively.
- Presenting ideas coherently within a stipulated time.

d) Life Skills and Core Skills:

- Examining self-attributes and identifying areas that require improvement self diagnosis, self-motivation.
- Adopting to a given situation and developing a functional approach to find solutions-adaptability, problem-solving.
- Understanding the importance of helping others-community service, enthusiasm.

Syllabus

WEEK	TOPIC	
1		Introduction to syllabus
	UNIT- 1 Section-A	Greeting, Introducing and taking leave
2	UNIT- 1 Section-B	Pure Vowels
3	UNIT- II Section-A	Giving Information and Asking for information
4	UNIT- II Section-B	Diphthongs
5	UNIT- III Section-A	Inviting, Accepting and Declining Invitations
6	UNIT- III Section-B	Consonants
7	UNIT- IV Section-A	Commands, Instructions and Requests
8	UNIT- IV Section-B	Accent and Rhythm
9	UNIT- V Section-A	Suggestions and Opinions
10	UNIT- V Section-B	Intonation
10WEEKS		TOTAL

Text Books:

Strengthen Your Communication Skills: Part – A by Maruthi Publications.

Reference Books:

1) INFOTECH English (Maruthi Publications)
2) Personality Development and Soft Skills (Oxford University Press, New Delhi)

B. TECH 1st SEMESTER	L	T	P	C
	-	-	4	2
16BS1L02: Engineering Chemistry Lab				

COURSE OBJECTIVES

1. To Investigate and understand physical behavior in the lab using scientific reasoning and logic and interpret the result of simple experiments and demonstration of chemical principles and also evaluate the impact of chemical discoveries on how we view the world.
2. Effectively communicate experimental results and solutions to application problems through oral and written reports.
3. Understand the basic concepts, definitions, characteristics and phenomena's.
4. Recognize the classical ideas and chemical phenomena and also define and analyze the concepts.

COURSE OUTCOMES

1. An understanding of professional and develop confidence on recent trends
2. Able to gain technical Knowledge of measuring, operating and testing of chemical instruments and equipment's.
3. Acquire ability to apply knowledge of Chemistry.
4. Exposed to the real time working environment.
5. Demonstrate the ability to learn principles, design and conduct experiments
6. Ability to work on laboratory and multidisciplinary tasks

List of Experiments

S. No	TITLE
	Introduction to chemistry lab
1	Estimation of HCl using standard Na_2CO_3
2	Determination of Total hardness of water
3	Estimation of Ferric iron
4	Estimation of $KMnO_4$ using standard $H_2C_2O_4$
5	Estimation of Dissolved Oxygen by Wrinkles Method
6	Determination of pH by pH – Meter and universal indicator Method
7	Conductometric titration of Strong acid Vs Weak base
8	Conductometric titration of strong acid **Vs** Strong base
9	Potentiometric titration of Strong acid Vs Strong base
10	Potentiometric titration of Strong acid Vs Weak base
11	Preparation of Phenol-Formaldehyde Resin
12	Determination of saponification value of oils
13	Determination of Pour and Cloud point of oils

Text Books:

1. Engineering Chemistry Lab Manual Prepared by Chemistry Faculty.

Reference Book:

1. Dr. Jyotsna Cherukuis(2012)Laboratory Manual of Engineering Chemistry-II, VGS Techno Series
2. K. Mukkanti (2009) Practical Engineering Chemistry, B. S. Publication .

B. TECH 1st SEMESTER	L	T	P	C
	-	-	4	2
16CS1L01: C Programming Lab				

COURSE OBJECTIVES

1. The Objective of this course is to introduce the field of programming using C language.
2. To have fundamental knowledge on basics of computers hardware and number systems.
3. To enhance their analyzing and problem solving skills and use the same for writing programs.
4. To learn and acquire art of computer programming.
5. The nature of C language is emphasized with a wide variety of examples.
6. To write efficient, maintainable, and portable code.

COURSE OUTCOMES

After Completion of the course student are

1. Able to identify different components of computer and their usage.
2. Able to write algorithms and flowcharts for basic problems.
3. Able to know concepts in problem solving.
4. Able to write, compile and debug programs in C language.
5. Able to design programs involving decision structures, loops and functions, pointers.
6. Able to understand the basic terminology used in computer programming.
7. Able to use of different data types in program.
8. Able to write diversified solutions using C language.

EXERCISE-I

1) Identify different components of a computer system. Write about them.
2) Prepare block diagram of mother board of a PC and describe each component.
3) Prepare algorithm for sequence and selection control structures.
4) Prepare algorithm for iterative control structure
5) Draw flowcharts for control structures (sequence, selection & iterative).

EXERCISE-II

1) Demonstrate the structure of C program
2) Write a C program to find the size of basic data types in C language.
3) Write a C program to find the biggest of three numbers using ternary operator.
4) Write a C program to convert decimal number to binary number using bitwise operators.

EXERCISE-III

1) Write a C program to find the biggest of three numbers using nested if-else statement.
2) Write a C Program to find the roots of a quadratic equation.
3) Write a C program to perform arithmetic operations using switch statement.
4) Write a C program to calculate the electricity bill using else-if ladder statement.
5) Write a C program to find the sum of elements of an integer array.

EXERCISE-IV

1) Write a C program to find the smallest and largest elements of an integer array.
2) Write a C program to perform matrix addition by checking compatibility.
3) Write a C program to perform matrix multiplication by checking compatibility.
4) Write a C program to generate the prime numbers up to n.

EXERCISE-IV

1) Write a C program to find given number is Armstrong number or not
2) Write a C program to find the length of the string without using string functions.
3) Write a C program to check the given string is palindrome or not without using string functions.
4) Write a C program to perform string operations using string handling functions.

EXERCISE-VI

1) Write a C program to find the square of a number using function and macro.
2) Write a C program to demonstrate the use of static storage class.
3) Write a C program to pass array to function and count the sum of elements in the array.

EXERCISE-VII

1) Write C functions to generate Fibonacci series with and without using recursion.
2) Write C functions to factorial with and without using recursion.
3) Write C functions to GCD of two numbers with and without using recursion.

EXERCISE-VIII

1) Write a C program to find address of a variable and a pointer variable.
2) Write a C functions to swap two numbers using call by value and call by reference
3) Write a C program to print employee details using structures and array of structures.

EXERCISE-IX

1) Write a C program to read and write individual characters to a file.
2) Write a C program to copy contents of one file to another.
3) Write a C program to reverse the contents in a file.
4) Write a C program to merge two files into third file.

B. TECH 2nd SEMESTER	L	T	P	C
	3	-	-	3
16BS2T01: Proficiency Course in English -II				

COURSE OBJECTIVES

1. To improve the language proficiency of technical under graduates in English with emphasis on LSRW Skills.
2. To provide learning environment to practice Listening, Speaking, Reading and Writing Skills within and beyond the classroom environment.
3. To assist students to carry on the tasks and activities through guided instructions and materials.
4. To effectively integrate English language learning with employability skills and training.
5. To design the main course material and exercises with authentic materials drawn from everyday use to cater to everyday needs.
6. To provide hands-on experience through case –studies, mini –projects, group and individual presentations.

CORUSE OUTCOMES

a) Reading Skills.
- Addressing explicit and implicit meaning of a text.
- Understanding the context.
- Learning new words and phrases.
- Using words and phrases in different contexts.

b) Writing Skills:
- Using the basic structure of a sentence.
- Applying relevant writing formats to create paragraphs, essays, letters, e-mails, reports and presentations.
- Retaining a logical flow while writing.
- Planning and executing an assignment creatively.

c) Interactive skills:
- Analyzing a topic of discussion and relating to it.
- Participating in discussions and influencing them.
- Communicating ideas effectively.
- Presenting ideas coherently within a stipulated time.

d) Grammar in context
- Enable the skills of grammar using in a situation
- Identifying the needs of apt grammar in life related situation
- Promoting discourse with grammar effectively

Syllabus:

S No	Content	Hours
UNIT –I	Inspiring speech One word substitutes Subject- verb agreement Describing objects	8
UNIT -II	Dial 000 Commonly confused words Voice Paragraph writing	8
UNIT-III	My Struggle for Education Collocations Reported speech Letter writing	8
UNIT-IV	A Snake in the grass GRE words Conditional clauses Note making and note taking	8
UNIT-V	Lithuania Idioms Degrees of comparison Resume	8
UNIT-VI	Virtue Phrasal verbs Simple compound and complex sentences Report writing	8
	Total	48

Text Book: Proficiency Course in English -II by Maruti Publications.

B. TECH 2nd SEMESTER	L	T	P	C
	3	-	-	3
16MA2T01: Linear Algebra and Vector Calculus				

PREREQUISITES

The two year intermediate course of Mathematics.

COURSE OBJECTIVES

1. To train the students for finding Rank –Echelon form, Normal form, and solution of liner systems – Direct Methods- Gauss Elimination, Gauss Jordon.
2. To train the student effectively how to find Eigen values, Eigen vectors and their properties.
3. To make the student to know the Cayley Hamilton Theorem-Applications: Finding Inverse and powers of a matrix by using Cayley-Hamilton theorem.
4. To evaluate many improper integrals easily by using Beta and Gamma functions.

COURSE OUTCOMES

The students are able to

1. apply the knowledge of matrices for solving linear system of equations
2. find the powers of the matrices by using Cayley Hamilton theorem.
3. apply the knowledge of evaluate improper integrals by using Beta and Gamma functions.
4. apply the knowledge of Vector Differentiation and Vector Integration in finding work done by a force.

Syllabus:

UNIT I:

Linear systems of equations

Rank-Echelon form, Normal form – Solution of Linear Systems – Direct Methods- Gauss Elimination, Jacobi and Gauss Seidel Method.

UNIT II:

Eigen values - Eigen vectors

Eigen values - Eigen vectors - Properties (without proof)-Cayley-Hamilton Theorem (without proof) Applications: Finding Inverse and powers of a matrix by using Cayley-Hamilton theorem.

UNIT III:

Special functions

Beta and Gamma functions - Properties - Relation between Beta and Gamma functions Application: Evaluation of improper integrals.

UNIT IV:

Multiple integrals

Multiple integrals - Double and triple integrals - Change of variables - Change of order of Integration. Application: Applications of Integration to Lengths, Volumes and Surface areas of solids of revolution in Cartesian Coordinates.

UNIT V:

Vector Differentiation

Gradient- Divergence- Curl - Laplacian and second order operators -Vector identities.

UNIT VI:

Vector Integration

Line integral - work done - Potential function - area - surface and volume integrals.

Vector integral theorems: Greens, Stokes and Gauss Divergence Theorems (without proof) and related problems.

Application: Work done by a force

Text Books:

1. **B.S. GREWAL,** Higher Engineering Mathematics, 42nd Edition, Khanna Publishers
2. **B.V. RAMANA,** Higher Engineering Mathematics, Tata McGraw Hill

Reference books:

1. ERWIN KREYSZIG, Advanced engineering Mathematics, 9th Edition, Wiley-India

B. TECH 2nd SEMESTER	L	T	P	C
	3	-	-	3
16EE2T01: Electrical Networks				

COURSE OBJECTIVES

The student able to understand

1. The concepts of passive elements, types of sources and various network reduction techniques.
2. The applications of network topology to electrical circuits.
3. The applications of network theorems for analysis of electrical networks.
4. The behavior of RLC networks for sinusoidal excitations and performance of R-L, R-C and R-L-C circuits with variation of one of the parameters.
5. The concept of resonance and magnetic coupled circuit.

COURSE OUTCOMES

At the end of course the students are able to solve

1. Various electrical networks in presence of active and passive elements.
2. Electrical networks with network topology concepts.
3. Electrical networks by using principles of network theorems with DC and AC excitation
4. Any R, L, C network with sinusoidal excitation and any R, L, C network with variation of any one of the parameters i.e R, L, C. and f.
5. Any magnetic circuit with various dot conventions.

UNIT-I

Fundamental of Electrical Circuits: Active and passive components and their V-I relations. Sources (dependent and independent) - source transformation technique –Ohm's and Kirchhoff's laws- Network reduction techniques (series, parallel and series – parallel combination of R, Land C separately) - Star-to-delta and delta-to-star transformation, nodal analysis and mesh analysis.

UNIT-II

Network Topology: Definitions of Graph and Tree. Basic cutset and tieset matrices for planar networks. Loop and nodal methods of analysis of networks with dependent and independent voltage and current sources. Duality and Dual networks.

UNIT-III

Theorems with DC Excitation: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem.

UNIT-IV

Single Phase A.C Systems: Periodic waveforms (determination of AC fundamentals). Concept of phase angle and phase difference, addition and subtraction of phasors. Complex and polar forms of representations, steady state analysis of R, L and C circuits, series and parallel circuits. Power Factor and its significance – Real, Reactive power and apparent Power.

UNIT-V

Theorems with AC Excitation: Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem, Reciprocity theorem, Millman's theorem and compensation theorem.

UNIT-VI

Resonance: Locus diagrams for various combination of R, L and C. Resonance, concept of band width and Quality factor.

Magnetic Circuit: Basic definition of MMF, flux and reluctance. Analogy between electrical and magnetic circuits. Faraday's laws of electromagnetic induction Concept of self and mutual inductance. Dot convention-coefficient of coupling and composite magnetic circuit. Analysis of series and parallel magnetic circuits.

Text Books:

1. Engineering circuit analysis by William Hayt and Jack E.Kemmerley, Mc Graw Hill Company, 6th edition.
2. Network synthesis: Van Valkenburg; Prentice-Hall of India Private Ltd.

Reference Books:

1. Networks Analysis by A. Sudhakar, Shyammohan S.Pillai, The McGraw-Hill Companies
2. Introduction to circuit analysis and design by Tildon Glisson, Jr, Springer Publications
3. Circuits by A.Bruce Carlson , Cengage Learning Publications
4. Network Theory Analysis and Synthesis by Smarajit Ghosh, PHI publications

B. TECH 2nd SEMESTER	L	T	L	C
	3	-	-	3
16BS2T03: Engineering Physics				

COURSE OBJECTIVES

1) **Understand** the basic concepts, definitions, characteristics and phenomena.
2) **Recognize** the classical ideas and physical phenomena and also define and analyze the concepts.
3) **Assess the role of Science** and in particular, physics, in helping us better understanding the complex, technological society of which we are apart.
4) **Investigate** and understand physical behavior in the lab using scientific reasoning and logic and interpret the result of simple experiments and demonstration of physical principles and also evaluate the impact of physical discoveries on how we view the world.
5) **Solve** a variety of basic problems and given word problems, student will identify the physical principle required to solve the problem, *formulate the equation* necessary to solve the problem.
6) **Effectively communicate** experimental results and solutions to application problems through oral and written reports.
   Explain physical phenomena using realistic mathematical modeling at the level of general physics

COURSE OUTCOMES

Student able to understand:

1. Basic crystal systems and determination of crystal structures.
2. Proper choice of Magnetic/Dielectric Materials as per the functionality of appliance could be realized.
3. Concept of Magnetic Induction and Maxwell's equations.
4. Application of Schrodinger equation and Concept of band theory of solids.
5. Pure & doped Semiconductor devices for better utility.
6. Optical properties of solids and super conducting properties of solids and their applications.

Syllabus

UNIT-I
CRYSTALLOGRAPHY AND X-RAY DIFFRACTION

Introduction – Space lattice – Basis – Unit Cell – Lattice parameters – Bravais lattices – Crystal systems – Structures and packing fractions of SC,BCC and FCC-Directions and planes in crystals – Miller indices – Separation between successive (h k l) planes – Bragg's law- Bragg's Spectrometer.

UNIT-II

MAGNETIC AND DIELECTRIC PROPERTIES

MAGNETIC PROPERTIES: Origin of magnetic moment-Magnetic Materials: Classification of Magnetic Materials and properties - Hysteresis Loop of ferromagnetic material.

DIELECTRIC PROPERTIES: Introduction - Electronic, ionic and orientational (Qualitative) polarizations - Internal fields in solids – Clausius - Mossotti equation.

UNIT-III

ELECTROMAGNETISM

Introduction-Concept of Electric Flux - Gauss's Law – Integral and Differential forms - Magnetic Field –The Biot-Savart's Law - Ampere's Law - B for a Solenoid - Faraday's Law of induction - Lenz's law - Displacement Current - Maxwell's Equations.

UNIT –IV

QUANTUM MECHANICS AND BAND THEORY OF SOLIDS:

De Broglie concept of matter waves, Schrodinger Time Independent wave equation – Application to a Particle in a box- Defects of Classical free electron theory of metals – Quantum free electron theory – concept of Fermi energy - Bloch theorem (qualitative) – Kronig – Penney model – Origin of energy band formation in solids – Classification of materials into conductors, semiconductors & insulators.

UNIT – V
SEMICONDUCTOR PHYSICS
Introduction – Intrinsic semiconductor and carrier concentration – Equation for conductivity – Extrinsic semiconductor and carrier concentration – Drift and diffusion currents – Einstein's equations - Hall Effect and its applications.

UNIT-VI

LASERS AND SUPER CONDUCTIVITY

LASERS: Introduction– Characteristics of lasers – Spontaneous and Stimulated emission of radiation – Einstein's coefficients – Population inversion - Three level and four level laser pumping schemes - Ruby laser – Helium-Neon laser- Applications of Laser.

SUPERCONDUCTIVITY: General properties – BCS Theory of Superconductivity - Meissner effect – Type-I and Type-II superconductors – Flux quantization –Josephson effects – Applications of Superconductors.

Text Books

2 A text book of Engineering Physics by M-N- Avadhanulu & P.G. Kshirasagar (S-Chand publications)
3 Engineering Physics by R.K. Gaur and S.L. Gupta.

Reference Books

1 Engineering Physics‟ by Palanisamy (Scitech Publishers)
2 Engineering Physics by Mani Naidu S (Pearson Publications)
3 Introduction to solid state physics‟ by Charles Kittle (Willey India Pvt-Ltd)
4 Applied Physics‟ by T. Bhimasenkaram (BSP BH Publications)
5 Applied Physics‟ by M. Arumugam (Anuradha Agencies)
6 Physics by David Halliday and Robert Resnick – Part I and Part II

B. TECH 2nd SEMESTER	L	T	P	C
	3	-	-	3
16CS2T01: Object Oriented Programming Through C++				

COURSE DESCRIPTION

This course is a comprehensive hands-on introduction to object oriented programming in C++ for students. Emphasis is placed on the features of C++ that support effective modeling of the problem domain and reuse of code and provides in-depth coverage of object-oriented programming principles and techniques using C++. Topics include classes, overloading, data abstraction, information hiding, encapsulation, inheritance, polymorphism, file processing, and exceptions.

PREREQUISITES

Knowledge of C programming.

COURSE OBJECTIVES

1. To enable the student to learn Object oriented technology.
2. To enable the student to understand concepts of objects and their importance in real world.
3. To Design classes and inheritances
4. To know how to handle Data through files
5. To know how to handle exceptions.
6. To provide practical, hands-on training in C++ programming.

COURSE OUTCOMES

The student will be proficient in the following:

1. Principles of object oriented technology.
2. The Evolution and Purpose of Object Oriented Programming.
3. Mastering in basic Object Oriented programming concepts and logic implementations.
4. Knowledge in file I/O operations and exceptions
5. Ability to identify and implement appropriate Solution for a given Problem.\
6. Know the terms "Object oriented Programming", “Class” ,”Object” ,"Constructor", “Destructor”, “friend”, “static” , “Data Abstraction”, “Encapsulation”, ” Inheritance”,” Polymorphism”,” File I/O”,” Exceptions” and where they are applicable.

Syllabus

UNIT I

INTRODUCTION

The Object Oriented Technology, Disadvantages of Conventional Programming, Advantages of OOP. Structure of a C++ Program, Differences between C and C++, Header Files and Libraries.

INPUT AND OUTPUT IN C++

Streams, Stream Classes Hierarchy, Bit Fields, Manipulators.

UNIT II

Tokens in C++, Variable Declaration and Initialization, Data Types, Constants, L Value and R Values, Operators in C and C++, Scope Access Operator, Comma Operator, This Operator, Reference Variable, Decision and Loop Statements.

FUNCTIONS IN C++

Structure of a Function, Passing Arguments, Return by Reference, Default Arguments, Const Arguments, Inputting Default Arguments, Inline Functions, Function Overloading, Recursion.

UNIT III

CLASSES AND OBJECTS

Class Definition, Declaring Objects, Access Specifiers and their scope, Member functions, Outside member functions as inline, Data Hiding or Encapsulation, Memory for Class and Objects, Static Member variables, Static Member Functions, Static Object, Array of Objects, Objects as Function Arguments, Friend Functions, Friend class, Local class, Empty Class, Qualifiers and Nested Classes, Member Function and Non-Member Function.

UNIT IV

CONSTRUCTORS AND DESTRUCTORS

Introduction of Constructor, Characteristics, Applications, Parameterized Constructors, Overloading Constructors, Constructor with Default Arguments, Copy Constructor and Destructors.

OPERATOR OVERLOADING

Introduction of Overloading, Overloading Unary Operators, Constraint on Increment and Decrement Operators, Overloading Binary Operators, Overloading with Friend Functions, Overloading Assignment Operator, Rules for Overloading Operators.

UNIT V

INHERITANCE

Introduction of Inheritance, Access Specifiers, Protected Data with Private Inheritance, Types of Inheritances, Virtual Base Class, Constructors and Destructors in Inheritance, Constructor and Destructor in Derived Class, Advantages and Disadvantages of Inheritance.

POLYMORPHISM

Polymorphism, Types, Pointer and Inheritance, Virtual and Pure Virtual Functions, Abstract Classes.

UNIT VI

APPLICATIONS WITH FILES

File Stream Classes, File Opening Modes, File Pointers and Manipulators, Sequential Access Files, Binary and ASCII Files, Random Access Files.

EXCEPTION HANDLING

Principles of Exception Handling, Keywords, Exception Handling Mechanism, Multiple Catch Statements, Catching Multiple Exceptions.

Text Books

1. Programming in C++, Ashok N Kamthane, Pearson 2nd Edition

References Books

1. Object Oriented Programming C++, Joyce Farrell, Cengage.
2. Mastering C++, Venugopal, Raj Kumar, Ravi Kumar TMH.
3. Object Oriented Programming with C++, 2nd Ed, SouravSahay, and OXFORD.

B. TECH 2nd SEMESTER	L	T	P	C
	1	-	4	3
16ME2T01: Engineering Drawing				

COURSE OBJECTIVE

Engineering drawing is the principle method of communication for engineers. The objective to introduce the students, the techniques of constructing the various types of polygons and curves. The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

COURSE OUTCOMES

1. Usage of drawing instruments and construct polygons.
2. Understand the orthographic projections of points, lines and planes in different positions.
3. Understand the orthographic projections of Solids.
4. Convert the Orthographic projections into Isometric and vice versa.

UNIT - I

INTRODUCTION: Engineering Drawing and Plane Curves, Use of Drawing Instruments and Conventions.

GEOMETRICAL CONSTRUCTIONS: Constructions of Polygons using General Method.

CONICS: Construction of Ellipse, Parabola and Hyperbola by Eccentricity Method.

CYCLOIDAL CURVES: Construction of Cycloid, Epi-Cycloid and Hypo-Cycloid.

UNIT - II

PROJECTIONS OF POINTS AND LINES: Introduction to Orthographic Projections - Projection of Points.

PROJECTION OF STRAIGHT LINES: Parallel to both the Planes, Parallel to One Plane and Inclined to Other Plane, Inclined to Both the Planes.

UNIT – III

PROJECTIONS OF PLANES: Introduction to Perpendicular Planes, Perpendicular to both the Reference Planes, Perpendicular to One Plane and Parallel to Other Plane, Perpendicular to One Plane and Inclined to Other Plane, Inclined to Both the Reference Planes.

UNIT – IV

PROJECTIONS OF SOLIDS: Projections of Simple Solids like Prism, Cylinder, Pyramids and Cones. Projections of Solids with Axis Perpendicular to one Plane, Projections of Solids with Axis Parallel to Both the Planes.

UNIT – V

PROJECTIONS OF SOLIDS – AXIS INCLINED TO ONE PLANE: Projections of Solids with Axis inclined to one plane and parallel to other Plane (Axis inclined to the VP and Parallel to the HP, Axis Inclined to the HP and Parallel to the VP).

UNIT – VI

ISOMETRIC PROJECTIONS: Principles of Isometric Projections - Isometric Scale, Isometric Projections of Planes, Simple Solids, Conversion of Isometric to Orthographic Views and Vice Versa.

Text Books:

1. Engineering Drawing by N.D. Bhatt, Charotar Publishers.
2. Engineering Drawing by K.L. Narayana & P. Khannaiah., SCIETECH Publishers.

Reference Books:

1. Engineering Drawing by M.B. Shah & B.C. Rana., Pearson's Publishers.
2. Engineering Drawing by K. Venugopal., NEW AGE Publications.

B. TECH 2nd SEMESTER	L	T	P	C
	-	-	4	2
16BS2L01: English Communication Skills Lab				

COURSE DESCRIPTION

Communicating in a language is also a skill. So a student has to look for an opportunity to practice the language he is learning in order to acquire communication skills. 'Strengthen your Steps' is designed to provide opportunities for engineering students to revise and consolidate communication skills in different contexts formal and informal. It prepares the student for facing Interviews, participating in group discussions and making presentations.

PREREQUISITES

The student is expected to have basic knowledge in English language and must be able to write in English. He is also expected to possess fundamental knowledge of general English grammar and vocabulary.

Syllabus and Lesson Plan

No. of Sessions	Name of the Topic	
2	Unit - 6	Body Language
2	Unit - 7	Dialogues
2	Unit - 8	Presentation Skills
2	Unit - 9	Group Discussion
2	Unit - 10	Interviews and Telephonic interviews.
2	Unit - 11	Debates
12	**Total**	

Text Book:

1. Strengthen Your Communication Skills – Maruthi Publications.

Reference Books:

1. Effective technical communication – Ashraf Rizvi.
2. A course in English communication – Madhavi Apte.

B. TECH 2nd SEMESTER	L	T	P	C
	-	-	4	2
16BS2L03: Engineering Physics Lab				

COURSE OBJECTIVES

1. To Investigate and understand physical behavior in the lab using scientific reasoning and logic and interpret the result of simple experiments and demonstration of physical principles and also evaluate the impact of physical discoveries on how we view the world.
2. Effectively communicate experimental results and solutions to application problems through oral and written reports.
3. Understand the basic concepts, definitions, characteristics and phenomena's.
4. Recognize the classical ideas and physical phenomena and also define and analyze the concepts.

COURSE OUTCOMES

1. An understanding of professional and develop confidence on recent trends
2. Able to gain technical Knowledge of measuring, operating and testing of physics instruments and equipments.
3. Acquire ability to apply knowledge of Physics.
4. Exposed to the real time working environment.
5. Demonstrate the ability to design and analyze Laws and Principles and conduct experiments
6. Ability to work on laboratory and multidisciplinary tasks

List of Experiments

Any Ten Experiments of the Following

A. Mechanics:

1. Determination of the Rigidity Modulus of given material wire using Torsional Pendulum.
2. Determination of the Acceleration due to Gravity and Radius of Gyration using Compound Pendulum.
3. Determination the Frequency of vibration in Transverse and Longitudinal Modes using Melde's Apparatus.
4. Determination Frequency of A.C supply by using Sonometer

B. Optics:

5. Determination of wavelength of Laser using diffraction grating.
6. Determination of Numerical Aperture of an Optical Fiber.
7. Determination of the Planck's constant using Photo-Cell.

C. Electro-Magnetism and Electronics:

8. Study the variation of Magnetic Field along the axis of a solenoid coil using Stewart-Gee's Apparatus.
9. Determination of the Time Constant for a C-R Circuit.
10. Determination of the Band Gap of a Semiconductor using a p-n junction diode.
11. Study of Characteristic curves (I/V) of a Zener diode to determine its Breakdown voltage.
12. Determination of Thermoelectric coefficient of a Thermistor by using its Characteristic curve.

Reference Book:

1. Engineering Physics Lab Manual Prepared by Physics Faculty.

B. TECH 2nd SEMESTER	L	T	P	C
	-	-	4	2
16CS2L01: Object Oriented Programming Through C++ Lab				

COURSE OBJECTIVES

1. The Objective of this course is to introduce the Object oriented programming techniques.
2. To write efficient, maintainable, and portable code.
3. To strengthen the ability to identify and apply the suitable object oriented concept for the given real world problem
4. To gain knowledge in practical applications of object oriented concept.

COURSE OUTCOMES

After Completion of the course student are:

1. Able to differentiate structure oriented programming and object oriented programming.
2. Able to understand and apply various object oriented features.
3. Able to know concepts in operator overloading, function overloading & polymorphism.
4. Able to write, compile and debug programs in C++ language.
5. Able to design programs involving constructors, destructors.
6. Able to reuse of code using inheritance.
7. Able to write diversified solutions using C++ language.

EXERCISE-1

1) Write a CPP Program to demonstrate the structure of a C++ program.
2) Write a CPP Program to display the names of header files, definitions and list of functions supported.
3) Write a program to show the base of a numeric value of a variable using **Hex, Oct** and **Dec** manipulator functions.
4) Write a CPP Program to use of the standard manipulators normally used in the stream classes.
5) Write a CPP Program to demonstrate the usage of bit fields.

EXERCISE-2

1) Write a CPP Program to define constant pointer and pointer to constant and perform possible operations.
2) Write a CPP Program access a variable in different scopes by using scope resolution operator and the use of comma operator.
3) Write a CPP Program to swap two numbers using call by value, call by address, call by reference and return by reference.
4) Write a CPP Program to calculate square and cube of a number using inline functions and macros. (Demonstrate the use of inline functions compared to macros).
5) Write a CPP Program to find the area of a rectangle, a triangle and surface area of a sphere using function overloading.

EXERCISE-3

1) Write a CPP Program to declare all members of a class as public, Access the members using objects. (Use public, protected, private).
2) Write a CPP Program to access the member functions inside and outside a class.
3) Write a CPP Program to access private data using non-member functions. (Use friend function).
4) Write a CPP Program to pass objects to functions by pass by value method.
5) Write a CPP Program to declare main () function as member function and overload it.

EXERCISE-4

1) Write a CPP Program to show that "for each object constructors is called separately" and read the values through keyboard (Use Constructor).
2) Write a CPP Program to create constructor with arguments and pass the arguments to constructor.
3) Write a CPP Program to create object and release them using destructor.
4) Write a CPP Program to perform addition, subtraction, multiplication of two objects using operator keyword.
5) Write a CPP Program to overload unary and binary operator overloading with friend function.

EXERCISE-5

1) Write a CPP Program to derive a class publicly from base class. Declare base class members under public, private and protected.
2) Write a CPP Program to derive single and multiple inheritances.
3) Write a CPP Program to declare virtual base class. Derive a class using two virtual classes.
4) Write a CPP Program to implementation of Virtual Function.
5) Write a CPP Program to Implementation of Pure Virtual Function.

EXERCISE-6

1) Write a CPP Program to write and read text in a file. Use ofstream and ifstream classes.
2) Write a CPP Program to open a file for writing and reading purpose. Use open () function.
3) Write a CPP Program write text in a file. Read the text from the file from EOF. Display the contents in reverse order.
4) Write a CPP Program to demonstrate that the data is read from file using ASCII format.
5) Write a CPP Program to find the factorial of a number. Throw multiple exceptions and define multiple catch statements to handle exceptions.

B. TECH 3rd SEMESTER	L	T	P	C
	3	1	-	4
16EE3T01: Electrical Circuit Analysis				

COURSE OBJECTIVES

The student able to Understand:

1. The concept of balanced and unbalanced three phase circuits & its phase sequence
2. The Measurement of active and reactive power in three phase systems
3. The transient analysis of circuits for AC and DC excitations& study the performance of a network based on input and output excitation
4. The realization of electrical network function into electrical equivalent passive elements.
5. The application of Fourier analysis and Transforms for analysis of electrical circuits

COURSE OUTCOMES

Students are able to

1. Solve three phase circuits under balanced & unbalanced condition
2. Find out transient response of electrical circuits for AC and DC excitations
3. Estimate the different types of two port network parameters
4. Derive electrical equivalent network for a given network transfer function.
5. Extract the different harmonics components from the response of electrical network

UNIT – I

Balanced Three Phase Circuits: Phase sequence –star and delta connection-relation between line and phase voltages and currents in balanced systems-analysis of balanced three phase circuits-measurement of active and reactive power in balanced three phase systems-problem solving

Unbalanced Three Phase Circuits: Analysis of three phase unbalanced circuits: Loop method – Star –Delta transformation technique-Two wattmeter methods for measurement of three phase power-Problem solving

UNIT – II

Transient Analysis in DC Circuits: Transient response of R-L, R-C, R-L-C circuits for DC excitations, solution using differential equations and Laplace transforms-problem solving

UNIT – III

Transient Analysis in AC Circuits: Transient response of R-L, R-C, R-L-C circuits for AC excitations, solution using differential equations and Laplace transforms-problem solving

UNIT – IV

Two Port Networks: Two port network parameters –Z, Y, ABCD and hybrid parameters and their relations, cascaded networks-pole and zeros of network functions-problem solving

UNIT-V

Network Synthesis Positive real function - basic synthesis procedure - LC immittance functions - RC impedance functions and RL admittance function - RL impedance function and RC admittance function - Foster and Cauer methods.

UNIT – VI

Fourier Analysis and Transforms: Fourier theorem- Trigonometric form and exponential form of Fourier series, Conditions of symmetry- line spectra and phase angle spectra, Analysis of electrical circuits to non sinusoidal periodic waveforms-problem solving

Fourier integrals and Fourier transforms – properties of Fourier transforms and application to electrical circuits

Text Books:

1. Engineering circuit analysis by William Hayt and Jack E.Kemmerley, Mc Graw Hill Company, 6th edition.
2. Network synthesis: Van Valkenburg; Prentice-Hall of India Private Ltd.

Reference Books:

1. Networks Analysis by A. Sudhakar, Shyammohan S.Pillai, The McGraw-Hill Companies
2. Introduction to circuit analysis and design by Tildon Glisson, Jr, Springer Publications
3. Circuits by A.Bruce Carlson , Cengage Learning Publications
4. Network Theory Analysis and Synthesis by Smarajit Ghosh, PHI publications
5. Networks and Systems by D. Roy Choudhury, New Age International publishers
6. Electric Circuits by David A. Bell, Oxford publications
7. Circuit Theory (Analysis and Synthesis) by A.chakrabarthi, Dhanpat Rai&co

B. TECH 3rd SEMESTER	L	T	P	C
	3	1	-	4
16EE3T02: Electro Magnetic Fields				

COURSE OBJECTIVES

The student able to Understand:

1. To study the production of electric field and potentials due to different configurations of static charges.
2. To study the properties of conductors and dielectrics, calculate the capacitance of different configurations-various and understand the concept of conduction and convection current densities.
3. To study the magnetic fields produced by currents in different configurations, application of ampere's law and the Maxwell's second and third equations
4. To study the magnetic force and torque through Lorentz force equation in magnetic field environment like conductors and other current loops
5. To develop the concept of self and mutual inductances and the energy stored
6. To study time varying and Maxwell's equations in different forms and Maxwell's fourth equation for the induced Emf.

COURSE OUTCOMES

Students are able to

1. Ability to calculate electric field and potentials using Guass's law or solving Laplace's or Poisson's equations
2. Learn how to calculate capacitance, energy stored in dielectrics and get's the concept of conduction and convection currents
3. Ability to find magnetic field intensity due to current, the application of ampere's law and the Maxwell's second and third equations
4. Students can calculate the magnetic forces and torque produced by currents in magnetic field
5. Student will be able to calculate self and mutual inductances and the energy stored in the magnetic field.
6. Students will gain knowledge on time varying fields and get ability to calculate induced Emf Concepts of displacement current and Poynting vector and associated problems are solved.

GENERAL: Rectangular, Cylindrical and Spherical Coordinate Systems.

UNIT – I

Electrostatics: Electrostatic Fields – Coulomb's Law – Electric Field Intensity (EFI) – EFI due to a line and a surface charge – Work done in moving a point charge in an electrostatic field – Electric Potential – Properties of potential function – Potential gradient – Guass's law – Application of Guass's Law – Maxwell's first law, div(D)=ρ_v Laplace's and Poison's equations – Solution of Laplace's equation in one variable. Electric dipole – Dipole moment – potential and EFI due to an electric dipole – Torque on an Electric dipole in an electric field – Behavior of conductors in an electric field – Conductors and Insulators.

UNIT – II

Dielectric & Capacitance: Electric field inside a dielectric material – polarization – Dielectric – Conductor and Dielectric – Dielectric boundary conditions, Capacitance – Capacitance of parallel

plate and spherical and co-axial capacitors with composite dielectrics – Energy stored and energy density in a static electric field – Current density – conduction and Convection current densities – Ohm's law in point form – Equation of continuity

UNIT – III

Magneto Statics: Static magnetic fields – Biot-Savart's law – Oesterd's experiment - Magnetic field intensity (MFI) – MFI due to a straight current carrying filament – MFI due to circular, square and solenoid current – Carrying wire – Relation between magnetic flux, magnetic flux density and MFI – Maxwell's second Equation, div(B)=0.

UNIT – IV

Ampere's circuital law and its applications: Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long current carrying filament – Point form of Ampere's circuital law – Maxwell's third equation, Curl (H)=Jc, Field due to a circular loop, rectangular loops.

UNIT – V

Force in Magnetic fields, self and mutual inductance: Magnetic force - Moving charges in a Magnetic field – Lorentz force equation – force on a current element in a magnetic field – Force on a straight and a long current carrying conductor in a magnetic field – Force between two straight long and parallel current carrying conductors – Magnetic dipole and dipole moment – a differential current loop as a magnetic dipole – Torque on a current loop placed in a magnetic field .Self and Mutual inductance – determination of self-inductance of a solenoid and toroid and mutual inductance between a straight long wire and a square loop wire in the same plane – energy stored and density in a magnetic field.

UNIT – VI

Time Varying Fields: Time varying fields – Faraday's laws of electromagnetic induction – Its integral and point forms – Maxwell's fourth equation, Curl (E)=-∂B/∂t – Statically and Dynamically induced EMFs – Simple problems -Modification of Maxwell's equations for time varying fields – Displacement current – Poynting Theorem and Poynting vector.

Text Books

1. EngineeringElectromagneticsby William H. Hayt& John. A. Buck Mc. Graw-Hill Companies,7th Editon.2006.
2. Introduction to Electro Dynamicsby D J Griffiths, Prentice-Hall of India Pvt.Ltd, 2nd edition

Reference Books

1. Principles of Electro Magnetics" by Sadiku, Oxford Publications, 4th edition.
2. Introduction to Electro Dynamics by D J Griffiths, Prentice-Hall of India Pvt. Ltd., 2nd edition.
3. Electromagnetic Field Theory" by Yaduvir Singh, Pearson.
4. Fundamentals of Engineering Electromagnetics by Sunil Bhooshan, Oxford higher education.
5. Electro magnetism: Problems with solutions by AshutoshPramanik, PHI Publications.

B. TECH 3rd SEMESTER	L	T	P	C
	3	-	-	3
16EE3T03: Electrical Machines-I				

COURSE OBJECTIVES

1. Knowing about the principles of electromagnetic energy conversion and understand the construction of dc machine
2. Understand the principle of operation and performance of dc generators
3. Knowing the characteristics of dc generators& dc motors
4. Understand the speed control and testing methods of dc motors
5. Knowing the basic ideas of design of dc machine

COURSE OUTCOMES

At the end of course the students will be

1. Able to explain the concepts of electromagnetic energy conversion
2. Demonstrate the operation and construction of DC machines
3. Compare the characteristics and performance of DC machine
4. Design aspects of a DC machine and Transformers

UNIT I

Dc Machines: Constructional features of DC machine–Principle of operation of DC generator–EMF equation–Types ofexcitation–Principle of operation of DC motors-Back EMF–Torque equation–Types of DCmotors –commutation–armature reaction–Applications of DC motor-problem solving

UNIT II

Characteristics Of Dc Machines: No load and load characteristics of DC Generators -Speed–Torque characteristics of DC motors,paralleloperation of DCgenerators, Losses & Efficiency-problem solving

UNIT III

Speed Control Of D.C Motors: Speed control of Dc Motors: Armature voltage and field flux control methods-Ward Leonard system-Principle of 3 point and 4 point starters-protective devices-Application of DC motors.

UNIT IV

Testing Of Dc Machines: Losses and efficiency-condition for maximum efficiency- Testing of DC machines: Brake test, Swinburne's Test, Retardation test, Hopkinson's Test-problem solving

UNIT-V

Transformers: Principle of operation–Constructional features of single phase and three phasetransformers–EMF equation–Transformer on No load and Load–Phasordiagram -Equivalent circuit–Regulation-paralleloperation of single phase -Auto transformers-Testing of transformer: Polarity test, load test, open and short circuit test, Sumpner's test- All day efficiency-Introduction to three phase transformers- tap changers-Scott connection-problem solving

UNIT –VI

Design Of Electrical Machines An Introduction: DC machine output equation-Choice of specific electric and magnetic loadings-Separation of D and L for rotating machines-Transformer output equation- core, yoke and winding design-number of tubes.

Text Books:

1. Electric Machines, Nagarath.I.J. and Kothari.D.P., T.M.H. Publishing Co Ltd., New Delhi, 3th edition 2006.
2. Electric Machinery and Transformers, B. S. Guru And H. R. Hiziroglu, Oxford University Press, New York

Reference Books:

1. Electrical Machines, S. K. Bhattacharya, Tata McGraw - Hill Education, New Delhi
2. Electric Machinery and Transformers, I. L. Kosow, Prentice Hall Of India, New Delhi
3. Electrical Machinery, Bimbhra.P.S., Khanna Publishers,
4. A Course in “Electrical Machine Design” A.K.Sawhney , Dhanpat Rai & Co(P) Ltd

B. TECH 3rd SEMESTER	L	T	P	C
	3	-	-	3
16EC3T02: Electronic Devices and Circuits				

COURSE OBJECTIVES

1. The objective of the course is to introduce the students to semiconductor devices such as (BJT, FET, and MOSFET) and their characteristics, analysis, operation of the circuits and Applications.
2. To provide students a base for a further study of analog and digital electronics, and to develop the ability, to analyze and design electronic circuits.
3. To analyze Small signal BJT Amplifiers at low frequencies.

COURSE OUTCOMES

By the end of the course student will be able to:

1. understand the essence of the diode functions, grasp the techniques for the analysis of diode circuits through modeling the diode characteristics, use diodes for various applications, including in design of rectifier circuits.
2. to develop a high degree of familiarity with the FET: its physical structure and operation, terminal characteristics, circuit models, single - stage amplifier configurations and basic circuit applications
3. analyze and design the basic discrete FET circuits.
4. analyze the BJT terminal characteristics, utilize the circuit models to perform the analysis of BJT circuits and to design single-stage BJT amplifiers.
5. acquire knowledge about semiconductor physics for intrinsic and extrinsic materials.

UNIT-I

CONDUCTION IN SEMICONDUCTORS:

Insulators, Semiconductors and Metals classification using energy band diagrams, mobility and conductivity, Carrier concentrations in an intrinsic semiconductor, donor and acceptor impurities, drift and diffusion, charge densities in a semiconductor, Generation and recombination of charge carriers, Carrier lifetime, Hall effect, Poisson and continuity equation, law of junction, Fermi Dirac function, Fermi level in a semiconductor having impurities

UNIT- II

SEMICONDUCTOR-DIODE CHARACTERISTICS:

Open circuited p-n junction, Biased p-n junction, p-n junction diode, current components in PN junction Diode, diode equation, V-I Characteristics, temperature dependence on V-I characteristics, Diode resistance, Space charge, or Transition, capacitance C_T, Diffusion Capacitance, energy band diagram of PN junction Diode.

Special Semiconductor Devices: Zener Diode, Breakdown mechanisms, Zener diode applications, LED, LCD, Photo diode, Varactor diode, Tunnel Diode, SCR. Construction, operation and characteristics of all the above diodes is required to be considered.

UNIT- III

RECTIFIERS AND FILTERS:

Basic Rectifier setup, Half wave rectifier, ripple factor, full wave rectifier (with and without transformer), Harmonic components in a rectifier circuit, Inductor filter, Capacitor filter, L- section filter, Pi- section filter, Multiple L- section and Multiple π section filter, and comparison of various filter circuits in terms of ripple factors, Simple circuit of a regulator using zener diode.

UNIT- IV

TRANSISTOR CHARACTERISTICS:

BJT: The Junction transistor. The transistor current components, Transistor Construction, detailed study of the currents in a transistor and transistor equation.

Transistor configurations: Transistor as an amplifier, characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, punch through/ reach through, Photo transistor, typical transistor junction voltage values, UJT characters.

FET: FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, comparison between JFET and MOSFET.

UNIT- V

TRANSISTOR AND FET BIASING AND THERMAL STABILIZATION:

Need for biasing, operating point, load line analysis, BJT biasing-methods, basic stability, fixed bias, collector to base bias, self-bias, Stabilization against variations in V_{BE},Ic, and β, Stability factors, (S, S', S''), Thermistor and Sensistor Compensation, Thermal runaway,
Thermal stability. Relevant problems.

FET BIASING

Introduction, Fixed-Bias configuration, Self-Bias Configuration Voltage- Divider Biasing and stabilization. Relevant problems.

UNIT- VI

SMALL SIGNAL LOW FREQUENCY TRANSISTOR AMPLIFIER MODELS:

BJT: Two port network, Transistor hybrid model, determination of h-parameters, conversion of h-parameters, generalized analysis of transistor amplifier model using h-parameters, Analysis of CB, CE and CC amplifiers using exact and approximate analysis, Comparison of transistor amplifiers.

FET: Generalized analysis of small signal model, Analysis of CG, CS and CD amplifiers, comparison of FET amplifiers.

Text Books:

1. Electronic Devices and Circuits- J. Millman, C. Halkias, Tata Mc- Graw Hill, Second Edition.
2. Electronic Devices and Circuits-B.P.Singh, Rekha Singh, Pearson Publications, Second Edition.
3. Electronic Devices and Circuits-David A.Bell, Oxford University Press, Fifth Edition.

Reference Books:

1. Electronic Devices and Circuits- K. Satya Prasad.
2. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition.
3. Electronic Devices and Circuit Theory-R.L. Boylestad and Louis Nashelsky, Pearson Publications, Tenth Edition.
4. Electronic Devices and Circuits -BV Rao, KBR Murty, K Raja Rajeswari, PCR Pantulu, Pearson, 2nd edition.
5. Integrated Electronics- Jacob Millman, C. Halkies, C.D. Parikh, Tata Mc-Graw Hill, 2009.

B. TECH 3rd SEMESTER	L	T	P	C
	3	-	-	3
16ME3T02: Fluid Mechanics and Hydraulic Machinery				

COURSE OBJECTIVES

The students completing this course are expected to understand the properties of fluids, its kinematic and dynamic behavior through various laws of fluids like continuity, Euler's, Bernoulli's equations, energy and momentum equations. Working and performance characteristics of various hydraulic machines like pumps and turbines.

COURSE OUTCOMES

At end of the course student able to

1. Understand and apply concepts of fluid statics, kinematics and dynamics for solving various fluid flow problems.
2. Analyze various losses in pipe flow problems and understand the measurement of flow.
3. Understand the concept of hydrodynamic force of jets on stationary and moving flat, inclined and curved vanes
4. Explain the working and performance of various types of turbines and pumps and their characteristics.

UNIT-I

FLUID STATICS: Dimensions and units- physical properties of fluids- specific gravity, viscosity and surface tension- vapour pressure and their influence on fluid motion- atmospheric gauge and vacuum pressure –measurement of pressure- Piezometer, U- Tube and Differential manometers.

UNIT-II

FLUID KINEMATICS: Stream line, path line, streak lines and stream tube-Classification of flows-steady & unsteady, uniform, non-uniform, laminar, turbulent, rotational, and irrational flows-Equation of continuity for one dimensional flow.

FLUID DYNAMICS: Surface and body forces -Euler's and Bernoulli's equations for flow along a stream line, momentum equation and its application on force on pipe bend.

UNIT-III

CLOSED CONDUIT FLOW: Reynold's experiment- Darcy Weisbach equation - Minor losses in pipes- pipes in series and pipes in parallel - Total energy line-hydraulic gradient line.

MEASUREMENT OF FLOW: Pilot tube, venture meter, orifice meter and Flow nozzle

UNIT-IV

BASICS OF TURBO MACHINERY: Hydrodynamic force of jets on stationary and moving flat, inclined, and curved vanes, jet striking centrally and at tip, velocity diagrams, work done and efficiency, flow over radial vanes, Force exerted by jet of water on series of vanes.

UNIT-V

HYDRAULIC TURBINES: Classification of turbines, impulse and reaction turbines, Pelton wheel, Francis turbine and Kaplan turbine-working proportions, work done, efficiencies , hydraulic design – draft tube theory- functions and efficiency.

PERFORMANCE OF HYDRAULIC TURBINES: Geometric similarity, Unit and specific quantities, characteristic curves, governing of turbines, selection of type of turbine, cavitation, surge

tank, water hammer.

UNIT-VI

CENTRIFUGAL PUMPS: Classification, working, work done – Manometric head- losses and efficiencies specific speed- pumps in series and parallel-performance characteristic curves, NPSH.

RECIPROCATING PUMPS: Working, Discharge, slip, indicator diagrams.

Text Books:

1. Hydraulics, fluid mechanics by P.N. MODI and S.M.SETH, Standard book house.
2. A text book of Fluid Mechanics and Hydraulic Machines by R.K.Bansal, Laxmi Publications.

Reference Books:

1. Fluid Mechanics and Fluid Power Engineering by D.S. Kumar, Kotaria & Sons.
2. Fluid Mechanics and Machinery by D. Rama Durgaiah, New Age International.

B. TECH 3rd SEMESTER	L	T	P	C
	-	-	4	2
16ME3L02: Fluid Mechanics and Hydraulic Machinery Lab				

COURSE OBJECTIVE

To impart practical exposure on the performance evaluation methods of various flow measuring equipment and hydraulic turbines and pumps.

COURSE OUTCOMES

At the end of the lab student able to

1. Predict major and minor losses in various piping system.
2. Predict performance characteristics of various Turbines and Pumps.
3. Calibrate Venturi meter and Orifice meter.
4. Student can apply the impulse momentum concepts on jets.

List of Experiments:

1. Impact of jets on Vanes.
2. Performance Test on Pelton Wheel.
3. Performance Test on Francis Turbine.
4. Performance Test on Kaplan Turbine.
5. Performance Test on Single Stage Centrifugal Pump.
6. Performance Test on Multi Stage Centrifugal Pump.
7. Performance Test on Reciprocating Pump.
8. Calibration of Venturi meter.
9. Calibration of Orifice meter.
10. Determination of friction factor for a given pipe line.
11. Determination of loss of head due to sudden contraction in a pipeline.
12. Bernoulli's apparatus.

NOTE: Any 10 of the above 12 experiments are to be conducted.

B. TECH 3rd SEMESTER	L	T	P	C
	-	-	4	2
16EE3L01: Electrical Circuits and Simulation Lab				

COURSE OBJECTIVES

This laboratory course will give a thorough knowledge about the basics of circuit analysis.

1. Implement and verify circuit theorems
2. Gain knowledge about resonance and circuit transients.
3. Implement and verify the performance of network based on input and output excitation
4. Gain knowledge about three phase systems

COURSE OUTCOMES

1. Acquire knowledge and skills about electric instruments, such as multimeter, oscilloscope
2. Identify and learn properties about main electrical components, such as resistors, capacitors,inductors, voltage source.
3. Verify in practice some important circuit Theorems and concepts, such as Thevenin, Superposition, impedance, phasors, sinusoidal signal characteristics, transients and steady state response.
4. Verify in practice the phase/line quantity relationship and calculate three phase power and power factor.

LIST OF EXPERIMENTS

1. Determination of Self, Mutual Inductances and coefficient coupling
2. Series and Parallel Resonance
3. Verification of Superposition theorem and maximum power transfer theorem
4. Experimental determination of Thevenin's and Norton's equivalent circuits and verification by direct test.
5. Verification of compensation Theorem.
6. Verification of Reciprocity , Millimann's Theorems
7. Mesh Analysis& Nodal Analysis
8. Calculate and verify 'Z' & 'Y' parameters of two-port network.
9. Study and plot the Transient Response of RL and RLC Circuit.
10. Three Phase Star and Delta Connections
11. Three phase power measurement
12. Three phase reactive power measurement with single-phase wattmeter.

Minimum of Ten Experiments from the Above List

References Books:

1. Department Lab Manual

Sudhakar.A and ShyamMohan.S.P, "C*ircuits and Networks Analysis andSynthesis"*, Fourthedition, Tata McGraw Hill Publishing Company Ltd., New Delhi,

B. TECH 3rd SEMESTER	L	T	P	C
	-	-	4	2
16EC3L01: Electronic Devices and Circuits Lab				

COURSE OBJECTIVES

1. To study basic electronic components.
2. To observe characteristics of electronic devices.

COURSE OUTCOMES

After completion of the EDC Lab students can able to:

1. Measure voltage, frequency and phase of any waveform using CRO.
2. Generate sine, square and triangular waveforms with required frequency and amplitude using Function generator.
3. Analyze the characteristics of different electronic devices such as diodes, transistors etc., and Simple circuits like rectifiers, amplifiers etc.,
4. The course intends to provide an overview of principles, operation and application of the basic Electronic components

PART A: (Only for viva voce Examination)

ELECTRONIC WORKSHOP PRACTICE (in 2 lab sessions):

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Switches (SPDT, DPDT, and DIP) Bread Boards.
2. Identification, Specifications and Testing of Active Devices, Diodes-(PN diode, Zener, laser, Photo, varactor, tunnel, schottkey) ,BJTs, Low power JFETs,MOSFETs, Power Transistors, LEDs, LCDs, Optoelectronic Devices, SCR, UJT, DIACs, TRIACs.
3. Single layer and Multi-layer PCBs (Design procedure using PCB 123 software).
4. Study and operation of a) Multimeters (Analog and Digital) b) Function Generator c) Regulated Power Supplies d) Study and Operation of CRO.

PART B: (Any ten experiments)

1. PN Junction diode characteristics A. Forward bias B. Reverse bias.
2. V-I characteristics of Zener diode
3. Transistor CB characteristics (Input and Output)
4. Transistor CE characteristics (Input and Output)
5. Half wave Rectifier with & without filters
6. Full wave Rectifier with & without filters
7. FET characteristics
8. UJT Characteristics
9. CE Amplifier
10. CC Amplifier
11. SCR characteristics

Equipment Required for Laboratories:

1. Regulated Power supplies (RPS) - 0-30v
2. CROs - 0-20M Hz
3. Function Generators - 0-1 M Hz
4. Multimeters
5. Decade Resistance Boxes/Rheostats
6. Decade Capacitance Boxes
7. Micro Ammeters (Analog or Digital) - 0-20μA, 0-50μA, 0-100μA, 0-200μA
8. Voltmeters (Analog or Digital) - 0-50V, 0-100V, 0-250V
9. Electronic Components - Resistors, Capacitors, BJTs, LCDs, SCRs, UJTs, PN diode, Zener, Laser, photo, varacter, tunnel, schottkey, LEDs, MOSFETs, diodes (Ge & Si Type), transistors (NPN & PNP)

B. TECH 4th SEMESTER	L	T	P	C
	3	1	-	4
16EE4T01: Electrical Machines-II				

COURSE OBJECTIVES

Student able to understand:

1. The Construction details of three phase IM and its characteristics at different loads and Speed control methods
2. The concept of working principle of Synchronous machine ,Voltage regulation Calculation by using different methods
3. The Concept of Design Specifications

COURSE OUTCOMES

At the end of course the students will be able to:

1. Explain the Construction details of three phase IM and its characteristics at different loads and Speed control methods
2. Analyze to develop equivalent circuit and evaluate performance of alternator
3. Demonstrate the operation and construction of synchronous machines
4. Ability to analyze load sharing of parallel operation of alternators
5. Ability to model and analyse electrical machines

UNIT I

Synchronous Generators: Construction features of alternators–winding factors-e.m.f equation-synchronous reactance-armature reaction—Predetermination of voltage regulation using E.M.F, M.M.F, Potier reactance and ASA methods–parallel operation–synchronizing power-Active and reactive power sharing—alternator on infinite bus bars-Salient pole synchronous machine –two reaction theory-slip test–operating characteristics-capability curves-problem solving.

UNIT II

Synchronous Motor: Principle operation- methods of starting–torque and power developed equations–Effect of change in excitation and load on synchronous motor-V curves and inverted V curves–Hunting and suppression methods-synchronous condenser-problem solving.

UNIT III

Three Phase Induction Machines: Construction details- production of rotating magnetic field-principle of operation- concept of slip and its effects—No load and blocked rotor tests-equivalent circuit- torque & power equations –torque -slip characteristics-losses and efficiency- load test-separation of loss-performance calculation from circle diagram- -Double cage rotor– cogging & crawling-Induction generator-problem solving.

UNIT IV

Starting And Speed Control Of Induction Machines: Need for starting- Types of starters-DOL, Rotor resistance starters- autotransformer and star/delta starters–Speed control techniques-voltage control–pole changing–frequency control–cascade connection-rotor resistance control–slip energy recovery scheme-Braking of three phase induction motor: plugging, dynamic braking and regenerative braking-problem solving.

UNIT V

Single Phase Induction Motor: Constructional features and the problem of starting–Double revolving field theory–starting methods- split-phase-capacitor start and run-shaded pole- Equivalent circuit- Load test

UNIT VI

Design Of Three Phase Machines (Introduction): Output equations- main dimensions-choice of average flux density-length of air gap-design of rotor- Synchronous machine: choice of electrical and magnetic loading -short circuit ratio-armature design -design of rotor and damper winding-problem solving.

Text Books:

1. Electric Machines, Nagarath.I.J. andKothari.D.P., T.M.H. Publishing Co Ltd., New Delhi, 3th edition 2006.
2. Electric Machinery and Transformers, B. S. Guru And H. R. Hiziroglu, Oxford University Press, New York

Reference Books:

1. Electrical Machines, S. K. Bhattacharya, Tata McGraw - Hill Education, New Delhi
2. Electric Machinery and Transformers, I. L. Kosow, Prentice Hall Of India, New Delhi
3. Electrical Machinery, Bimbhra.P.S., Khanna Publishers,
4. A Course in “Electrical Machine Design” A.K.Sawhney , DhanpatRai& Co(P) Ltd

B. TECH 4th SEMESTER	L	T	P	C
	3	1	-	4
16EE4T02: Control Systems				

COURSE OBJECTIVES

The student able to

1. Learn the mathematical modeling of physical systems and to use block diagram algebra and signal flow graph to determine overall transfer function
2. Know the stability of closed loop system by RH criterion and Root Locus method
3. Present the frequency response approaches for the analysis of LTI System using bode plots, polar plots and Nyquist stability
4. Discus basic aspects of design and compensation of linear control systems using bode plot.
5. To formulate state models and analyze the systems.

COURSE OUTCOMES

1. Ability to derive the transfer function of physical systems and determination of transfer function using block diagram algebra and signal flow graph.
2. Ability to analyze absolute and relative stability of LTI Systems.
3. Ability to design different compensators to improve system performances.
4. Understanding the concepts of controllability and observability.

UNIT I

Mathematical Modeling of Control Systems: Introduction, Open Loop and Closed Loop control systems and their differences, Classification of control systems, Feedback characteristics, and Transfer function of linear systems. Differential equations of electrical networks, Translational and Rotational mechanical systems, Transfer function of DC Servo motor, Transfer function of AC Servo motor, Synchro transmitter and Receiver, Block diagram algebra and Problems, Signal flow graph – Reduction using Mason's gain formula with Problems

UNIT II

Time Response Analysis: Standard test signals, Time response of first order systems, Time response of second order systems, Time domain specifications, Steady state errors and error constants, Effects of PI, PD and PID controllers, Problems

UNIT III

Stability and Root locus technique: The concept of stability, Location of poles on s-plane for stability, Routh's stability criterion and problems, Limitations of Routh's stability, The Root locus concept, Construction of root loci and simple problems

UNIT IV

Frequency response analysis: Introduction, Frequency domain specifications, Bode diagrams and Procedure for magnitude and phase plot of Bode plot, Problems on Bode plot, Stability analysis from Polar plots and problems, Nyquist stability criterion and problems

UNIT V

Compensation techniques: Lag and Lead compensators, Lag-Lead compensators, Design of compensators using Bode plots

UNIT VI

State space analysis of continuous systems:

Concepts of state, state variables and state model, State space representation of transfer function, Diagonalization – Solving the Time invariant state equations, State transition Matrix and its Properties, Concept of Controllability and Observability

Text Books:

1. Modern control Engineering, Kotsuhiko Ogata, Prentice Hall of India.
2. Automatic control systems, BenjamanC.Kuo, Prentice Hall of India, 2nd Edition.

Reference Books:

1. Control Systems, ManikDhanesh N, Cengage publications.
2. Control Systems principles and design, M. Gopal, Tata McGraw Hill education Pvt Ltd., 4th Edition.
3. Control Systems Engineering, S.Palani, Tata McGraw Hill Publications.
4. Control Systems by A. NagoorKani, RBA Publications.

B. TECH 4th SEMESTER	L	T	P	C
	3	-	-	3
16EC4T04: Switching Theory and Logic Design				

COURSE OBJECTIVES

1. Understand concepts of combinational and sequential circuits
2. Analyze the synchronous and asynchronous logic circuits
3. Understand concepts of memory, programmable logic and digital integrated circuits.

COURSE OUTCOMES

After completion of course students are able to

1. work on different number systems
2. understand different codes, error detection and correction mechanisms
3. design various combinational & sequential circuits
4. implement any logic with various PLD's

UNIT-1

Number Systems and Boolean algebra: Digital systems, Binary numbers, Number-base conversions, Octal and Hexadecimal numbers, Complements, signed binary numbers, Binary codes. Basic definitions, Axiomatic definition of Boolean algebra, Basic theorems and properties of Boolean algebra, Boolean functions, Canonical and Standard forms.

UNIT-2

Logic Gates and Gate Level Minimization: Digital logic gates, The map method, Four variable map, Five variable map, POS implementations, Don't-care conditions, NAND and NOR implementations, Other two level implementations, Exclusive-or function, Error detection and correction codes - Parity generation and checking, Hamming code.

UNIT-3

Combinational Logic: Combinational logic circuits, Design procedure, Binary adder-subtractor, Decimal adder, Magnitude comparator, Decoders, Encoders, Multiplexers, Demultiplexers, Code converters.

UNIT-4

Sequential Circuits 1: Sequential circuits, Latches, Flip-flops and their analysis, Registers, Shift registers - Serial in/ serial out, Serial in/ parallel out, Parallel in/ parallel out, Parallel in/ serial out shift registers, Bidirectional shift register, Universal shift register.

UNIT-5

Sequential Circuits 2: Ripple counters, Synchronous counters, Modulo-N counters, Shift register counters. FSM: Mealy and Moore models, State reduction and assignment, Design procedure.

UNIT-6

Memory and Programmable Logic: Introduction, Random Access Memory, Read Only Memory, Programmable Logic Array (PLA), Programmable Array Logic(PAL), Introduction to Complex Programmable Logic Devices(CPLD) and Field Programmable Gate Arrays(FPGA).

Text Books:

1. Digital design – Morris Mano M, 4th edition, Pearson
2. Digital fundamentals – Thomas L.Floyd, 11th edition, Pearson.

Reference Books:

1. Ronald J. Tocci, "*Digital System Principles and Applications*", PHI, Sixth Edition, 1997.
2. *Fundamentals of Logic Design*", by C. H. Roth, Jr, PWS Publishing Company

B. TECH 4th SEMESTER	L	T	P	C
	3	-	-	3
16EC4T02: Pulse and Digital Circuits				

COURSE OBJECTIVES

The student will be made

1. To understand the concept of wave shaping circuits.
2. To understand the concept of switching characteristics of diode and transistor.
3. To Understand Sampling Gates.
4. To analyze different types of Multi vibrators and their design procedures.
5. To Introduce the Time-base Generators.

COURSE OUTCOMES

After going through this course the student will be able to

1. Design linear and non-linear wave shaping circuits.
2. Apply the fundamental concepts of wave shaping for various switching and signal generating circuits.
3. Design different multivibrators and time base generators.

UNIT I

Linear wave shaping: High pass, low pass RC circuits, their response for sinusoidal, step, pulse, square and ramp inputs. RC network as differentiator and integrator, double differentiation, attenuators, RL and RLC circuits and their response for step input, Ringing circuit.

UNIT II

Non – Linear Wave Shaping : Diode clippers, Transistor clippers, clipping at two independent levels, Transfer characteristics of clippers, Emitter coupled clipper, Comparators, applications of voltage comparators, clamping operation, clamping circuits using diode with different inputs, Clamping circuit theorem, practical clamping circuits, effect of diode characteristics on clamping voltage, Transfer characteristics of clampers.

UNIT III

Switching Characteristics of Devices & Sampling Gates: Diode as a switch, piecewise linear diode characteristics and Transistor as switches, Break down voltage consideration of transistor, saturation parameters of Transistor and their variation with temperature, Design of transistor switch, transistor-switching times.

Logic & Sampling gates: Realization of Logic Gates using DTL, TTL and ECL. Basic operating principles of sampling gates, Unidirectional and Bi-directional sampling gates, Reduction of pedestal in gate circuits, Four-diode sampling gates; Applications of sampling gates.

UNIT IV

Multivibrators: Analysis & Design of Bistable Multivibrators: Fixed bias& self-biased transistor binary, Commutating capacitors, Triggering in binary, Schmitt trigger circuit, Applications.

UNIT V

Multivibrators (Contd.): Analysis & design of Monostable Multivibrator: Collector-coupled and Emitter-coupled Monostable multivibrators, Triggering in monostable multi;
Analysis & design of Astable multivibrator (Collector coupled and Emitter-coupled) using transistors.

UNIT VI

Time Base Generators: General features of a time base signal, methods of generating time base waveform, Miller and Bootstrap time base generators – basic principles, Transistor miller time base generator, Transistor Bootstrap time base generator, Current time base generators.

Text Books:

1. Pulse Digital and Switching Waveforms - J. Millman and H. Taub, McGraw-Hill, 1991.
2. Solid State Pulse circuits - David A. Bell, PHI, 4th Edn., 2002 .

Reference Books:

1. Pulse and Digital Circuits – A. Anand Kumar, PHI, 2005.
2. Wave Generation and Shaping - L. Strauss.
3. Pulse, Digital Circuits and Computer Fundamentals - R.Venkataraman.

B. TECH 4th SEMESTER	L	T	P	C
	3	-	-	3
16BM4T01: Principles of Economics and Management				

COURSE OUTCOMES

At the end of the course the student should be able to

1. Differentiate between Micro and Macro Economics and apprise the nitty gritty of demand function.
2. Identify various kinds of markets, the pricing methods used and solve the basic problems using BEP analysis.
3. Comprehend the basic concepts of Management and Human Resource Management.
4. Apply the basic concepts of Production Management and Marketing Management in planning the production and distribution of products.
5. Evaluate the basic forms of organization best suited for entrepreneurship and appreciate the importance of Financial Management in a firm.

UNIT I:

Introduction to Economics: Concept, Nature & Scope of Economics-Macro and Micro Economics-Demand Analysis: Demand Determinants- Law of Demand& its exceptions- Elasticity of Demand-Types –Demand Forecasting-Methods.

UNIT II:

Market Structures: Types of Markets-Price output determination in Perfect Competition, Monopoly, Monopolistic Competition, Oligopoly **-** Pricing methods - Break – Even Analysis (simple problems).

UNIT III:

Introduction to Management: Concept - Functions of Management - Scientific Management-Principles of Management- Leadership Styles - Functional areas of Management.

Human Resource Management: Definition, Significance and Functions - PM Vs HRM – Recruitment, Selection, Training and Development -Job Analysis - Role and position of HR department – Performance Appraisal.

UNIT IV:

Marketing Management : Needs- Wants - Products - Market- Marketing- Production Concept, Product Concept, Sales Concept, Marketing Concept, Societal Marketing Concept- Organizing the Marketing Department - **Marketing Mix**: Product, Price, Place, Promotion (in brief)

Production Management: Concept of production management-Types of Production processes-Plant Location & Layout, Statistical Quality Control.

UNIT V:

Financial Management: Financial Statements – Contents of Trading Account, Profit and Loss Account – Balance Sheet (Theory only) - Analysis of Financial statements : Ratio analysis (simple problems) - Concept of Finance - Objectives of Finance-Wealth Maximization Vs. Profit Maximization - Functions of Finance - Role of financial manager - Organization of finance function.

UNIT VI:

Forms of Business Organizations- Sole Proprietorship, Partnership, Joint Stock Company -Private limited and Public limited Companies, Public enterprises and their types, Business Cycles.

Entrepreneurship- Entrepreneur – Qualities of good entrepreneur - Entrepreneurial Functions, Entrepreneurial Development: Objectives, Training, Benefits - Phases of Installing a Project.

Text Books:

1. P.G.Ramanujam, B.V.R.Naidu & PVR Sastry, **Management Science**, Himalaya Publishing House, Mumbai.
2. A.R. Aryasri, **Managerial Economics and Financial Analysis**, Tata Mc Graw- Hill, New Delhi.

Reference Books:

1. M.Y.Khan & P.K.Jain, **Financial Management**, TATA McGraw-Hill, New Delhi.
2. Koontz O Donnel, **Management**, TATA McGraw-Hill, New Delhi.
3. K. Aswathappa, **Production Mangement**, Himalaya Publishing House, Mumbai.
4. P.Subba Rao, **Human Resource Management**, Himalaya Publishing House, Mumbai.
5. Philip Kotler, **Marketing Management**, Pearson Prentice Hall, New Delhi.
6. Vasant Desai, **Entreprenuership**, Himalaya Publishing House, Mumbai.
7. Varshini &Maheswari, **Managerial Economics**, SChand & Co, New Delhi.

B. TECH 4th SEMESTER	L	T	P	C
	-	-	4	4
16EE4L01: Electrical Machines Lab – I				

COURSE OBJECTIVE

To give students a fair knowledge of testing different types of DC machines and Transformers

1. To rig up circuits for testing a given machine
2. To obtain the performance characteristics of machines

COURSE OUTCOMES

1. Demonstrate knowledge of D.C. motor and generator operation.
2. Demonstrate knowledge of transformer theory.

LIST OF EXPERIMENTS

1. Load test on DC motors
2. Speed Control of DC Motor: Field control, Armature control
3. Load test on DC generators.
4. Load test on single phase transformer.
5. Open circuit & Short circuit test on single phase transformer
6. Open circuit characteristics of DC generator (Self and Separately Excited)
7. Swinburne's test and separation of losses in DC Machine.
8. Hopkinson's test
9. Sumpner's test on 1 phase transformers
10. 3-phase transformer connections
11. 3-phase to 2–phase conversion
12. Demo type experiment based on student activity

Minimum of Ten Experiments from the Above List

Reference Books:

1. Department Laboratory Manual.

B. TECH 4th SEMESTER	L	T	P	C
	-	-	4	4
16EE4L02: Control System and Simulation Lab				

COURSE OBJECTIVES

1. To impart hands on experience to understand the performance of basic control system components such as D.C. servo motors, A.C. Servo motors.
2. To understand time and frequency responses of control system with and without controllers and compensators.

COURSE OUTCOMES

1. Able to analyze the performance and working of D.C. servo motors, A.C. Servo motors and synchronous motors.
2. Able to design P,PI,PD and PID controllers
3. Able to design lag, lead and lag–lead compensators
4. Able to control the temperature using PID controller
5. Able to determine the transfer function of D.C.motor
6. Able to control the position of D.C servo motor performance

LIST OF THE EXPERIMENTS

1. Time response of Second order System
2. Characteristics of Synchros
3. Effect of feedback on DC Servo motor.
4. Effect of P, PD ,PI ,PID controller on a second order system
5. Design and implementation of Lag and lead compensator
6. DC position control system
7. Transfer function of DC motor
8. Temperature controller using PID
9. Characteristics of AC servo motor
10. Digital simulation of P, PI, PD, PID controllers using MATLAB software.
11. Stability analysis of a second order system using MATLAB software
12. State Space model for classical transfer function using MATLAB verification

Minimum of Ten Experiments from the Above List

Reference Books:

1. Department Laboratory Manual.

B. TECH 4th SEMESTER	L	T	P	C
	-	-	4	4
16EC4L02: Pulse and Digital Circuits Lab				

COURSE OBJECTIVES

1. To observe the wave shaping circuits.
2. To understand the switching characteristics of a transistor.
3. To design and analyze the characteristics of multivibrators.
4. To understand sampling gates and time base generators.

COURSE OUT COMES

After completion of the PDC Lab students can able to:

1. Reshape the given non-sinusoidal input signals
2. Remove any portion of given signal above or below the reference level
3. Generate different signals for required applications.
4. Transmit the input signal to the output for specified time interval.

LIST OF EXPERIMENTS

1. Linear wave shaping (low pass & high pass)
2. Non- linear wave shaping-clippers
3. Non- linear wave shaping-clampers
4. Transistor as a switch
5. Realization of Logic Gates.
6. Sampling gates (uni-directional & bi- directional)
7. Astable multivibrators
8. Mono-stable multivibrator
9. Bi-stable multivibrator
10. Schmitt –trigger using BJT
11. Relaxation oscillator using UJT
12. Boot strap sweep circuit
13. Study of flip-flops and some applications.

EQUIPMENT REQUIRED FOR LABORATORIES

1. RPS – 0 – 30V
2. CRO – 0 – 20MH_Z
3. Function Generators – 0 – 1MH_Z
4. Multimeters
5. Decade Resistance boxes
6. Decade Capacitor boxes
7. Micro ammeters (Analog or Digital) – 0-20μA, 0-50μA, 0-100 μA, 0-200 μA.
8. Voltmeters (Analog or Digital) -0-50V, 0-100V, 0-250V.

Electronic Components – Resistors, Capacitors, BJTs, LCDs SCRs, VJTs, PN Diode, Zener, Laser, Photo, Varacter, Tunnel, Schottlry, LED's, MOSFETs, Diods (Ge & Si type), Transistors, (NPN & PNP).

B. TECH 5th SEMESTER	L	T	P	C
	3	1	-	4
16EE5T01: Power Transmission Systems				

Learning objectives:

1. To study the various conventional energy sources to generate power.
2. To study the load demand curves and tariff methods.
3. To study the types of conductors and calculation of L and C parameters
4. To study the performance of short and medium lines.
5. To study the performance of long lines.
6. To study about the insulators, sag and tension calculations.

Learning outcomes

1. Illustrate the various power generating plants
2. Analyze the different tariff methods and its economical aspects
3. Deduce the expressions for transmission line parameters
4. Calculate the mechanical performance of insulators, sag & tension to a transmission line

UNIT-1

Conventional Energy Sources

Thermal power stations: Selection of site, general layout of a thermal power plant, Types of boilers, economizers, super heaters, condenses and turbines, merits and demerits- ESPs

Hydro electric plants: Selection of site, layout of Hydro stations- types of hydro stations, Merits & Demerits

Gas Power Plants: Introduction -Simple layout, combined cycle, Merits and Demerits.

Nuclear Power Plants: Introduction- layout – Merits & Demerits

UNIT-II

Economical aspects of power plants: Load curve, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, capacity factor, utilization and plant use factor- .

Tariff methods: Costs of generation and their division in to fixed, semi fixed and running costs. tariff methods: simple rate, flat rate, block rate, two part and three part, and power factor tariff methods-problem solving.

Unit-III

Transmission Line Parameters: Types of conductors - calculation of resistance for solid conductors - Calculation of inductance for single phase and three phase, single and double circuit

lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition, . Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines, .

UNIT-IV

Performance of Short and Medium Length Transmission Lines: Classification of Transmission Lines - Short, medium, long line and their model representations -Nominal-T, Nominal-Pie and A, B, C, D Constants, . Mathematical Solutions to estimate regulation and efficiency of all types of lines, Effect on Regulation of the Transmission Line, Skin and Proximity effects.

UNIT-V

Performance of Long Transmission Lines: Long Transmission Line-Rigorous Solution, evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations, Incident, Reflected and Refracted Waves -Surge Impedance and SIL of Long Lines, Wave Length and Velocity of Propagation of Waves, Equivalent-T and Equivalent Pie network models, Ferranti effect - Charging Current.

Corona - Description, factors affecting the corona, effects of corona

UNIT-VI

Sag and Tension Calculations: Sag and Tension calculations with equal and unequal heights of towers, effects of Wind and Ice on Conductors, Stringing chart.

Insulators: Types of Insulators, voltage distribution in insulator string, methods of improving string efficiency, .

TEXT BOOKS:

1. Power system Analysis-by John J Grainger William D Stevenson, TMC Companies, 4th edition
2. Electrical power systems - by C.L.Wadhwa, New Age International (P) Limited, Publishers – 7th addition

REFERENCE BOOKS:

1. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar, A.Chakrabarthy, Dhanpat Rai & Co Pvt. Ltd.
2. Power System Analysis and Design by B.R.Gupta, Wheeler Publishing.
3. Modern Power System Analysis by I.J.Nagaraj and D.P.Kothari, Tata McGraw Hill, 2nd Edition

B. TECH 5th SEMESTER	L	T	P	C
	3	1	-	4
16EE5T02: POWER ELECTRONICS				

Learning Objectives:

i. To study the characteristics of various power semiconductor derives and analyze the operation of diode bridge rectifier.
ii. Analysis of firing circuits for SCR. Analyze the operation of AC voltage controller and half–wave phase controlled rectifiers.
iii. To understand the operation of single phase full–wave converters and analyze harmonics in the input current.
iv. To study the operation of three phase full–wave converters and dual converter.
v. To analyze the operation of high frequency dc–dc converters.
vi. To understand the working of inverters and application of PWM techniques for voltage control and harmonic mitigation.

UNIT–I:

Power Semi Conductor Devices: Thyristors–Silicon controlled rectifiers (SCR's) –Characteristics of power MOSFET and power IGBT– Basic theory of operation of SCR–Static characteristics– Turn on and commutation methods– Firing circuits for SCR– MOSFET and IGBT -Dynamic characteristics of SCR, Snubber circuits.

UNIT–II:

Single phase AC-DC Bridge Converters & Harmonic analysis: Operation of semi and fully controlled converters with R, RL and RLE load, analysis on output voltage and input current – Effect of source Inductance, large load inductance under continuous condition, input power factor.

UNIT–III:

Three Phase AC–DC Bridge Converters: Operation of Fully controlled and semi controlled converters and with R, RL and RLE loads under continuous conduction, steady state analysis with R, RL and RLE loads–Line commutated Inverter operation–Dual converters with non–circulating and circulating currents.

UNIT – IV:

DC–DC Converters: High frequency DC–DC converters**:** Buck Converter operation– Time ratio control and current limit control strategies, steady state analysis under CCM, Boost converter operation, Buck-Boost converter, voltage gain characteristics of the above DC-DC converters.

UNIT – V:

DC–AC Converters and Control Technique: Single phase inverters–unipolar and bipolar switching–Three phase Inverters 120^0 and 180^0 conduction modes, Sine triangular PWM technique, Harmonic analysis.

UNIT–VI:

Single Phase AC Voltage controller and Cycloconveters– Principle of phase control- integral cycle control-Single phase AC voltage controller with R and RL load– Principle of cycloconverter-Single phase Step-up cyclo converter - Single phase Step-down cyclo converter .

Learning Outcomes:

Student should be able to

1. Define the characteristics turn on & turn off process of various power semiconductor devices and analyze the operation of diode bridge rectifier
2. Explain the operation of single and three phase full–wave converters and analyze harmonics in the input current and dual converter
3. Analyze the operation of high frequency dc–dc converters under CCM
4. Explain the working of inverters and application of PWM techniques for voltage control and harmonic mitigation

Text Books:

1. Power Electronics: Circuits, Devices and Applications – by M. H. Rashid, Prentice Hall of India, 2nd edition, 1998
2. Power Electronics: converters, applications & design –by Nedmohan, Tore M. Undeland, Robbins by Wiley India Pvt. Ltd.
3. Power Converter Circuits -by William Shepherd, Li zhang, CRC Taylor & Francis Group.

Reference Books:

1. Elements of Power Electronics–Philip T.Krein.oxford.
2. Power Electronics – by P.S.Bhimbra, Khanna Publishers.
3. Thyristorised Power Controllers – by G. K. Dubey, S. R. Doradla, A. Joshi and R. M. K.Sinha, New Age International (P) Limited Publishers, 1996.
4. Power Electronics handbook by Muhammad H. Rashid, Elsevier.

B. TECH 5th SEMESTER	L	T	P	C
	3	0	-	3
16EE5T03: ELECTRICAL AND ELECTRONIC MEASUREMENTS				

UNIT–I:

Measuring Instruments: Classification – Deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type, dynamometer and electrostatic instruments – Expression for the Deflecting torque and control torque – Errors, compensation, Extension range of instruments – Principles of CT and PT and errors.

UNIT – II:

DC and AC Bridges: Method of measuring low, medium and high resistance, Kelvin's double bridge, Loss of charge method for measurement of high resistance – Megger– Measurement of earth resistance – Measurement of inductance – Quality Factor – Maxwell's bridge–Hay's bridge – Anderson's bridge–Measurement of capacitance and loss angle – Desautybridge – Schering Bridge– Wagner's earthing device–Wien's bridge.

UNIT –III:

Potentiometers: Principle and operation of D.C Crompton's potentiometer – standardization – Measurement of unknown resistance – current – Voltage. **A.C Potentiometers:** Polar and coordinate types – Standardization - Applications

UNIT –IV:

Measurement of power: Operation and analysis of single phase and three phase dynamometer wattmeter, LPF wattmeter and UPF wattmeter – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems – Type of P.F Meters.

UNIT –V:

Measurement of Energy: Single phase and three phase dynamometer and moving iron type Single phase induction type energy meter – Driving and braking torques – errors and compensations – Testing by phantom loading using

R.S.S. meter– Three phase energy meter – Tri vector meter – Maximum demand meters– Electrical resonance type frequency meter and Weston type synchroscope

UNIT VI

Digital Meters:

Digital voltmeter – Successive approximation – Measurement of phase difference – frequency – Hysteresis loop using lissajious patterns in CRO – Ramp and integrating type – Digital Frequency meter – Digital multimeter – Digital Tachometer

Learning Outcomes:

Student should be able to

1. Demonstrate the knowledge about construction and working principles of different types of measuring instruments
2. Demonstrate the knowledge about construction and working principles of different types of measuring Instruments
3. Explain the deviations in magnetic measurements due to the influence of the instrument
4. Apply the principles of various types of Digital Meters

Text Books:

1. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C.Widdis, fifth Edition, Wheeler Publishing.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.
3. Electrical and Electronic Measurements and instrumentation by R.K.Rajput, S.Chand

Reference Books:

1. Electrical & Electronic Measurement & Instruments by A.K.Sawhney Dhanpat Rai & Co. Publications.
2. Electrical and Electronic Measurements –by G.K.Banerjee, PHI Learning Private Ltd., New Delhi–2012.
3. Hand Book of sensors and Actuators Vol.7, Measuring Current, Voltage and Power, Seties editor S.Middelhoek, Elsevier
4. Measurement Instrumentation and Sensors, John_G_Webster, CRC Press LLC

B. TECH 5th SEMESTER	L	T	P	C
	3	0	-	3
16EC5T04: LINEAR & DIGITAL IC APPLICATIONS				

COURSE OUTCOMES:

Students are able to

CO1: Understand & demonstrate different applications based on operational-amplifier.

CO2: Demonstrate the applications of waveform generators based on operational-amplifier and IC 555 timer.

CO3: Differentiate A/D and D/A converter, understand their types and analyze their Applications.

CO4: Represent any combinational and sequential circuits using digital ICs.

UNIT- I:

INTEGRATED CIRCUITS:

Integrated circuits-Types, Classification, Package Types and temperature ranges, Differential Amplifier- DC and AC analysis of Dual input balanced output Configuration, Properties of other differential amplifier configuration (Dual Input Unbalanced Output, Single Ended Input – Balanced/ Unbalanced Output), DC Coupling and Cascade Differential Amplifier Stages, Level translator.

UNIT- II:

OPERATIONAL AMPLIFIER AND ITS APPLICATIONS:

Characteristics of OP-Amps, Op-amp Block Diagram, ideal and practical Op-amp specifications Op-Amp parameters,(DC and AC characteristics) 741 op-amp & its features. Linear Applications of Op-Amps: Inverting and Non-inverting amplifier, Integrator and differentiator, Summing and Difference amplifier. Non-Linear Applications of Op-Amps: Comparators, Triangular and Square wave generators. Sine wave generation: principle, Wein-bridge, phase-shift oscillators.

UNIT- III:

ACTIVE FILTERS AND TIMERS:

Introduction, classification, Butter worth filters – 1st order, LPF, HPF, Band pass, Band reject and all pass filters qualitative and quantitative analysis. Timers**:** Introduction to 555 timer, functional diagram, Monostable and Astable operations and applications, Schmitt Trigger.

UNIT - IV :

A to D & D to A CONVERTERS:

Introduction, basic DAC techniques, 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.

UNIT-V:

COMBINATIONAL LOGIC DESIGN:

Introduction, Design and Analysis procedures, Decoders, encoders, multiplexers and demultiplexer, comparators, Ripple Adder, Binary Parallel Adder, Binary Adder-Subtractor**,** Combinational multipliers, Design considerations of the above combinational logic circuits with relevant Digital ICs.

UNIT - VI:

SEQUENTIAL LOGIC DESIGN:

Introduction to flip-flops, Design of Counters using Digital ICs, Counter applications, Synchronous design methodology, Universal Shift Register, Ring Counter, Johnson Counter, Design considerations of the above sequential logic circuits with relevant Digital ICs.

TEXT BOOKS:

1. Linear Integrated Circuits – D. Roy Chowdary, New Age International (p) Ltd, 2nd Edition, 2003. **(UNITS- II, III & IV)**

2. Op-Amps & Linear ICs - Ramakanth A. Gayakwad, PHI, 1987.(**UNITS-I,II&III)**

3. Digital Design Principles & Practices – John F. Wakerly , PHI/ Pearson Education Asia, 3rd Edition , 2005. **(UNITS-V&VI)**

REFERENCES:

1. Design with Operational Amplifiers & Analog Integrated Circuits - Sergio Franco, Mc.Gh

2. Digital fundamentals-Floyd and Jain Pearson education 8th Edition 2005.

B. TECH 5th SEMESTER	L	T	P	C
	3	0	0	3
16EE5E01: UTILIZATION OF ELECTRICAL ENERGY				

Learning objectives:

- To understand the operating principles and characteristics of traction motors with respect to speed, temperature, loading conditions.
- To acquaint with the different types of heating and welding techniques.
- To study the basic principles of illumination and its measurement.
- To understand different types of lightning system including design.
- To understand the basic principle of electric traction including speed–time curves of different traction services.
- To understand the method of calculation of various traction system for braking, acceleration and other
- To understand about UPS system

UNIT – I

Selection of Motors: Choice of motor, type of electric drives, starting and running characteristics, speed control, temperature rise, applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization.

UNIT – II

Electric Heating & Electric Welding: Advantages and methods of electric heating, resistance heating induction heating and dielectric heating. - Electric welding: Resistance and arc welding, electric welding equipment, comparison between A.C. and D.C. Welding.

UNIT – III

Illumination fundamentals & Various Methods: Introduction, terms used in illumination, laws of illumination, polar curves, integrating sphere, lux meter, sources of light.- Discharge lamps, MV and SV lamps – comparison between tungsten filament lamps and fluorescent tubes, Basic principles of light control, Types and design of lighting and flood lighting, LED lighting.

UNIT – IV

Electric Traction – I: System of electric traction and track electrification– Review of existing electric traction systems in India– Special features of traction motor– Mechanics of train movement– Speed–time curves for different services – Trapezoidal and quadrilateral speed time curves.

UNIT – V

Electric Traction – II: Calculations of tractive effort– power –Specific energy consumption for given run–Effect of varying acceleration and braking retardation–Adhesive weight and braking retardation adhesive weight and coefficient of adhesion– Principles of energy efficient motors.

UNIT – VI

UPS Systems: Introduction- Types and principles of UPS -types of batteries- Design and selection of UPS- Testing of UPS and its protection- Installation Procedure to maintain UPS.

Learning Outcomes:

1. Identify a suitable motor for electric drives and most appropriate heating or welding techniques for suitable application
2. Estimate the illumination levels produced by various sources and recommend the most efficient illuminating sources and should be able to design different lighting systems by taking inputs and constraints in view
3. Determine the speed/time characteristics of different types of traction motors and estimate energy consumption levels at various modes of operation
4. Demonstrate ups system

TEXT BOOK:

1. Utilization of Electric Energy – by E. Openshaw Taylor, Orient Longman.
2. Art & Science of Utilization of electrical Energy – by Partab, Dhanpat Rai & Sons.

REFERENCE BOOKS:

1. Utilization of Electrical Power including Electric drives and Electric traction – by N.V.Suryanarayana, New Age International (P) Limited, Publishers, 1996.
2. Generation, Distribution and Utilization of electrical Energy – by C.L. Wadhwa, New Age International (P) Limited, Publishers,1997.
3. Technical manual on uninterruptible power supply system by headquarters, department of the army available at: http://webbooks.net/freestuff/ups.pdf

B. TECH 5th SEMESTER	L	T	P	C
	3	0	0	3
16EE5E02: INSTRUMENTATION ENGINEERING				

Learning Objectives:

- To study various types of signals and their representation.
- To study various types of transducers: Electrical, Mechanical, Electromechanical, Optical etc.
- To study and measure the various types of Non–electrical quantities.
- To study various types of digital voltmeters
- To study the working principles of various types of oscilloscopes and their applications.
- To study various types of signal analyzers

UNIT-I

Characteristics of Signals and their representation: Measuring Systems, Performance Characteristics, - Static characteristics, Dynamic Characteristics; Errors in Measurement – Gross Errors, Systematic Errors, Statistical Analysis of Random Errors. Signal and their representation: Standard Test, periodic, a periodic, modulated signal, sampled data, pulse modulation and pulse code modulation

UNIT-II

Transducers: Definition of transducers, Classification of transducers, Advantages of Electrical transducers, Characteristics and choice of transducers; Principle operation of resistor, inductor, LVDT and capacitor transducers; LVDT Applications, Strain gauge and its principle of operation, Guage factor, Thermistors, Thermocouples, Synchros, Piezo electric transducers, photo diodes.

UNIT-III

Digital Voltmeters: Digital voltmeters- Successive approximation, ramp, dual-Slope integration continuous balance type-Micro processor based ramp type DVM digital frequency meter-digital phase angle meter

UNIT-IV

Oscilloscope: Cathode ray oscilloscope-time base generator-horizontal and vertical amplifiers-Measurement of phase and frequency-lissajous patterns-Sampling oscilloscope-analog and digital type data logger, transient recorder

UNIT-V

Signal Analyzers: Wave Analyzers- Frequency selective analyzers, Heterodyne, Application of Wave analyzers- Harmonic Analyzers, Total Harmonic distortion, spectrum analyzers, Basic

spectrum analyzers, spectral displays, vector impedance meter, Q meter. Peak reading and RMS voltmeters

UNIT-VI

Measurement of Non-Electrical Quantities: Measurement of strain, Gauge Sensitivity, Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Measurement of Temperature, Pressure, Vacuum, Flow, Liquid level.

TEXT BOOKS:

1. Transducers and Instrumentation by D.V.S Murthy, Prentice Hall of India
2. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpatrai & Co.

REFERENCE BOOKS:

1. Measurements Systems, Applications and Design – by D O Doeblin
2. Principles of Measurement and Instrumentation – by A.S Morris, Pearson /Prentice Hall of India
3. Electronic Instrumentation-by H.S.Kalsi Tata MCGraw-Hill Edition, 1995.
4. Modern Electronic Instrumentation and Measurement techniques – by A.D Helfrick and W.D.Cooper, Pearson/Prentice Hall of India.

Learning Outcomes:

- Able to represent various types of signals.
- Acquire proper knowledge to use various types of Transducers.
- Able to monitor and measure various parameters such as strain, velocity, temperature, pressure etc.
- Acquire proper knowledge and working principle of various types of digital voltmeters.
- Able to measure various parameter like phase and frequency of a signal with the help of CRO.
- Acquire proper knowledge and able to handle various types of signal analyzers.

B. TECH 5th SEMESTER	L	T	P	C
	3	0	0	3
16EE5E03: HIGH VOLTAGE ENGINEERING				

Learning Objectives:

The course should enable the student to understand

- The various types of over voltages in power system and protection methods.
- Generation of over voltages in laboratories
- Measurement of over voltages.
- Nature of Breakdown mechanism in solid, liquid and gaseous dielectrics.
- Testing of power apparatus and insulation coordination.

UNIT–I:
Introduction to High Voltage Technology
Electric Field Stresses Uniform and non–uniform field configuration of electrodes – Estimation and control of electric Stress, Numerical methods for electric field computation.

UNIT–II:
Break down phenomenon in gaseous, liquid and solid insulation
Gases as insulating media, Collision process , Ionization process, Townsend's criteria of breakdown in gases – Paschen's law, Liquid as Insulator , Pure and commercial liquids , Breakdown in pure and commercial liquid, Intrinsic breakdown, Electromechanical breakdown, Thermal breakdown Breakdown of solid dielectrics, composite dielectrics used in practice.

UNIT–III:
Generation of High voltages and High currents
Generation of high DC voltages, Generation of high alternating voltages, Generation of impulse voltages and currents, Tripping and control of impulse generators.

UNIT–IV:
Measurement of high voltages and High currents
Measurement of high AC, DC and Impulse voltages, Voltages and measurement of high currents, Direct, alternating and Impulse.

UNIT–V:
Non–destructive testing of material and electrical apparatus
Measurement of DC resistivity, Measurement of dielectric constant and loss factor, Partial discharge measurements.

UNIT–VI:
High voltage testing of electrical apparatus
Testing of insulators and bushings, Testing of isolators and circuit breakers, Testing of cables – Testing of transformers, Testing of surge arresters, Radio interference measurements.

Text Books:

1. High Voltage Engineering: Fundamentals by E.Kuffel, W.S.Zaengl, J.Kuffel by Elsevier, 2nd Edition.

2. High Voltage Engineering and Technology by Ryan, IET Publishers.

Reference Books:

1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 3rd Edition
2. High Voltage Engineering by C.L.Wadhwa, New Age Internationals (P) Limited, 1997.
3. High Voltage Insulation Engineering by RavindraArora, Wolfgang Mosch, New Age International (P) Limited, 1995.

Learning Outcomes:

- To be acquainted with the performance of high voltages with regard to different configurations of electrode systems.
- To be able to understand theory of breakdown and withstand phenomena of all types of dielectric materials.
- To acquaint with the techniques of generation of AC,DC and Impulse voltages.
- To be able to apply knowledge for measurement of high voltage and high current AC,DC and Impulse.
- To be in a position to measure dielectric property of material used for HV equipment.
- To know the techniques of testing various equipment's used in HV engineering.

B. TECH 5th SEMESTER	L	T	P	C
	3	0	0	3
16CS5E07: DATA STRUCTURES				

COURSE OUTCOMES

At the end of the course student able to

1. Illustrate single, circular and double linked list.
2. Analyze stacks and queues using arrays and linked lists.
3. Explain various operations on binary trees.
4. Apply appropriate sorting and searching techniques for the given data.
5. Analyze various concepts in binary tree
5. Illustrate various operations on Graphs.

UNIT – I

Introduction- Concept of data structures, overview of data structures, implementation of data structures. Searching: Linear Search, Binary Search, Fibonacci search. Sorting (Internal): Basic concepts, Sorting by: insertion (Insertion sort), selection (selection sort), exchange (Bubble sort, quick sort), distribution (radix sort) and merging (merge sort).

UNIT – II

Stacks Representation using Arrays and Linked List, operations on stack, factorial calculation, and evaluation of arithmetic expression.

UNIT – III

Queues Representation using Arrays and Linked List, operations on queue, circular queue, queue using stack.

UNIT – IV

Linked lists: Linked Lists- Single linked list, Circular linked list, Double linked list, Circular double linked list.

UNIT – V

Trees Binary Trees: Basic tree concepts, Properties, Representation of Binary Trees using Arrays and Linked List, Binary Tree Traversals, threaded binary tree. Binary search trees: Basic concepts, BST operations: Search, insertion, deletion and traversals, Creation of binary search tree from in-order and pre (post)order traversals.

UNIT – VI

Graphs Basic concepts, representations of graphs, operations on graphs- vertex insertion, vertex deletion, find vertex, edge addition, edge deletion, graph traversals (BFS & DFS)(No Programs required)

Text Books:

1. Richard F, Gilberg , Forouzan, Data Structures, 2nd edition, , Cengage.
2. Debasis samanta, Classic Data Structures, PHI, 2 nd edition, 2011.

Reference Books:

1. Seymour Lipschutz, Data Structure with C, TMH.
2. G. A. V. Pai, Data Structures and Algorithms, TMH, 2008.
3. Horowitz, Sahni, Anderson Freed, Fundamentals of Data Structure in C, University Press, 2nd edition

B. TECH 5th SEMESTER	L	T	P	C
	0	0	4	2
16EE5L01: ELECTRICAL MACHINES-II LAB				

OBJECTIVE

To give students a fair knowledge of testing different types of Synchronous machines and IM

- To rig up circuits for testing a given machine
- To obtain the performance characteristics of machines

LIST OF EXPERIMENTS

1. Voltage regulation of alternators (EMF & MMF Methods)
2. Regulation of three–phase alternator by Potier triangle method.
3. Slip test on salient pole alternator.
4. Determination of V and Inverted V curves
5. Circle diagram of 3- Ø squirrel cage induction motor
6. Load test on 3-phase slip ring induction motor
7. No load and Blocked rotor test on 1- Ø squirrel cage induction motor
8. Speed control of slip ring induction motor using rotor resistance.
9. Speed control of squirrel cage induction motor using V/F control.
10. Synchronization of alternator using 3 – lamp method

OUTCOME

1. Demonstrate knowledge of and apply the theory of induction motors and synchronous machines
2. Describe the requirements and characteristics of selected motors and generators for a given application
3. calculate Voltage regulation of Synchronous machine by using different methods
4. Ability to analyze load sharing of parallel operation of alternators

REFERENCES

1. Department Laboratory Manual.
2. Laboratory manual in Electro Machines by curriculum Development cell IIT, Delhi, Wiley Eastern Ltd,1990

B. TECH 5th SEMESTER	L	T	P	C
	0	0	4	2
16EE5L02: ELECTRICAL MEASUREMENTS LAB				

PART-A: Electrical Measurements

1. Measurement of low resistance using KDB.
2. Measurement of inductance & capacitance
3. Calibration of single phase energy meter
4. Measurement of power and power factor using two wattmeter method.
5. Calibration of dynamometer power factor meter
6. Calibration of LPF wattmeter – by direct loading.
7. Measurement of earth resistance
8. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter
9. Measurement of % ratio error and phase angle of given C.T. by comparison.
10. Measurement of 3 phases reactive power with single-phase wattmeter.
11. Measurement of parameters of a choke coil using 3 voltmeter and 3 ammeter methods.

Ten Experiments from the Above List

Learning Outcomes:

1. Demonstrate the knowledge about construction and working principles of different types of measuring instruments
2. Examine and conduct experiments, as well as to analyze and interpret data of power and energy.
3. Explain the deviations in magnetic measurements due to the influence of the instrument
4. Apply the principles of various types of Digital meters

B. TECH 5th SEMESTER	L	T	P	C
PROFESSIONAL ETHICS &INTELLECTUAL PROPERTY RIGHTS				

COURSE OUTCOMES:

Students are able to

CO1. Identify the professional roles played by an engineer and illustrate the process of Social experimentation

CO2.Determine Engineer's responsibilities and rights towards the society

CO3.Analyze various aspects of Intellectual Property Rights and recognize the process of protecting the copyrights

CO4.Describe the registration process of Patents and trademarks and also demonstrate the concept of trade secrets and cybercrimes

UNIT-I:

ENGINEERING ETHICS: Importance of Engineering Ethics, Professional and Professionalism, Professional Roles to be played by an Engineer, Professional Ethics.

UNIT-II:

ENGINEERING AS SOCIAL EXPERIMENTATION: Role of engineering in knowledge society, Knowledge acquired, Conscientiousness, Relevant Information, Engineers as Managers, Consultants, and Leaders.

ENGINEERS' RESPONSIBILITY FOR SAFETY AND RISK: Role and importance of Safety and risk- Types of Risks , Threshold Levels for Risk, Risk Benefit Analysis.

UNIT-III:

ENGINEERS' RESPONSIBILITIES AND RIGHTS: Collegiality, Conflict of Interest-solving conflict problems, Ethical egoism, Collective bargaining, Confidentiality, Acceptance of Bribes/Gifts, Occupational Crimes-industrial espionage, Whistle Blowing-types of whistle blowing.

UNIT IV:

INTELLECTUAL PROPERTY AND COPY RIGHTS: Introduction to Intellectual Property Law , Types of Intellectual Property, Infringement, Copyrights**:** Introduction to Copyrights, Principles of Copyright, Rights Afforded by Copyright Law, Copyright Formalities and Registration.

UNIT-V:

PATENTS AND TRADEMARKS: Introduction to Patent Law, Rights under Patent Law , Patent Requirements, Patent Application Process and Granting of Patent, Double Patenting, Patent Cooperation Treaty**.** Trademarks: Introduction to Trade Mark, Trade Mark Registration Process, Trade Mark maintenance, Likelihood of confusion

UNIT-VI: TRADE SECRETS AND CYBER LAW: Introduction to Trade Secrets , Maintaining Trade Secret, Physical Security, Unfair Competition, Breach of Contract .Cyber law**:** Introduction to Cyber Law , Information Technology Act ,Cyber Crime and E-commerce, Data Security .

TEXT BOOKS:

1. "Engineering Ethics and Human Values" by M.Govindarajan, S.Natarajan and V.S.Senthil Kumar-PHI Learning Pvt. Ltd-2009. **(UNIT -I,II &III)**
2. Deborah E.Bouchoux: "Intellectual Property". Cengagelearning , NewDelhi, BS Publications (Press) **(IV,V&VI)**
3. PrabhuddhaGanguli: ' Intellectual Property Rights" Tata Mc-Graw – Hill, New Delhi**(IV,V&VI)**

B. TECH 6th SEMESTER	L	T	P	C
	3	1	0	4
16EE6T01: POWER SYSTEM ANALYSIS				

Learning Objectives:

- To study the development of impedance diagram (p.u) and formation of Ybus
- To study the Gauss Seidel, Newton raphson, decoupled and fast decoupled load flow methods.
- To study the concept of the Zbus building algorithm.
- To study short circuit calculation for symmetrical faults
- To study the effect of unsymmetrical faults.
- To study the rotor angle stability analysis of power systems.

UNIT –I

Per-Unit Representation: Per Unit Quantities–Single line diagram– Impedance diagram of a power system – Graph theory definition – Formation of element node incidence and bus incidence matrices – Primitive network representation – Formation of Y– bus matrix by singular transformation and direct inspection methods.

UNIT –II

Power Flow Studies: Necessity of power flow studies – Derivation of static power flow equations – Gauss-Seidel Method (limited to 3-buses), Algorithm-Newton Raphson Method in Rectangular and polar coordinates form – Derivation of Jacobian matrix, power flow solution using NR method (3bus), Decoupled and fast Decoupled method (3 bus), Algorithms.

UNIT – III

Z-Bus formulation: Formation of Z-Bus: Partial network, Algorithm for the Modification of Z-Bus Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses (Derivations and Numerical Problems).- Modification of Z-Bus for the changes in network (Problems) -Sparsity Matrix.

UNIT – IV

Symmetrical Fault Analysis: 3-Phase short circuit currents and reactances of synchronous machine, short circuit MVA calculations, symmetrical fault calculations using Z-bus.

UNIT –V

Symmetrical Components & Faults: Synthesis of unsymmetrical phasor from their symmetrical components, operators, symmetrical components of unsymmetrical phasor, phase – shift of symmetrical components in Y-Δ, power in terms of symmetrical components, sequence networks – positive, negative and zero sequence networks. Various types of unsymmetrical faults LG, LL, LLG on unloaded alternator, unsymmetrical faults on power system

UNIT –VI

Power System Stability Analysis: Elementary concepts of Steady state, Dynamic and Transient Stabilities. Description of Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State Stability. Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, methods to improve steady state and transient stability.

OUTCOMES:

1. Construct the impedance diagram (p.u) and formation of Ybus
2. Analyze the Gauss Seidel, Newton raphson, decoupled and fast decoupled load flow methods
3. Apply the concept of the Zbus building algorithm and short circuit calculation for symmetrical faults
4. Analyze the effect of unsymmetrical faults and the rotor angle stability analysis of power systems

TEXT BOOKS:

1. Power System Analysis by John.J Grainger and Stevenson, Tata McGraw Hill – 4th Edition
2. Modern Power system Analysis – by I.J.Nagrath &D.P.Kothari: Tata Mc Graw–Hill Publishing Company, 2nd edition.
3. Electrical power systems by C.L. Wadhwa, New age- International(P) Ltd., - 7th Edition
4. Power System Analysis and Design by J.Duncan Glover, M.S.Sarma, T.J. Overbye – Cengage Learning publications.

REFERENCE BOOKS:

1. Power System Analysis – by A.R.Bergen, Prentice Hall, Inc.
2. Power System Analysis by Hadi and Saadat – TMH Edition.
3. Power System Analysis by B.R.Gupta, Wheeler Publications.
4. Electrical Power Systems by P.S.R.Murthy, B.S.Publications

B. TECH 6th SEMESTER	L	T	P	C
	3	1	0	4
16EC6T02: MICROPROCESSORS & MICROCONTROLLERS				

COURSE OUTCOMES:

CO1. Explain architecture, instructions and addressing modes of various Microprocessors and Microcontrollers.

CO2. Develop Assembly programs for various industrial requirements.
CO3. Analyze 8086 interfacing with different peripherals and implement programs.
CO4. Design a minimum workable system with Microprocessors & Microcontrollers.

UNIT-I:
INTRODUCTION TO MICROPROCESSORS: Little Endian and Big Endian Formats , Von-Neumann and Harvard architectures, RISC Vs CISC processors, Family of Intel processors.
8085 Microprocessor: Register organization, Architecture and signal description, General bus operation, I/O addressing capability, Timing diagrams.

UNIT-II:
8086 MICROPROCESSOR: Register organization, Architecture and Signal description, Physical memory organization, General bus operation, I/O addressing capability, Special purpose activities.

UNIT-III:
MINIMUM MODE AND MAXIMUM MODE OF 8086: Timing diagrams, Addressing modes of 8086, Instruction set of 8086, Assembler directives, Procedures and Macros, Assembly language programming.

UNIT-IV:
BASIC PERIPHERALS AND INTERFACING WITH 8086: Memory interfacing, 8255-PPI, Interfacing to D/A and A/D converters, Stepper motor interfacing, Control of high power devices using 8255.

UNIT-V:
SPECIAL PURPOSE PROGRAMMABLE INTERFACING DEVICES: Interrupts and interrupt service routines Interrupt cycle of 8086, non-maskable interrupt, maskable interrupts, interrupt programming. 8259 – PIC, 8251 – USART, 8237 – DMA controller.

UNIT-VI:
8051 MICROCONTROLLER: Introduction to microcontrollers, 8051 microcontroller, 8051 pin description, connections, I/O ports, Memory organization, Interrupts, Timers, Serial port, Programming with Embedded C.

TEXT BOOKS:

1. Microprocessor Architecture, programming and applications with the 8085 by Ramesh Goankar, 5th edition, Penram International Publications 2000 **(UNIT - I)**
2. Advanced Microprocessors And Peripherals by A .K .Ray, K.M.Bhurchandi,Tata McGraw Hill Publishers, 2006. **(UNITS - II,III,IV & V)**
3. 8051 Micro Controllers -Kenneth J. Ayala, Penram International/ Thomson,1995. **(UNIT - VI)**

REFERENCE BOOKS:

1. Barry B. Brey, "The Intel Microprocessors 8086/8088, 80186/80188, 80286,80386, 80486, and Pentium processors. Architecture, programming and interfacing".
2. Douglas V Hall, "Microprocessors and Interfacing: Programming and Hardware", 2nd edition, TMH.
3. Microcontrollers by Ajay V Deshmukh, TATA McGraw Hill publications 2012. Microcontrollers(Architecture, Programming, Interfacing and System Design-2nd Edition) – Raj kamal, Pearson Publication 2012.

B. TECH 6thSEMESTER	L	T	P	C

	3	0	0	3

16EE6T02: POWER SEMICONDUCTOR DRIVES

Learning Objectives:

- To analyze the operation of single and three phase converter fed DC drives and four quadrant operation of dc motors using dual converters.
- To discuss the converter control of dc motors in various quadrants.
- To understand the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters.
- To learn the principles of static rotor resistance control and various slip power recovery schemes.
- To understand the speed control mechanism of synchronous motors

UNIT–I:

Single phase rectifier fed DC Drives: Introduction to Thyristor controlled drives, Single Phase semi and Fully controlled converters connected to d.c separately excited and d.c series motors – continuous current operation – output voltage and current waveforms – Speed – Torque Characteristics-.

UNIT–II:

Three phase rectifier fed DC Drives: Revision of speed control techniques – Separately excited and series motors controlled by full converters – Output voltage and current waveforms – Speed-torque characteristics — Four quadrant operation using dual converters.

UNIT–III:

Chopper fed DC Drives : Single quadrant, Two quadrant and four quadrant chopper fed separately excited, series excited motors – Continuous current operation– Output voltage and current waveforms – Speed–torque characteristics, Closed loop speed control operation (Block diagrams only).

UNIT–IV:

Induction motor control – Stator side: Variable voltage characteristics–Control of Induction Motor by AC Voltage Controllers – Waveforms –Speed torque characteristics– Variable Voltage Variable Frequency control of induction motor by voltage source inverter – PWM control – Closed loop operation of induction motor drives (Block Diagram Only).

UNIT–V:

Control of Induction motor – Rotor side: Static rotor resistance control – Slip power recovery schemes – Static Scherbius drive – Static Kramer drive – Performance and speed torque characteristics – Advantages –Applications.

UNIT–VI:

Control of Synchronous Motors: Separate control &self control of synchronous motors – Operation of self controlled synchronous motors by VSI– Closed Loop control operation of synchronous motor drives (Block Diagram Only) –Variable frequency control–Pulse width modulation.

Learning Outcomes:

Student should be able to

1. To analyze the operation of single and three phase converter fed DC drives and speed-torque characteristics and expressions of 3 phase converter fed DC drives
2. To discuss two quadrant and four quadrant chopper fed DC drives
3. Observe the concept of a speed control of induction motor by using AC voltage controller and voltage source inverters
4. To learn the principles of various slip power recovery schemes and speed control mechanism of synchronous motor

Text Books:

1. Fundamentals of Electric Drives – by G K Dubey Narosa Publications
2. Power Semiconductor Drives, by S.B. Dewan, G.R.Slemon, A.Straughen, Wiley-India Edition.

Reference Books:

1. Electric Motors and Drives Fundamentals, Types and Apllications, by Austin Hughes and Bill Drury, Newnes.
2. Thyristor Control of Electric drives – Vedam Subramanyam Tata McGraw Hill Publications.
3. Power Electronic Circuits, Devices and applications by M.H. Rashid, PHI.
4. Power Electronics handbook by Muhammad H.Rashid, Elsevier

B. TECH 6th SEMESTER	L	T	P	C
	3	0	0	3
16EE6E01: SWITCH GEAR AND PROTECTION				

UNIT–I

Circuit Breakers: Introduction, Miniature Circuit Breaker(MCB)– Elementary principles of arc interruption– Restrike Voltage and Recovery voltages– Restrike phenomenon– Average and Max. RRRV– Current chopping and Resistance switching– Introduction to oil circuit breakers– Description and operation of Air Blast– Vacuum and SF6 circuit breakers– CB ratings and specifications– Auto reclosing.

UNIT–II

Electromagnetic Protection: Principle of operation and construction of attracted armature– Balanced beam– induction disc and induction cup relays– Relays classification– Instantaneous– DMT and IDMT types– Applications of relays**:** Over current/under voltage relays– Directional relays– Differential relays and percentage differential relays– Universal torque equation– Distance relays**:** Impedance– Reactance– Mho and offset mho relays– Characteristics of distance relays and comparison.

UNIT–III

Generator Protection: Protection of generators against stator faults– Rotor faults and abnormal conditions– restricted earth fault and inter turn fault protection– Numerical examples.

Transformer Protection: Protection of transformers**:** Percentage differential protection– Design of CT's ratio– Buchholz relay protection–Numerical examples.

UNIT–IV:

Feeder and Bus bar Protection: Protection of lines**:** Over current– Carrier current and three zone distance relay using impedance relays–Translay relay–Protection of bus bars– Differential protection.

UNIT–V:

Static and Digital Relays: Static relays**:** Static relay components– Static over current relay– Static distance relay– Micro processor based digital relays.

UNIT–VI:

Protection against over voltage and grounding: Generation of over voltages in power systems– Protection against lightning over voltages– Valve type and zinc–Oxide lighting arresters– Insulation coordination– BIL– impulse ratio– Standard impulse test wave– volt~time characteristics– Grounded

and ungrounded neutral systems–Effects of ungrounded neutral on system performance– Methods of neutral grounding**:** Solid–resistance–Reactance–Arcing grounds and grounding Practices.

Learning Outcomes:

Student should be able to

1. Express the principle of operation of circuit breaker with arc phenomena and also different types of circuit breaker
2. Differentiate the types of relays and circuit breakers depends on applications and electrical equipment which has to be protected
3. Develop appropriate protection methods for different electrical equipment's to reduce fault currents and over voltages effectively with in short time
4. Solve the abnormal conditions like short circuit current, over voltages under different faults occurrence

Text Books:

1. Protection and SwitchGear by BhaveshBhalja, R.P. Maheshwari, NileshG. Chothani, Oxford University Press, 2013
2. Power system protection- Static Relays with microprocessor applications. by T.S. Madhava Rao, TMH
3. Electrical Power System Protection by C. CHRISTOPOULOS and A. Wright, Springer publications

Reference Books:

1. Power System Protection and Switchgear by Badari Ram, D.N Viswakarma, TMH Publications.
2. Fundamentals of Power System Protection by Paithankar and S.R. Bhide, PHI, 2003.
3. Art & Science of Protective Relaying – by C R Mason, Wiley Eastern Ltd.

B. TECH 6th SEMESTER	L	T	P	C
	3	0	0	3
16EE6E02: DIGITAL CONTROL SYSTEMS				

Learning objectives

- To understand the concepts of digital control systems and assemblevarious components associated with it. Advantages compared to the analog type.
- The theory of z–transformations and application for the mathematical analysis of digital control systems.
- To represent the discrete–time systems in state–space model and evaluation of state transition matrix.
- To examine the stability of the system using different tests.
- To study the conventional method of analyzing digital control systems in the w–plane.
- To study the design of state feedback control by "the pole placement method."

UNIT – I

Introduction and signal processing : Introduction to analog and digital control systems – Advantages of digital systems – Typical examples – Signals and processing – Sample and hold devices – Sampling theorem and data reconstruction – Frequency domain characteristics of zero order hold.

UNIT–II

Z–transformations : Z–Transforms – Theorems – Finding inverse z–transforms – Formulation of difference equations and solving – Block diagram representation – Pulse transfer functions and finding open loop and closed loop responses.

UNIT–III

State space analysis and the concepts of Controllability and observability: State Space Representation of discrete time systems – State transition matrix and methods of evaluation – Discretization of continuous – Time state equations – Concepts of controllability and observability – Tests (without proof).

UNIT – IV

Stability analysis: Mapping between the S–Plane and the Z–Plane – Primary strips and Complementary Strips – Stability criterion – Modified routh's stability criterion and jury's stability test.

UNIT – V

Design of discrete–time control systems by conventional methods: Transient and steady state specifications – Design using frequency response in the w–plane for lag and led compensators – Root locus technique in the z– plane.

UNIT – VI

State feedback controllers: Design of state feedback controller through pole placement – Necessary and sufficient conditions – Ackerman's formula.

Learning outcomes

- The students learn the advantages of discrete time control systems and the "know how" of various associated accessories.
- The learner understands z–transformations and their role in the mathematical analysis of different systems (like laplace transforms in analog systems).
- The stability criterion for digital systems and methods adopted for testing the same are explained.
- Finally, the conventional and state–space methods of design are also introduced.

Text Book

1.Discrete–Time Control systems – K. Ogata, Pearson Education/PHI, 2nd Edition

Reference Books

1.Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003.

2.Digital Control and State Variable Methods by M.Gopal, TMH

B. TECH 6th SEMESTER	L	T	P	C
	3	0	0	3
16EE6E03: BIO MEDICAL INSTRUMENTATION				

UNIT-I:

INTRODUCTION TO BIOMEDICAL INSTRUMENTATION: Age of Biomedical Engineering, Development of Biomedical Instrumentation, Man Instrumentation System, Components of the Man-Instrument System, Physiological System of the Body, Problems Encountered in Measuring a Living System, Sources of Bioelectric Potentials, Muscle, Bioelectric Potentials, Sources of Bioelectric Potentials, Resting and Action Potentials, Propagation of Action Potential, Bioelectric Potentials-ECG, EEG and EMG, Envoked Responses.

UNIT-II:

ELECTRODES AND TRANSDUCERS: Introduction, Electrode Theory, Biopotential Electrodes, Examples of Electrodes, Basic Transducer Principles, Biochemical Transducers, The Transducer and Transduction Principles, Active Transducers, Passive Transducers, Transducers for Biomedical Applications, Pulse Sensors, Respiration Sensor, Transducers with Digital Output.

UNIT-III:

CARDIOVASCULAR SYSTEM AND MEASUREMENTS: The Heart and Cardiovascular System, Electro Cardiography, Blood Pressure Measurement, Measurement of Blood Flow and Cardiac Output, Measurement of Heart Sound, Plethysmography.

MEASUREMENTS IN THE RESPIRATORY SYSTEM: The Physiology of The Respiratory System, Tests and Instrumentation for The Mechanics of Breathing, Respiratory Therapy Equipment.

UNIT-IV:

PATIENT CARE AND MONITORING: Elements of Intensive-Care Monitoring, Patient Monitoring Displays, Diagnosis, Calibration and Repair ability of Patient-Monitoring Equipment, Other Instrumentation for Monitoring Patients, Organization of the Hospital for Patient-Care Monitoring, Pacemakers, Defibrillators, Radio Frequency Applications of Therapeutic use.

THERAPEUTIC AND PROSTHETIC DEVICES: Audiometers and Hearing Aids. Myoelectric Arm, Laparoscope, Ophthalmology Instruments, Anatomy of Vision,. Electro physiological Tests,

Ophthalmoscope, Tonometer for Eye Pressure Measurement. Diathermy, Clinical Laboratory Instruments, Biomaterials, Stimulators.

UNIT-V:

DIAGNOSTIC TECHNIQUES AND BIO-TELEMETRY: Principles of Ultrasonic Measurement, Ultrasonic Imaging, Ultrasonic Applications of Therapeutic Uses, Ultrasonic Diagnosis, X-Ray and Radio-Isotope Instrumentations, CAT Scan, Emission Computerized Tomography, MRI, Introduction to Biotelemetry, Physiological Parameters Adaptable to Biotelemetry, The Components of Biotelemetry System, Implantable Units, Telemetry for ECG Measurements during Exercise, Telemetry for Emergency Patient Monitoring.

UNIT-VI:

MONITORS, RECORDERS AND SHOCK HAZARDS: Biopotential Amplifiers, Monitors, Recorders, Shock Hazards and Prevention,Physiological Effects and Electrical Current, Shock Hazards from Electrical Equipment, Methods of Accident Prevention, Isolated Power Distribution System.

Text Books:

- "Bio-Medical Electronics and Instrumentation", Onkar N. Pandey, Rakesh Kumar, Katson Books.
- "Bio-Medical Instrumentation", Cromewell , Wiebell, Pfeiffer

References

- "Introduction to Bio-Medical Equipment Technology", 4th Edition, Joseph J. Carr, John M. Brown, Pearson Publications.
- "Hand Book of Bio-Medical Instrumentation", Instrumentation", Kandahar. McGrawHill

B. TECH 6th SEMESTER	L	T	P	C
	3	0	0	3
16CS6E06: OPERATING SYSTEMS				

COURSE OUTCOMES

1: Students are able to define fundamental concepts about operating systems.
2: Describe process management and CPU scheduling.
3: Describe concurrency control mechanisms.
4: Analyse memory management Technique.
5: Students are able state Deadlocks and Write solution to it.
6: Students are able to define file systems interface and Implementation.

UNIT-I:

Computer System and Operating System Overview: Overview of computer operating systems, operating systems functions, protection and security, distributed systems, special purpose systems, operating systems structures and systems calls, operating systems generation.

UNIT-II:

Process Management – Process concept- process scheduling, operations, Inter process communication. Multi Thread programming models. Process scheduling criteria and algorithms, and their evaluation.

UNIT-III:

Concurrency: Process synchronization, the critical- section problem, Peterson's Solution, synchronization Hardware, semaphores, classic problems of synchronization, monitors, Synchronization examples

UNIT-IV:

Memory Management: Swapping, contiguous memory allocation, paging, structure of the page table, segmentation

Virtual Memory Management:

virtual memory, demand paging, page-Replacement, algorithms, Allocation of Frames, Thrashing

UNIT-V:

Principles of deadlock – system model, deadlock characterization, deadlock prevention, detection and avoidance, recovery form deadlock,

UNIT-VI:

File system Interface- the concept of a file, Access Methods, Directory structure, File system mounting, file sharing, protection.

File System implementation- File system structure, allocation methods, free-space management **Mass-storage structure** overview of Mass-storage structure, Disk structure, disk attachment, disk scheduling

TEXT BOOKS:

1. Operating System Concepts- Abraham Silberchatz, Peter B. Galvin,Gagne 7th Edition, John Wiley.
2. Operating Systems' – Internal and Design Principles Stallings, Sixth Edition, Pearson education.

B. TECH 6th SEMESTER	L	T	P	C
	0	0	4	2
16EE6L01: POWER ELECTRONICS LAB				

Learning objectives:

- To study the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR.
- To analyze the performance of single–phase and three–phase full–wave bridge converters, single–phase dual converter with both resistive and inductive loads.
- To understand the operation of AC voltage controller and cycloconverter with resistive and inductive loads.
- To understand the working of Buck converter, Boost converter, single–phase bridge inverter and PWM inverter.

LIST OF EXPERIMENTS

1. Study the Characteristics of SCR, MOSFET & IGBT
2. Study the Characteristics of TRIAC and DIAC
3. Gate firing circuits for SCR's
4. Single -Phase Half controlled converter with R and RL load
5. Single -Phase fully controlled bridge converter with R and RL loads
6. Single -Phase AC Voltage Controller with R and RL Loads
7. Single -Phase Cyclo–converter with R and RL loads
8. Single -Phase dual converter with RL loads
9. Three -Phase half controlled bridge converter with RL load.
10. Study of single phase full bridge inverter for square wave output
11. Study of DC–DC boost converter.
12. Study of DC–DC buck converter.

Minimum of Ten Experiments from the Above List

Learning outcomes:

1. Explain the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR
2. Analyze the performance of single–phase and three–phase full–wave bridge converters, single–phase dual converter with both resistive and inductive loads

3. Describe the operation of AC voltage controller and cycloconverter with resistive and inductive loads
4. Discuss the working of Buck converter, Boost converter, single–phase bridge inverter and PWM inverter

B. TECH 6th SEMESTER	L	T	P	C
	0	0	4	2
16EC6L01: MICROPROCESSORS & MICROCONTROLLERS LAB				

Students are able to

CO1. Demonstrate assembly language programs for various problems.
CO2. Develop the programs using Microcontroller 8051 for various applications.
CO3. Design microprocessor to external devices like keyboard, DAC, Stepper motor.
CO4. Analyze the Embedded C programs for simple applications.

PART-I:

MICROPROCESSOR-8086 Programming

1. Verify Arithmetic Operations for Multi byte Addition and Subtraction using ALP.
2. Execute ALP for Multiplication and Division for signed and unsigned Arithmetic operations.
3. Develop assembly programs for different ASCII Arithmetic operation.
4. Explain how Logical operations are performed in Microprocessors with the help of TASM SOFTWARE.
5. Perform Convections of all BCD and ASCII operations using ALP.
6. Construct different programs for checking all String operations.
7. Apply DOS/BIOS programming for Reading data from keyboard.

PART-II:

INTERFACING WITH 8086

1. Design an Interfacing circuit for DAC with 8086 μP to generate various waveforms using 8255.
2. Write a control word format for 8255 to interface stepper motor with 8086 μP using 8255.

PART-III:

INTERFACING WITH MICROCONTROLLER

1. Write an Embedded C program to interface switches and LEDs/Seven Segment display.
2. Demonstrate different modes of Timers in 8051 μC.
3. Verify how Serial Communication Implemented in 8051 μC.

EQUIPMENT REQUIRED FOR LABORATORY

1. MASM/TASM software
2. 8086 Microprocessor Kits
3. D/A Interface
4. Stepper motor
5. 8051 Micro Controller kits
6. Keil Software

B. TECH 6th SEMESTER	L	T	P	C
	0	0	0	0
: SOFT SKILLS				

- Total Number of Laboratory Sessions: 10
- Total Number of Modules: 4

List of Modules:

- **Module-I:** Communicative Grammar and Language Skills

  i) Grammar: a) Parts of Speech
  b) Articles and useful prepositions
  c) Sentence and its types
  d) Verb forms and Tenses
  e) Question Tags
  f) Do-Forms and Wh-questions
  g) Common mistakes at proficiency

  ii) Language Skills

  a) Listening activity with a CD on Parts of Speech
  b) Listening activity with a CD on Articles and Prepositions
  c) Listening activity through CD on sentence and its types
  d) Listening activity with a CD on Verb forms and Tenses
  e) Reading activity on Question Tags
  f) Reading activity on Do-Forms and Wh-questions
  g) Writing activity (Resume)
  h) Writing activity (E-mail)
  i) Writing activity (Guided Composition)
  j) Writing activity (Guided Composition)

- **Module-II:** Communication Skills
  a) JAM/J2M on a given topic
  b) Introduce yourself (Strengths and weaknesses)
  c) Conversations
  d) Body Language
  e) Presentations
  f) Group Discussion
  g) Interview Skills

- **Module-III:** Vocabulary
  a) 20 useful vocabulary for an engineering resume
  b) Commonly confused words
  c) One-word Substitutes
  d) Useful phrases or expressions for a Telephonic Interview
  e) Useful phrases or expressions for introduction and conclusion at a speech, interview, presentation, seminar, conference, GD etc.

f) GRE words
g) Useful phrases for an interview

- **Module-IV:** Soft Skills
  a) Positive Attitude- Courtesy and etiquette
  b) Motivation
  c) Adaptability
  d) Goal Setting
  e) Leadership Qualities
  f) Team Work
  g) Problem Solving
  h) Time and Stress Management
  i) Negotiation and conflict resolution
  j) Interpersonal Skills

- **Method/Approach to be Adopted:** Communicative, implicit, incidental and activity based method to create enthusiasm among the students.

Division of Syllabus for each Laboratory Session

Lab-I: Time allotted 4 periods

Part-I: Communicative Grammar and Language Skills
Grammar Topic: Parts of Speech
Language Skills Topic: Listening activity with a CD on Parts of Speech
Activity follows

Part-II: Communication Skills

Topic: JAM/J2M on a given topic

Part –III: Vocabulary

Topic: 20 useful vocabulary for an engineering resume

Part-IV: Soft Skills

Topic: Positive Attitude- Courtesy and etiquette

Lab-II: Time allotted 4 periods

Part-I: Communicative Grammar and Language Skills

Grammar Topic: Articles and useful prepositions
Language Skills Topic: Listening activity with a CD on Articles and Prepositions
Follow-up Activity: Articles and Prepositions
For E.g., Picture Description on Articles and Prepositions

Part-II: Communication Skills

Topic: Introduce yourself (Strengths and weaknesses)
Activity: Role Play/Simulation

Part –III: Vocabulary
Topic: Commonly confused words

Part-IV: Soft Skills
Topic: Motivation

Lab-III: Time allotted 4 periods

Part-I: Communicative Grammar and Language Skills
Grammar Topic: Sentence and its types
Language Skills Topic: Listening activity through CD on sentence and its types
Follow-up Activity: Sentence and its types

Part-II: Communication Skills
Topic: Conversations
For E.g., Greetings and Introducing, Making Requests etc.
Activity: Role Play/Simulation

Part –III: Vocabulary
Topic: One-word Substitutes

Part-IV: Soft Skills
Topic: Adaptability

Lab-IV: Time allotted 4 periods

Part-I: Communicative Grammar and Language Skills
Grammar Topic: Verb forms and Tenses
Language Skills Topic: Listening activity with a CD on Verb forms and Tenses
Follow-up Activity: Story Narration

Part-II: Communication Skills
Topic: Conversations

Part –III: Vocabulary
Topic: Useful phrases or expressions for a Telephonic Interview

Part-IV: Soft Skills
Topic: Goal Setting

Lab-V: Time allotted 4 periods

Part-I: Communicative Grammar and Language Skills
Grammar Topic: Question Tags
Language Skills Topic: Reading activity with a CD on Question Tags
Follow-up Activity: Question Tags

Part-II: Communication Skills

Topic: Body Language

Part –III: Vocabulary
Topic: Useful phrases or expressions for introduction and conclusion at a speech, interview, presentation, seminar, conference, GD etc.

Part-IV: Soft Skills
Topic: Leadership Qualities

Lab-VI: Time allotted 4 periods

Part-I: Communicative Grammar and Language Skills
Grammar Topic: Do-Forms and Wh-questions
Language Skills Topic: Reading activity without a CD on Do-Forms and Wh-questions
Follow-up Activity on Do-Forms and Wh-questions

Part-II: Communication Skills
Topic: Presentations

Part –III: Vocabulary
Topic: GRE words

Part-IV: Soft Skills
Topic: Team Work

Lab-VII: Time allotted 4 periods

Part-I: Communicative Grammar and Language Skills
Grammar Topic: Common mistakes at proficiency
Language Skills Topic: Writing (Resume)

Part-II: Communication Skills
Topic: Group Discussion

Part –III: Vocabulary
Topic: GRE Words

Part-IV: Soft Skills
Topic: Problem Solving

Lab-VIII: Time allotted 4 periods

Part-I: Communicative Grammar and Language Skills
Grammar Topic: Common mistakes at proficiency
Language Skills Topic: Writing (E-mail)

Part-II: Communication Skills
Topic: Group Discussion

Part –III: Vocabulary
Topic: GRE words

Part-IV: Soft Skills

Topic: Time and Stress Management

Lab-IX: Time allotted 4 periods

Part-I: Communicative Grammar and Language Skills
Grammar Topic: Common mistakes at proficiency
Language Skills Topic: Writing (Guided Composition)

Part-II: Communication Skills
Topic: Group Discussion

Part –III: Vocabulary
Topic: Common mistakes at proficiency

Part-IV: Soft Skills
Topic: Negotiation and conflict resolution

Lab-X: Time allotted 4 periods

Part-I: Communicative Grammar and Language Skills
Grammar Topic: Common mistakes at proficiency
Language Skills Topic: Writing (Guided Composition)

Part-II: Communication Skills
Topic: Interview Skills

Part –III: Vocabulary
Topic: Common mistakes at proficiency

Part-IV: Soft Skills
Topic: Interpersonal Skills

APTITUDE LAB FOR VI SEM (40 HOURS)

TOPICS

APTITUDE

- **PERCENTAGES (3)**
- **RATIO AND PROPORTIONS (3)**
- **AVERAGES (2)**
- **TIME AND WORK (2)**
- **PIPES AND CISTERNS (1)**
- **PROFIT AND LOSS (3)**
- **LCM & HCF (3)**
- **SIMPLE INTEREST (2)**
- **COMPOUND INTEREST (3)**
- **TIME AND DISTANCE (2)**
- **TRAINS ,BOATS & STREAMS (2)**

REASONING

- **BLOOD RELATIONS (2)**
- **DIRECTIONS (2)**
- **SYLLOGISM (2)**
- **CODING AND DECODING (2)**
- **ANOLOGY (2)**
- **CLASSIFICATION (2)**
- **SERIES (2)**

B. TECH 7th SEMESTER	L	T	P	C
	3	1	0	4
16EE7T01: POWER SYSTEM OPERATION AND CONTROL				

Learning Objectives:

- To understand optimal dispatch of generation with and without losses.
- To study the optimal scheduling of hydro thermal systems.
- To study the optimal unit commitment problem.
- To study the load frequency control for single area system
- To study the PID controllers for single area system and two area system.
- To understand the reactive power control and compensation of transmission lines.

UNIT–I

Economic Operation of Power Systems: Optimal operation of Generators in Thermal Power Stations, - heat rate Curve – Cost Curve – Incremental fuel and Production costs, input-output characteristics, Optimum generation allocation with line losses neglected, Optimum generation allocation including the effect of transmission line losses – Loss Coefficients, General transmission line loss formula.

UNIT–II

Hydrothermal Scheduling: Optimal scheduling of Hydrothermal System: Hydroelectric power plant models, scheduling problems- Short term hydrothermal scheduling problem.

UNIT–III

Unit Commitment: Optimal unit commitment problem – Need for unit commitment – constraints in unit commitment – cost function formulation – solution methods – dynamic programming.

UNIT–IV

Single Area Load Frequency Control: Modelling of steam turbine, generator, mathematical modelling of speed governing system – Transfer function, modelling of Hydro turbine. Necessity of keeping frequency constant. Definitions of Control area – Single area control – Block diagram representation of an isolated power system – Steady state analysis – Dynamic response – Uncontrolled case, PI Control of single area and it's representation, Steady state response.

UNIT–V

LFC Controllers & Two-Area Load Frequency Control: Load Frequency controller: Proportional plus Integral control of single area and its block diagram representation, steady state response – Load

Frequency Control and Economic dispatch control. Load frequency control of two area system – uncontrolled case and controlled case, tie-line bias control,

UNIT–VI

Reactive Power Control: Overview of Reactive Power control – Reactive Power compensation in transmission systems –advantages and disadvantages of different types of compensating equipment for transmission systems; load compensation – Specifications of load compensator, Uncompensated and compensated transmission lines: shunt and Series Compensation, introduction to flexible alternating current transmission system (FACTS).

Learning Outcomes:

1. Describe optimal operation of Generators in Thermal and Hydro Power Stations
2. Explain the optimal unit commitment problem
3. Operate and Differentiate the load frequency control for single area and two area system
4. Explain the reactive power control and compensation of transmission lines

TEXT BOOKS

1. Power System stability & control, Prabha Kundur,TMH
2. Modern Power System Analysis – by I.J.Nagrath & D.P.Kothari Tata Mc Graw – Hill Publishing Company Ltd, 2nd edition.

REFERENCE BOOKS:

1. Power System Analysis and Design by J.Duncan Glover and M.S.Sarma., THOMPSON, 3rd Edition.
2. Electric Energy systems Theory – by O.I.Elgerd, Tata Mc Graw-hill Publishing Company Ltd., Second edition.
3. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill - , 4th edition
4. Electrical power systems - by C.L.Wadhwa, New Age International (P) Limited, Publishers – 7th Edition
5. Power System Analysis by Hadi Saadat – TMH Edition.

B. TECH 7th SEMESTER	L	T	P	C
	3	1	0	4
16EE7T02: ELECTRICAL DISTRIBUTION SYSTEMS				

Learning Objectives

- To study general concepts of distribution system.
- To study and design the substations and distribution systems.
- To study the determination of voltage drop and power loss.
- To study the distribution system protection and its coordination.
- To study the effect of compensation on p.f improvement.
- To study the effect of voltage control on distribution system.

UNIT- I

Distribution systems: Classification of Distribution systems, design features of Distribution systems, radial Distribution ,ring main Distribution ,voltage drop calculations: DC Distributors for following cases :radial DC distributor fed at one end and at both ends (equal and unequal voltages),ring main distributor, stepped distributor and AC Distribution , Comparison of AC and DC Distribution system.

UNIT – II:

Substations: Location of substations**:** Rating of distribution substation – Service area within primary feeders – Benefits derived through optimal location of substations.

Distribution Feeders: Design Considerations of distribution feeders**:** Radial and loop types of primary feeders – Voltage levels – Feeder loading – Basic design practice of the secondary distribution system.

UNIT – III:

System Analysis: Voltage drop and power–loss calculations**:** Derivation for voltage drop and power loss in lines – Manual methods of solution for radial networks – Three phase balanced primary lines.

UNIT – IV:

Protection: Objectives of distribution system protection – Types of common faults and procedure for fault calculations – Protective devices**:** Principle of operation of fuses – Circuit reclosures – Line sectionalizes and circuit breakers.

Coordination: Coordination of protective devices**:** General coordination procedure – Residual current circuit breaker RCCB (Wikipedia).

UNIT – V:

Compensation for Power Factor Improvement: Capacitive compensation for power–factor control – Different types of power capacitors – shunt and series capacitors – Effect of shunt capacitors (Fixed and switched) – Power factor correction – Capacitor allocation – Economic justification – Procedure to determine the best capacitor location.

UNIT – VI:

Voltage Control: Voltage Control**:** Equipment for voltage control – Effect of series capacitors – Effect of AVB/AVR –Line drop compensation.

Learning Outcomes:

1. Explain the various concepts of distribution system and the design of substations
2. Discuss the voltage drop and power loss in distribution systems
3. Explain the distribution protection and its coordination
4. Discuss the effect of compensation on p.f improvement and voltage control

Text Book:

1. "Electric Power Distribution system, Engineering" – by TuranGonen, McGraw–hill Book Company.

Reference Books:

1. Electrical Distribution Systems by Dale R.Patrick and Stephen W.Fardo, CRC press
2. Electric Power Distribution – by A.S. Pabla, Tata McGraw–hill Publishing company, 4th edition, 1997.
3. Electrical Power Distribution Systems by V.Kamaraju, Right Publishers.

B. TECH 7th SEMESTER	L	T	P	C
	3	0	0	3
16EE7T03: RENEWABLE ENERGY SYSTEMS				

Learning Objectives

- To study the solar radiation data, extra terrestrial radiation, radiation on earth's surface.
- To study solar thermal collections.
- To study solar photo voltaic systems.
- To study maximum power point techniques in solar PV and wind.
- To study wind energy conversion systems, Betz coefficient, tip speed ratio.
- To study basic principle and working of hydro, tidal, biomass, fuel cell and geothermal systems.

UNIT–I

Fundamentals of Energy Systems : Energy conservation principle – Energy scenario (world and India) – Solar radiation: Outside earth's atmosphere – Earth surface – Analysis of solar radiation data – Geometry – Radiation on tilted surfaces – Numerical problems.

UNIT–II

Solar Thermal Systems : Liquid flat plate collections: Performance analysis – Transmissivity Absorptivity product collector efficiency factor – Collector heat removal factor – Numerical problems. Introduction to solar air heaters – Concentrating collectors and solar pond.

UNIT–III

Solar Photovoltaic Systems : Balance of systems – IV characteristics – System design: storage sizing – PV system sizing – Maximum power point techniques: Perturb and observe (P&O) technique – Hill climbing technique.

UNIT–IV

Wind Energy : Wind patterns – Types of turbines – Kinetic energy of wind – Betz coefficient – Tip–speed ratio – Efficiency – Power output of wind turbine – Selection of generator(synchronous, induction) – Maximum power point tracking.

UNIT–V

Hydro and Tidal power systems: Basic working principle – Classification of hydro systems: Large, small, micro – measurement of head and flow – Energy equation – Types of turbines – Numerical problems. Tidal power – Basics – Kinetic energy equation – Numerical problems – Wave power – Basics – Kinetic energy equation.

UNIT–VI

Biomass, fuel cells and geothermal systems : Biomass Energy: Fuel classification – Pyrolysis – Direct combustion of heat – Different digesters and sizing. Fuel cell: Classification – Efficiency – VI characteristics. Geothermal: Classification – Dry rock and acquifer – Energy analysis.

Learning Outcomes

Student should be able to

1. Analyze the solar radiation, performance of liquid flat plate collectors and design of PV system sizing and classifying various maximum power point techniques.
2. Classification of various types of wind turbines, summarize Betz coefficient, Tip-Speed ratio and selection of generators
3. Determine large, small, micro hydro systems and types of turbines. Kinetic energy equation for tidal power and wave power
4. Classification of various Biomass fuels, Efficiency, VI characteristics and Geothermal energy analysis

Text Books

1. Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH, New Delhi, 3rd Edition.
2. Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis -second edition, 2013.
3. Energy Science: Principles, Technologies and Impacts, John Andrews and Nick Jelly, Oxford.

Reference Books

1. Renewable Energy- Edited by Godfrey Boyle-oxford university, press, 3rd edition, 2013.
2. Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal, World scientific, Singapore.
3. Renewable Energy Technologies /Ramesh & Kumar /Narosa.
4. Renewable energy technologies – A practical guide for beginners – Chetong Singh Solanki, PHI.
5. Non conventional energy source –B.H. Khan- TMH-2nd edition

B. TECH 7th SEMESTER	L	T	P	C
	3	0	0	3
16EE7E01: SPECIAL ELECTRICAL MACHINES				

Learning Objective:

- To explain theory of operation and control of switched reluctance motor.
- To explain the performance and control of stepper motors, and their applications.
- To describe the operation and characteristics of permanent magnet dc motor.
- To distinguish between brush dc motor and brush less dc motor**.**
- To explain the theory of travelling magnetic field and applications of linear motors.
- To impart knowledge on the Construction, principle of operation and performance of permanent magnet synchronous motors

UNIT I

Switched Reluctance Motor: Principle of operation – Design of stator and rotor pole arc – Power converter for switched reluctance motor – Control of switched reluctance motor.

UNIT II:

Stepper Motors: Construction – Principle of operation – Theory of torque production – Hybrid stepping motor – Variable reluctance stepping motor – Open loop and closed loop control.

UNIT III:

Permanent Magnet DC Motors: Construction – Principle of working – Torque equation and equivalent circuits – Performance characteristics – Moving coil motors.

UNIT IV:

Permanent Magnet Brushless DC Motor: Construction – Principle of operation – Theory of brushless DC motor as variable speed synchronous motor – Sensor less and sensor based control of BLDC motors.

UNIT V:

Linear motors: Linear induction motor: Construction– principle of operation– applications. Linear synchronous motor: Construction – principle of operation– applications.

UNIT V

Permanent Magnet Synchronous Motors (PMSM) : Principle of operation – Ideal PMSM – EMF and Torque equations – Armature MMF – Synchronous Reactance – Sine wave motor with practical windings - Phasor diagram – Torque/speed characteristics - Power controllers - Converter Volt-ampere requirements– Applications

Learning Outcomes:

The student should be able to

1. Explain theory of operation and control of switched reluctance motor and stepper motor
2. Describe the operation and characteristics of permanent magnet dc motor and PMBLDC Motor
3. Explain the theory of travelling magnetic field and applications of linear motors
4. Explain the significance of permanent magnet synchronous motors

TEXT BOOKS:

1. Special electrical Machines, K.Venkata Ratnam, University press, 2009, New Delhi.
2. Brushless Permanent magnet and reluctance motor drives, Clarenden press, T.J.E. Miller, 1989, Oxford.
3. Special electrical machines, E.G. Janardhanan, PHI learning private limited, 2014.

REFERENCE BOOKS:

1. R.Krishnan, ‘Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application’, CRC Press, New York, 2001.
2. P.P. Aearnley, ‘Stepping Motors – A Guide to Motor Theory and Practice’, Peter Perengrinus London, 1982.
3. T. Kenjo and S. Nagamori, ‘Permanent Magnet and Brushless DC Motors’, Clarendon Press, London, 1988.
4. E.G. Janardanan, ‘Special electrical machines’, PHI learning Private Limited, Delhi, 2014.

B. TECH 7th SEMESTER	L	T	P	C
	3	0	0	3
16EE7E02: FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS				

UNIT–I:

Introduction to FACTS: Power flow in an AC System – Loading capability limits – Dynamic stability considerations – Importance of controllable parameters – Basic types of FACTS controllers – Benefits from FACTS controllers – Requirements and characteristics of high power devices – Voltage and current rating – Losses and speed of switching – Parameter trade–off devices.

UNIT–II:

Voltage source and Current source converters: Concept of voltage source converter(VSC) – Single phase bridge converter – Square–wave voltage harmonics for a single–phase bridge converter – Three–phase full wave bridge converter– Three–phase current source converter – Comparison of current source converter with voltage source converter.

UNIT–III:

Shunt Compensators–1: Objectives of shunt compensation – Mid–point voltage regulation for line segmentation – End of line voltage support to prevent voltage instability – Improvement of transient stability – Power oscillation damping.

Methods of controllable VAR generation: Variable impedance type static VAR generators – Thyristor Controlled Reactor (TCR) and Thyristor Switched Reactor (TSR).

UNIT–IV:

Shunt Compensators–2: Thyristor Switched Capacitor (TSC)– Thyristor Switched Capacitor – Thyristor Switched Reactor (TSC–TCR). Static VAR compensator (SVC) and Static Compensator (STATCOM)**:** The regulation and slope transfer function and dynamic performance – Transient stability enhancement and power oscillation damping– Operating point control and summary of compensation control.

UNIT V:

Series Compensators: Static series compensators**:** Concept of series capacitive compensation – Improvement of transient stability – Power oscillation damping – Functional requirements. GTO thyristor controlled Series Capacitor (GSC) – Thyristor Switched Series Capacitor (TSSC) and Thyristor Controlled Series Capacitor (TCSC).

UNIT–VI:

Combined Controllers: Schematic and basic operating principles of unified power flow controller (UPFC) and Interline power flow controller(IPFC) – Application of these controllers on transmission lines.

Learning Outcomes:

The student should be able to

1. Explain the power flow control and its parameters in transmission system by using FACTS
2. Classify the concepts and operation of voltage source converter and current source converter
3. Analyze different shunt compensation technique for power system stability problem
4. illustrate the operating characteristics and performance of shunt controllers for various power system stability problems

Text Books:

1. "Understanding FACTS" N.G.Hingorani and L.Guygi, IEEE Press.Indian Edition is available:—Standard Publications, 2001.
2. "Flexible ac transmission system (FACTS)" Edited by Yong Hue Song and Allan T Johns, Institution of Electrical Engineers, London.
3. Thyristor-based FACTS Controllers for Electrical Transmission Systems, by R.Mohan Mathur and Rajiv K.Varma, Wiley.

B. TECH 7th SEMESTER	L	T	P	C
	3	0	0	3
16EC7E03: EMBEDDED SYSTEMS				

COURSE OUTCOMES:
Students are able to
CO1. Summarize the Embedded systems and its characteristics.
CO2. Describe the Embedded Hardware & Firmware requirements to design an embedded system.
CO3. Explain the Integration of Hardware and Firmware and testing of the design.
CO4. Analyze the real time and non-real time Embedded systems

UNIT-I:
INTRODUCTION: Embedded System-Definition, Embedded System versus General computing systems, History of Embedded Systems, Classification of Embedded Systems, Major application areas of Embedded Systems, purpose of Embedded Systems, The typical Embedded System-core of the Embedded System, memory, sensors and actuators, communication interface, Embedded firmware, other system components, PCB and passive components.

UNIT-II:
EMBEDDED SYSTEMS-CHARACTERISTICS AND QUALITY ATTRIBUTES:
Characteristics of Embedded System, quality attributes of Embedded System, Application -specific Embedded System-washing Machine, Domain-specific examples of Embedded System-Automotive.

UNIT-III:
EMBEDDED HARDWARE DESIGN: Analog and digital electronic components, I/O types and examples, Serial communication devices, Parallel device ports, Wireless devices, Timers and counting devices, Watchdog timer, Real time clock, VLSI and Integrated circuit design, EDA Tools, Or CAD EDA tool, The PCB Layout Design.

UNIT-IV:
EMBEDDED FIRMWARE DESIGN: Embedded firmware design approaches, embedded firmware development languages, ISR Concept, Interrupt sources, interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concept of C versus Embedded C and Complier versus Cross complier. The main software utility tool, CAD and the hardware, Translation tools-Pre-processors, Interrupts Compliers and Linkers, Debugging tools,

UNIT-V:
HARDWARE SOFTWARE CO-DESIGN AND TESTING: Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade –offs, Integration of Hardware and Firmware, ICE, Issues in embedded system design. Quality assurance and testing of the design, testing on host machine, simulators, Laboratory Tools.

UNIT-VI:

EMBEDDED SYSTEM DEVELOPMENT: The integrated development environment, Types of files generated on cross-compilation, Deassembler/Decomplier, Simulator, Emulator and Debugging, Target hardware debugging, Boundary Scan, Embedded system development process and tools.

TEXT BOOKS:

1.Embedded Systems, Raj Kamal-Tata McGraw Hill Education Private Limited, Second Edition, 2008**.(UNIT - I,II,III&IV)**

2. Introduction to Embedded Systems By Shibu.K.V-Tata McGraw Hill Education Private Limited, 2009**.(UNIT - V & VI)**

REFERENCES:

1. Embedded Systems Architecture By Tammy Noergaard, Elsevier Publications, 2005

2. Embedding system building blocks By Labrosse, CMP publishers.

B. TECH 7th SEMESTER	L	T	P	C
	3	0	0	3
16CS7E05: OOPS THROUGH JAVA				

COURSE OUTCOMES: at end of the course students are able to

1: Difference between procedural oriented programming and object oriented programming (OOP) paradigms, Java features, Apply OOP Concepts.
2: Define java control statements and String Class.
3: Apply the concept of Inheritance and polymorphism.
4: Explain the Packages and Interfaces.
5: Define Exception handling and Applets.
6: Implement the concepts of Multithreading.

UNIT-I:
INTRODUCTION TO OOPS
Java: History – Java features – Java Environment – JDK1.8 – API. - Types of java program – Creating and Executing a Java program – Java Tokens: Keywords, Character set, Identifiers, Literals, Separator – Java Virtual Machine (JVM) – Command Line Arguments – Comments in Java program.
INTRODUCTION TO OOPS: Paradigms of Programming Languages - Basic concepts of Object Oriented Programming – Differences between Procedure Oriented Programming and Object Oriented Programming - Objects and Classes – Data abstraction and Encapsulation, Inheritance, Polymorphism – Benefits of OOP – Application of OOPs.

UNIT-II:
JAVA BASICS: Constants – Variables – Data types - Scope of variables – Type casting – Operators:
Arithmetic - Logical – Bit wise operator – Increment and Decrement – Relational – Assignment – Conditional – Special operator – Expressions – Evaluation of Expressions.
DECISION MAKING AND BRANCHING: Simple if statement – if – else statement – Nesting if – else – else if Ladder – switchstatement – Decision making and Looping: while loop – do – while loop - for loop – break –– continue
Statement. – Simple programs.
ARRAYS: One Dimensional Array – Creating an array – Array processing– Multidimensional Array.
CLASS AND OBJECTS: Defining a class – Methods – Creating objects – Accessing class members – Constructors – Method overloading – Static members – Nesting of Methods – this keyword – Command line input – Simple programs.
Strings: String Array – String Methods – String Buffer and String Builder Class – Simple programs

UNIT-III: INHERITANCE AND ACCESS MODIFIERS
INHERITANCE: Defining a subclass – Deriving a sub class – Single Inheritance – Multilevel Inheritance –Hierarchical Inheritance – Overriding methods – Final Classes - Final variables and methods – Abstract methods and classes – super keyword - Visibility Control: public access, private access, protected.

UNIT-IV: INTERFACES AND PACKAGES

INTERFACES: Multiple Inheritance - Defining interface – Extending interface - Implementing Interface - Accessing interface variables – Simple programs. Member access rules, super uses, using final with inheritance,
polymorphism, abstract classes.

Packages: Java API Packages – System Packages – Naming Conventions – Creating & Accessing a Package – Adding Class to a Package – Hiding Classes – Programs.

UNIT-V: EXCEPTION HANDLING AND APPLETS

EXCEPTION HANDLING: Limitations of Error handling – Advantages of Exception Handling - Types of Errors – Basics of Exception Handling - Exception Hierarchy – try blocks – throwing an exception – catching an exception – finally statement, built-in and user defined exceptions.

Applets: Introduction – Applet Life cycle – Creating & Executing an Applet.

UNIT-VI: MULTITHREADING

MULTITHREADING: Differences between multi-threading and multitasking, Creating Threads – Life Cycle of a Thread – Defining & Running Thread – Thread Methods – Thread Priority – Synchronization – Implementing runnable interface – Thread Scheduling.

TEXT BOOKS:

1. Java: The complete reference, 7/e, Herbert schildt, TMH.
2. Java: How to Program, 8/e, Dietal, Dietal, PHIE.Balaguruswamy: “Programming with Java A Primer”, 4th Edition, Tata McGraw Hill, 2009.

REFERENCE BOOKS:

1. Core JAVA, Black Book, NageswaraRao, Wiley, Dream Tech.
2. Programming in Java2, Dr K SomaSundaram, JAICO Publishing house.
3. Object Oriented Programming through Java, P. Radha Krishna, University Press.

B. TECH 7th SEMESTER	L	T	P	C
	0	0	4	2
16EE7L01: POWER SYSTEM SIMULATION LAB				

OBJECTIVES

This course should enable the student to:

a. Understand the usage of standard packages necessary for analysis and simulation of power system required for it planning, operation and control.

LIST OF THE EXPERIMENTS

1. Computation of Parameters and Modelling of Transmission Lines
2. Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
3. Load Flow Analysis - I : Solution of Load Flow And Related Problems using Gauss-Seidel Method
4. Load Flow Analysis - II: Solution of Load Flow and Related Problems using Newton-Raphson
5. Fault Analysis
6. Transient and Small Signal Stability Analysis: Single-Machine Infinite Bus System
7. Transient Stability Analysis of Multimachine Power Systems
8. Electromagnetic Transients in Power Systems
9. Load – Frequency Dynamics of Single- Area and Two-Area Power Systems
10. Economic Dispatch in Power Systems

OUTCOMES

A student who satisfactory complete the course should be able to

1. Formulate bus admittance and impedance matrices and Power flow solution of small systems
2. Write a program for Unit commitment and economic dispatch problem
3. Calculate the fault current in a power system network
4. Analyze steady state and transient stability of power system

B. TECH 7th SEMESTER	L	T	P	C
	0	0	4	2
16EE7L02: ELECTRICAL SYSTEM SIMULATION LAB				

1. Simulation of Transient Response Of RLC Circuits

   Response to Pulse Input
   Response to Step Input
   Response to Sinusoidal Input.
2. Pspice simulation of OP-amp based integrator and Differentiator circuit.
3. Simulation of 3 Phase AC voltage controller using PSPICE.
4. Single phase half controlled converter using R and RL load using MATLAB / SIMULINK.
5. Single phase fully controlled converter using R and RL load using MATLAB/ SIMULINK.
6. Three phase fully controlled converter using R and RL load using MATLAB / SIMULINK.
7. Single phase AC voltage regulator using MATLAB / SIMULINK.
8. Simulation of Boost and Buck converters.
9. Simulation of D.C separately excited motor using transfer function approach
10. Write a programme and Simulate Single phase full converter using R-L load with and without LC Filter using PSPICE
11. Write a programme and Simulate single phase AC Voltage controller using RL load using PSPICE.
12. Write a programme and Simulate three phase AC Voltage controller using RL load using PSPICE

Minimum of Ten Experiments from the Above List

OUTCOMES

A student who satisfactory complete the course should be able to

1. Analyze dynamic performance of various loads that are connected to any electric circuits.
2. Apply and analyze the electronic circuits using PSPICE software
3. Design a Simulink circuit of different power electronic circuits and simulate the results using MATLAB/SIMULINK software.
4. Write a program and analyze the different power electronic circuits using various loads using PSPICE Software

B. TECH 7th SEMESTER	L	T	P	C
	0	0	4	2
16EE7LE1: INDUSTIAL AUTOMATION LABAROTORY (PLC)				

LIST OF EXPERIMENTS:

1. To study Ladder logic programming of a industrial PLC like SEIMENS / FATEK / MICROLOGIX
2. Verify the logic gates using PLC
3. Verify the latching and blinking concepts in ladder logic diagram with suitable examples
4. Verify the timer counter concepts
5. Using PLC with suitable examples
6. Write a ladder logic program for filling beverage in a bottle using PLC
7. Write a ladder logic program to maintain the water level with valve control using PLC
8. Write a ladder logic program for 4-way traffic signals controller in PLC environment
9. Write a program for filling three different water tanks using PLC
10. Write a ladder logic circuit for star delta starter control using PLC
11. Write a ladder logic program for six lamp sequence operation using PLC
12. Write a ladder logic program for a 3 stage air condition system in function hall using PLC
13. Write a ladder logic program for operating conveyor belt using PLC
14. Write a ladder logic program to generate pulse for controlling dc motor speed using PLC

B. TECH 7thSEMESTER	L	T	P	C
	0	0	4	2
16EC7LE2: ROBOTICS LAB				

COURSE OUTCOMES:

Students are able to

CO1: Demonstrate the various basic Principles about building and functioning of Robot
CO2: Explain about different Programming concepts for robotic movements
CO3: Apply the ROBOTS for various detections in common world.
CO4: Develop different robots which are depending on required applications

Minimum Ten Experiments to be conducted:

1. To develop hand movement of ROBOT
2. To examine Leg movement of ROBOT
3. To design different face moveme nts of ROBOT
4. To Perform forward & reverse movement of ROBOT
5. To generate circular movement in ROBOT
6. To Develop an automatic turn left and turn right ROBOT
7. To design Obstacle detecting ROBOT
8. To Develop Fire Detecting ROBOT
9. To construct GAS Detecting ROBOT
10. Perform Path movement ROBOT using BLUETOOTH Technology,
11. To Develop Signal based ROBOT
12. To Design Audio based ROBOT

ADDITIONAL EXPERIMENTS

1. Design of Coconut tree climbing ROBOT.
2. Develop Planting ROBOT.
3. Build Farming ROBOT.

EQUIPMENT REQUIRED

1. Aurdino board
2. Stepper motors
3. Metal strips
4. Pro-E Software
5. 8052 microcontroller boards
6. Sensors (Gas,Temperature, U.V)

B. TECH 7th SEMESTER	L	T	P	C
	0	0	4	2
16CS7LE6: DATA BASE MANAGEMENT SYSTEM LAB				

COURSE OUTCOMES

At the end of the course student able to

1. Understand the different issues involved in the design and implementation of a database system
2. Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data.
3. Create and maintain tables using SQL
4. Populate and query a database using SQL DML/DDL commands.
5. Understand the use of structured query language and its syntax, transactions, database recovery and techniques for query optimization.
6. Acquire a good understanding of database systems concepts and to be in a position to use and design databases for different applications.

Lab Experiments:

1. Study of DBMS, RDBMS and ORDBMS.
2. To study Data Definition language Statements.
3. To study Data Manipulation Statements.
4. Study of SELECT command with different clauses.
5. Study of SINGLE ROW functions (character, numeric, Data functions).
6. Study of GROUP functions (avg, count, max, min, Sum).
7. Study of various type of SET OPERATORS (Union, Intersect, Minus).
8. Study of various type of Integrity Constraints.
9. Study of Various type of JOINS.
10. To study Views and Indices.

B. TECH 7th SEMESTER	L	T	P	C
	0	0	4	2
16CS7LE5: JAVA PROGRAMMING LAB				

Course Outcomes:

At the end of the lab student are able to

1. Implement solutions for a range of problems using object-oriented programming.
2. Develop Java programs that solve simple business applications.
3. Develop Java programs using String and String Buffer Class
4. Develop Java programs that implement concept of various types of inheritance.
5. Implement Java programs using packages and interfaces.
6. Implement Exception Handling in java.

Note: Use JDK 1.7 or above on any platform.

LAB EXPERIMENTS

1. Installation of JDK, setting CLASSPATH and executing simple java program.
2. Write a Java Program to define a class, describe its constructor, overload the Constructors and instantiate its object.
3. Write a Java Program to define a class, define instance methods for setting and retrieving values of instance variables and instantiate its object.
4. Write a Java Program to define a class, define instance methods and overload them and use them for dynamic method invocation.
5. Write a Java Program to demonstrate use of sub class.
6. Write a Java Program to implement array of objects.
7. Write a Java program to practice using String class and its methods.
8. Write a Java program to practice using String Buffer class and its methods.
9. Write a Java Program to implement inheritance and demonstrate use of method overriding.
10. Write a Java Program to implement multilevel inheritance by applying various access controls to its data members and methods.
11. Write a program to demonstrate use of implementing interfaces.
12. Write a Java program to implement the concept of importing classes from user defined package and creating packages.
13. Write a program to implement the concept of Exception Handling using predefined exception.
14. Write a program to implement the concept of Exception Handling by creating user defined exceptions.

Text Books

1. Herbert Schildt: “Java The complete reference”, 7th Edition, Tata McGraw Hill, 2011.
2. E.Balaguruswamy: “Programming with Java A Primer”, 4th Edition, Tata McGraw Hill, 2009.

B. TECH 8th SEMESTER	L	T	P	C
	3	0	0	3
16EE8E01: ENERGY CONSERVATION AND AUDIT				

Learning Objectives

- To understand energy efficiency, scope, conservation and technologies.
- To design energy efficient lighting systems.
- To estimate/calculate power factor of systems and propose suitable compensation techniques.
- To understand energy conservation in HVAC systems.
- To calculate life cycle costing analysis and return on investment on energy efficient technologies.

UNIT–I

BASIC PRINCIPLES OF ENERGY AUDIT AND MANAGEMENT Energy audit – Definitions – Concept – Types of audit – Energy index – Cost index – Pie charts – Sankey diagrams – Load profiles – Energy conservation schemes and energy saving potential – Numerical problems – Principles of energy management –Initiating, planning, controlling, promoting, monitoring, reporting – Energy manager – Qualities and functions – Language – Questionnaire – Check list for top management.

UNIT–II

LIGHTING : Modification of existing systems – Replacement of existing systems – Priorities: Definition of terms and units – Luminous efficiency – Polar curve – Calculation of illumination level – Illumination of inclined surface to beam – Luminance or brightness – Types of lamps – Types of lighting – Electric lighting fittings (luminaries) – Flood lighting – White light LED and conducting Polymers – Energy conservation measures.

UNIT–III

POWER FACTOR AND ENERGY INSTRUMENTS : Power factor – Methods of improvement – Location of capacitors – Power factor with non linear loads – Effect of harmonics on Power factor – Numerical problems. Energy Instruments – Watt–hour meter – Data loggers – Thermocouples – Pyrometers – Lux meters – Tong testers – Power analyzer.

UNIT–IV

SPACE HEATING AND VENTILATION : Ventilation – Air–Conditioning (HVAC) and Water Heating: Introduction – Heating of buildings – Transfer of Heat–Space heating methods – Ventilation and air–conditioning – Insulation–Cooling load – Electric water heating systems – Energy conservation methods.

UNIT–V

ECONOMIC ASPECTS AND ANALYSIS : Economics Analysis – Depreciation Methods – Time value of money – Rate of return – Present worth method – Replacement analysis – Life cycle costing analysis – Energy efficient motors (basic concepts).

UNIT–VI

COMPUTATION OF ECONOMIC ASPECTS : Calculation of simple payback method – Net present worth method – Power factor correction – Lighting – Applications of life cycle costing analysis – Return on investment.

Learning Outcomes: Student will be able to

- Explain energy efficiency, conservation and various technologies.
- Design energy efficient lighting systems.
- Calculate power factor of systems and propose suitable compensation techniques.
- Explain energy conservation in HVAC systems.
- Calculate life cycle costing analysis and return on investment on energy efficient technologies.

Text Books

- Energy management by W.R. Murphy & G. Mckay Butter worth, Elsevier publications. 2012
- Energy efficient electric motors by John .C. Andreas, Marcel Dekker Inc Ltd–2nd edition, 1995

Reference Books

- Electric Energy Utilization and Conservation by S C Tripathy, Tata McGraw hill publishing company Ltd. New Delhi.
- Energy management by Paul o' Callaghan, Mc–Graw Hill Book company–1st edition, 1998.
- Energy management hand book by W.C.Turner, John wiley and sons.
- Energy management and conservation –k v Sharma and pvenkata seshaiah-I K International Publishing House pvt.ltd,2011.
- http://www.energymanagertraining.com/download/Gazette_of_IndiaP artIISecI-37_25-08-2010.pdf

B. TECH 8th SEMESTER	L	T	P	C
	3	0	0	3
16EE8E02: ELECTRICAL POWER QUALITY				

UNIT–I

Introduction: Overview of power quality – Concern about the power quality – General classes of power quality and voltage quality problems – Transients – Long– duration voltage variations – Short–duration voltage variations – Voltage unbalance – Waveform distortion – Voltage fluctuation – Power frequency variations.

UNIT–II

Voltage imperfections in power systems: Power quality terms – Voltage sags – Voltage swells and interruptions – Sources of voltage sag, swell and interruptions – Nonlinear loads – IEEE and IEC standards. Source of transient over voltages – Principles of over voltage protection – Devices for over voltage protection – Utility capacitor switching transients.

UNIT–III

Voltage Regulation and power factor improvement: Principles of regulating the voltage – Device for voltage regulation – Utility voltage regulator application – Capacitor for voltage regulation – End–user capacitor application – Regulating utility voltage with distributed resources – Flicker – Power factor penalty – Static VAR compensations for power factor improvement.

UNIT– IV

Harmonic distortion and solutions: Voltage distortion vs. Current distortion – Harmonics vs. Transients – Harmonic indices – Sources of harmonics – Effect of harmonic distortion – Impact of capacitors, transformers, motors and meters – Point of common coupling – Passive and active filtering – Numerical problems.

UNIT–V

Distributed Generation and Power Quality: Resurgence of distributed generation – DG technologies – Interface to the utility system – Power quality issues and operating conflicts – DG on low voltage distribution networks.

UNIT–VI

Monitoring and Instrumentation: Power quality monitoring and considerations – Historical perspective of PQ measuring instruments – PQ measurement equipment – Assessment of PQ measuring data – Application of intelligent systems – PQ monitoring standards.

Learning Outcomes: Student will be able to

1. Identify the concept of Power Quality and voltage imperfections in power systems
2. Describe the concept of voltage regulation and power factor improvement
3. Discuss the concept of harmonic distortion and mitigation techniques
4. Describe the concept of DG in Power quality and monitoring Methods

Textbooks:

1. Electrical Power Systems Quality, Dugan R C, McGranaghan M F, Santoso S, and Beaty H W, Second Edition, McGraw–Hill, 2012, 3rd edition.
2. Electric power quality problems –M.H.J. Bollen IEEE series-Wiley india publications, 2011.
3. Power Quality Primer, Kennedy B W, First Edition, McGraw–Hill, 2000.

Reference Books:

1. Understanding Power Quality Problems: Voltage Sags and Interruptions, Bollen M HJ, First Edition, IEEE Press; 2000.
2. Power System Harmonics, Arrillaga J and Watson N R, Second Edition, John Wiley & Sons, 2003.
3. Electric Power Quality control Techniques, W. E. Kazibwe and M. H. Sendaula, Van Nostrad einhold, New York.
4. Power Quality c.shankaran, CRC Press, 2001
5. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis).
6. Power Quality in Power systems and Electrical Machines–EwaldF. fuchs, Mohammad A.S. Masoum–Elsevier.

B. TECH 8th SEMESTER	L	T	P	C
	3	0	0	3
16EC8E04: SIGNALS AND SYSTEMS				

COURSE OBJECTIVES

1. To analyze the different types of signals and their characteristics along with representation of periodic and aperiodic signals using Fourier series and Fourier Transforms.
2. To analyze the convolution and correlation property on different signals.
3. To differentiate the applications of Fourier Transform and Z -Transform to analyze the stability of the system.
4. To classify the different types of systems depending on the time and the applications of routers in communication.

COURSE OUTCOMES

After studying this course students will be able to:

1. Understand the signal fundamentals in terms of types and how to represent the various signals.
2. Understand the concept of Fourier series and Fourier transforms to determine the signal and system characteristics.
3. Demonstrate concepts of sampling theorem, various types of systems and their properties for signal transmission and convolution and correlation.
4. Know the concept of ROC (Region of convergence) using Laplace and Z- Transform to analyze the system stability.

UNIT-I

SIGNAL ANALYSIS & FOURIER SERIES: Orthogonal Signal space, Signal approximation using orthogonal functions, Mean square error, Closed or Complete set of orthogonal functions, Orthogonality in complex functions, Exponential and Sinusoidal signals, Concepts of Impulse function, Unit step function, Signum function. Representation of Fourier series, properties of Fourier series, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Complex Fourier spectrum

UNIT-II

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 transforms, 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, Linear time invariant (LTI) system, Linear time variant (LTV) system, Transfer function of a LTI system. Filter characteristics of linear systems. Distortion less Transmission through a system, Signal bandwidth, system bandwidth, Ideal LPF, HPF and BPF characteristics, Causality and Poly-Wiener criterion for physical realization, relationship between bandwidth and rise time.

UNIT-IV

CONVOLUTION AND CORRELATION OF SIGNALS: Concept of convolution in time domain and frequency domain, Graphical representation of convolution, Convolution property of Fourier transforms. Cross correlation and auto correlation of functions, properties of correlation function, Energy density spectrum, Parseval's theorem, Power density spectrum, Relation between auto correlation function and energy/power spectral density function.

UNIT-V

LAPLACE TRANSFORMS: Review of Laplace transforms, Partial fraction expansion, Inverse Laplace transform, Concept of region of convergence (ROC) for Laplace transforms, constraints on ROC for various classes of signals, Properties of L.T's relation between L.T's, and F.T. of a signal. Laplace transform of certain signals using waveform synthesis.

UNIT-VI

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 and Communications – B.P.Lathi.
2. Signals and Systems – A.V.Oppenheim, A.S.Willsky and S.H.Nawab

Reference Books:

1. Signals and Systems – A Anandh Kumar, PHI Publications..
2. Signals and Systems – Simon Haykin and Van Veen.

B. TECH 8th SEMESTER	L	T	P	C
	3	0	0	3
16CS8E05: SOFTWARE ENGINEERING				

Course Outcomes: at end of the course students are able to

1. Identify software development life cycle phases.
2. Analyze and specify software requirements with various stakeholders of a software development project.
3. Participate in design, development, deployment and maintenance of a medium scale software development project.
4. Evaluate the impact of potential solutions to software engineering problems using the knowledge of models, tools, and techniques.
5. Define various testing strategies and debugging process.
6. Identify various software quality management and concepts.

UNIT I :

Introduction to Software Engineering :The evolving role of software, Changing Nature of Software, Software myths. A Generic view of process: Software engineering- A layered technology, a process framework, The Capability Maturity Model Integration (CMMI), process assessment.

UNIT II :

Process models :The waterfall model, Incremental process models, Evolutionary process models, The Unified process.

Software Requirements: Functional and non-functional requirements, User requirements, System requirements, Interface specification, the software requirements document.

UNIT III :

Requirements engineering process :Feasibility studies, Requirements elicitation and analysis, Requirements validation, Requirements management.

UNIT IV :

Design Engineering :Design process and Design quality, Design concepts, the design model. Software architecture, Architectural styles and patterns

UNIT V :

Performing User interface design :Golden rules, User interface analysis and design, interface analysis, interface design steps, Design evaluation. Quality Management : Quality concepts, Software quality assurance, Software Reviews, Formal technical reviews, Statistical Software quality Assurance, Software reliability, The ISO 9000 quality standards.

UNIT VI:

Testing Strategies: A strategic approach to software testing, test strategies for conventional software, Black-Box and White-Box testing, Validation testing, System testing, the art of Debugging. Metrics for Process and Products: Software Measurement, Metrics for software quality.

TEXT BOOKS:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 7th edition, McGraw-Hill International Edition.

2. Software Engineering- Sommerville, 7th edition, Pearson education.

REFERENCES:

1. Software Engineering- K.K. Agarwal & Yogesh Singh, New Age International Publishers

2. Software Engineering, an Engineering approach- James F. Peters, Witold Pedrycz, John Wiely.

3. Systems Analysis and Design- Shely Cashman Rosenblatt,Thomson Publications.

4. Software Engineering principles and practice- Waman S Jawadekar, The McGraw-Hill Companies.

B. TECH 6th / 8th SEMESTER	L	T	P	C
	3	-	-	3
16CEXO01: GREEN BUILDINGS AND INFRASTRUCTURE				

COURSE OUTCOMES: Students are able to

1. Recognize existing energy codes, green building codes and green rating systems.
2. Compare cost and performance of building materials with recycled components.
3. List out construction materials and methods that more easily allow for salvage and re-use of building materials.
4. List out available renewable energy resources.
5. Develop the techniques and benefits of building performance testing, monitoring and metering.
6. Identify techniques for weatherization and sustainable remodeling of existing structures.

Unit – I

Green Buildings: Definition of Green Buildings, typical features of green buildings, benefits of Green Buildings- Sustainable site selection and planning of buildings to maximize comfort, day lighting, ventilation, planning for storm water drainage.

Unit - II

Environmentally friendly building materials and technologies: Natural Materials like bamboo, timber, rammed earth, stabilized mud blocks, hollow blocks, lime & lime-pozzolana cements, materials from agro and industrial waste, Ferro-cement and Ferro-concrete.

Unit - III

Energy and resource conservation: Need for energy conservation, various forms of energy used in buildings, embodied energy of materials, energy used in transportation and construction processes-water conservation systems in buildings-water harvesting in buildings.

Unit - IV

Use of renewable energy resources: Wind and Solar Energy Harvesting, potential of solar energy in India and world, construction and operation of various solar appliances, success case studies of fully solar energy based buildings in India.

Unit – V

Climate Design: Local climatic conditions-temperature, humidity, wind speed and direction-impact of climate change on built environment - comforts: the desirable conditions - Principles of thermal design - means of thermal -light and lighting-building acoustics- energy efficient lighting, Ventilation and air quality requirement, various techniques for passive cooling, case studies for passive cooling and thermal comfort.

Unit - VI

Green Building Rating Systems: Introduction to Leadership in Energy and Environment Design (LEED), Green Rating systems for Integrated Habitat Assessment - Modular wastewater treatment systems for built environment.

TEXT BOOKS:

1. "Alternative building materials and technologies" by K.S. Jagadish, B.V. Venkatarama Reddy and K.S. Nanjunda Rao, New age international publishers, New Delhi.
2. "Non-Conventional Energy Resources" by G. D. Rai, Khanna Publishers.

REFERENCES:

1. Kibert, C. (2005) Sustainable Construction: Green Building Design and Delivery (Hoboken, NJ: John Wiley & Sons).
2. McDonough, W. and M. Braungart (2002) Cradle to Cradle: Remaking the Way We Make Things (New York: Farrar, Straus and Giroux).

B. TECH 6th / 8th SEMESTER	L	T	P	C
	3	-	-	3
16CEXO02: DISASTER MANAGEMENT				

COURSE OUTCOMES: Students are able to

1. Identify the tools of integrating disaster management principles in disaster mitigation process.
2. Distinguish between the different approaches needed to manage pre and post- disaster activities.
3. Explain the process of risk management.
4. Recognize the 'relief system', 'disaster victim' and relate them.
5. Evaluate the planning strategies useful in risk mitigation processes.
6. Explain about public awareness and economic incentive possibilities.

UNIT-I

Natural Hazards and Disaster management: Introduction of DM – Inter Disciplinary -nature of the subject- Disaster Management cycle- Five priorities for action. Case study methods of the following: floods, draughts -Earthquakes- global warming, cyclones & Tsunamis- Post Tsunami hazards along the Indian coast - landslides.

UNIT-II

Man Made Disaster and their management along with case study methods of the following: Fire hazards - transport hazard dynamics -Solid waste management- post disaster – bio terrotirism -threat in mega cities, rail and air craft's accidents, and Emerging infectious diseases & Aids and their management.

UNIT-III

Risk and Vulnerability: Building codes and land use planning - social vulnerability - environmental vulnerability - Macroeconomic management and sustainable development, climate change risk rendition - financial management of disaster - related losses.

UNIT-IV

Role of Technology in Disaster managements: Disaster management for infra structures, taxonomy of infrastructure - treatment plants and process facilities-electrical substations- roads and bridges- mitigation programme for earth quakes -flowchart, geospatial information in agriculture drought assessment-multimedia technology in disaster risk management and training transformable indigenous knowledge in disaster reduction.

UNIT-V

Education and Community Preparedness: Education in disaster risk reduction-Essentials of school disaster education-Community capacity and disaster resilience-Community based disaster recovery -Community based disaster management and social capital-Designing resilience-building community capacity for action.

UNIT-VI

Multi-sectional Issues: Impact of disaster on poverty and deprivation-Climate change adaptation and human health -Exposure , health hazards and environmental risk-Forest management and disaster risk reduction.-Institutional capacity in disaster management -The Red cross and red crescent movement.-Corporate sector and disaster risk reduction-A community focused approach.

TEXTBOOKS:

1. 'Disaster Management - Global Challenges and Local Solutions' by Rajib shah & R. Krishnamurthy (2009), Universities press.
2. 'Disaster Science & Management' by Tushar Bhattacharya, Tata McGraw Hill Education Pvt. Ltd., New Delhi.
3. 'Disaster Management - Future Challenges and Opportunities' by Jagbir Singh (2007), I K International Publishing House Pvt. Ltd.

REFERENCE BOOKS:

1**.** **'**Disaster Management' edited by H K Gupta (2003), Universities press.
2. "Disaster Management and Mitigation" by Prof. R.B. Singh (2016), World Focus

B. TECH 6th / 8th SEMESTER	L	T	P	C
	3	-	-	3
16EEXO01: ELECTRICAL SAFETY MANAGEMENT				

COURSE OUTCOMES: Students are able to

1. Explain the objectives and precautions of Electrical safety, effects of shocks and their prevention.
2. Summarize the safety aspects during installation of plant and equipment.
3. Describe the electrical safety in residential, commercial and agricultural installations.
4. Describe the various Electrical safety in hazardous areas, Equipment earthing and system neutral earthing.
5. State the electrical systems safety management and IE rules.

UNIT-I

Introduction to Electrical Safety, Shocks and their Prevention: Terms and definitions- objectives of safety and security measures- Hazards associated with electric current, and voltage who is exposed, principles of electrical safety- Approaches to prevent Accidents- scope of subject electrical safety. Primary and secondary electrical shocks -possibilities of getting electrical shock and its severity- medical analysis of electric shocks and its effects - shocks due to flash/ Spark over's - prevention and safety precautions against contact shocks - flash shocks, burns, residential buildings and shops.

UNIT-II

Safety during Installation of Plant and Equipment: Introduction, preliminary preparations, preconditions during installation electrical plant and equipment, safety aspects. Field quality and safety during erection, personal protective equipment installation of a large oil immersed power transformer, installation of outdoor switchyard equipment, safety during installation of electrical rotating machines, drying out and insulation resistance measurement of rotating machines.

UNIT-III

Electrical Safety In Residential, Commercial And Agricultural Installations Wiring and fitting – Domestic appliances – shock from wet wall and water taps – fan firing shock – multi-storied building – Temporary installations – Agricultural pump installation – Do's and Don'ts for safety in the use of domestic electrical appliances.

UNIT-IV

Electrical Safety In Hazardous Areas : Hazardous zones – class 0,1 and 2 – spark, flashovers and corona discharge and functional requirements – Specifications of electrical plants, equipments for hazardous locations Classification of equipment provided for various hazardous gases and vapours – classification of equipment/enclosure for hazardous locations.

UNIT-V

Equipment Earthing and System Neutral Earthing : Introduction description of earth system between system grounding and Equipment Grounding, Equipment Earthing, Functional Requirement of earthing system, neutral grounding(System Grounding), Types of Grounding, Methods of Earthing Generators Neutrals.

UNIT-VI

Safety Management of Electrical Systems: Principles of Safety Management, Management Safety Policy, Safety organization, safety auditing, Motivation to managers, supervisors, employees towards safety.

TEXT BOOKS:

1. S. Rao, Prof. H.L. Saluja, "Electrical safety, fire safety Engineering and safety management", Khanna Publishers. New Delhi, 1988.(units-I to V)

REFERENCE BOOK:

1. Pradeep Chaturvedi, "Energy management policy, planning and utilization", Concept Publishing company, New Delhi, 1997.

B. TECH 6th / 8th SEMESTER	L	T	P	C
	3	-	-	3
16EEXO02: NON CONVENTIONAL ENERGY SOURCES				

COURSE OUTCOMES: Students are able to

- Analyze solar radiation data, extraterrestrial radiation, radiation on earth's surface.
- Design solar thermal collections.
- Design solar photo voltaic systems.
- Develop maximum power point techniques in solar PV and wind.
- Explain wind energy conversion systems, Betz coefficient , tip speed ratio.
- Explain basic principle and working of hydro, tidal, biomass ,fuel cell and geothermal systems.

UNIT–I

Fundamentals of Energy Systems : Energy conservation principle – Energy scenario (world and India) – Solar radiation: Outside earth's atmosphere – Earth surface – Analysis of solar radiation data – Geometry – Radiation on tilted surfaces – Numerical problems.

UNIT–II

Solar Thermal Systems: Liquid flat plate collections: Performance analysis – Transmissivity – Absorptivity – Product collector efficiency factor – Collector heat removal factor – Numerical problems – Introduction to solar air heaters – Concentrating collectors and solar pond.

UNIT–III

Solar Photovoltaic Systems : Balance of systems – IV characteristics – System design: Storage sizing, PV system sizing, Maximum power point techniques: Perturb and observe (P&O) technique – Hill climbing technique.

UNIT–IV

Wind Energy: Wind patterns – Types of turbines – Kinetic energy of wind – Betz coefficient – Tip–speed ratio – efficiency – Power output of wind turbine – Selection of generator(synchronous, induction) – Maximum power point tracking.

UNIT–V

Hydro and Tidal power systems: Basic working principle – Classification of hydro systems: large, small, micro – Measurement of head and flow – Energy equation – Types of turbines – Numerical problems. Tidal power – Basics – Kinetic energy equation – Numerical problems – Wave power – Basics – Kinetic energy equation.

UNIT–VI

Biomass, fuel cells and geothermal systems: Biomass Energy: Fuel classification – Pyrolysis – Direct combustion of heat – Different digesters and sizing.

- **Fuel cell:** classification – Efficiency – VI characteristics.
- **Geothermal**: classification – Dry rock and acquifer – Energy analysis.

Text Books

- Solar Energy: Principles of Thermal Collection and Storage, S. P. Sukhatme and J. K. Nayak, TMH, New Delhi, 3rd Edition.

- Renewable Energy Resources, John Twidell and Tony Weir, Taylor and Francis.
- Energy Science: Principles, Technologies and Impacts, John Andrews and Nick Jelly, Oxford.

Reference Books

- Handbook of renewable technology Ahmed and Zobaa, Ramesh C Bansal,World scientific, Singapore.
- Renewable Energy Technologies /Ramesh & Kumar /Narosa.
- Renewable energy technologies – A practical guide for beginners – Chetong Singh Solanki, PHI.

B. TECH 6th / 8th SEMESTER	L	T	P	C
	3	-	-	3
16MEXO01:COMPOSITE MATERIALS				

COURSE OUTCOMES: Student are able to

CO1: Summarize the basic terminology and advantages of composite materials. **[K2]**

CO2: Classify and **Analyze** various types of laminates. **[K2, K4]**

CO3: Analyze the mechanical behavior of composite material as well as summarize various manufacturing methods of Laminated Fiber Reinforced Composite Material.**[K4]**

CO4: Analyze the micromechanical behavior of composite material. **[K4]**

CO5: Analyze the macromechanical behavior of composite material. **[K4]**

CO6: Explain various applications of Composite material in detail. **[K2]**

UNIT – I

INTRODUCTION TO COMPOSITE MATERIALS:

Definitions: Composite material, Fiber, Matrix. Types of fibers and Raw Fiber Properties, Types of Matrix, Prepegs, Fillers and other Additives. Advantages of Composite Materials and Structures – Strength and Stiffness advantages, Cost advantages, Weight advantages, Applications

UNIT – II

ANALYSIS OF LAMINATED COMPOSITES:

Laminates, Basic Assumptions, Strain-Displacement Relationship, Stress-Strain Relationships, Equilibrium Equations, Laminate Stiffness, Determination of Lamina Stresses and Strains, Types of Laminate Configuration, Balanced Laminate, Anti-symmetric Laminate, Examples

UNIT – III

BASICS OF COMPOSITE MATERIALS :

Mechanical Behavior of Composite Materials - Lamina, Laminate: The basic building block of a composite material.

Manufacturing of Laminated Fiber-Reinforced Composite Materials

UNIT – IV

MICRO MECHANICAL ANALYSIS OF COMPOSITE STRENGTH AND STIFFNESS:

Properties of typical composite materials, Volume and Weight Fractions, Longitudinal Strength and Stiffness. Transverse Modulus, In-plane shear Modulus, Poisson's ratio.

UNIT – V

ELASTIC PROPERTIES OF UNIDIRECTIONAL LAMINA:

Stress-strain relationships. Engineering Constants. Stress strain relations of a Thin Lamina. Examples

UNIT – VI

APPLICATIONS OF COMPOSITE MATERIALS:

Use of Composite materials in present world – Aeronautical Applications, Space applications, Automotive applications and commercial applications.

TEXT BOOKS:

1. Mechanics of Composite Materials - R M Jones / Taylor & Francis
2. Mechanics of Composite Materials and Structures - Madhujit Mukhopadhyay / Universities Press

B. TECH 6th / 8th SEMESTER	L	T	P	C
	3	-	-	3
16MEX002: OPERATION RESEARCH				

COURSE OUTCOMES: Students are able to

CO1: Apply linear programming techniques to solve industrial optimization problems.[K3]

CO2: solve transportation and assignment problems using operation research techniques. [K3]

CO3: Solve sequencing problems using operation research techniques. [K3]

CO4: Solve replacement problems for optimization. [K3]

CO5: Analyze game theory and apply them for optimization. [K4]

CO6: Analyze queuing theory and apply it for optimization and also analyze inventory models for various industrial problems. [K4]

UNIT—I

LINEAR PROGRAMMING: Linear programming problem formulation – Graphical solution – simplex method- artificial variables techniques -two–phase method, Big-M method – Duality principle.

UNIT – II

TRANSPORTATION PROBLEM: Formulation – optimal solution, unbalanced transportation problem – Degeneracy

ASSIGNMENT PROBLEM- Formulation – optimal solution - variants of assignment problem- traveling salesman problem.

UNIT – III

SEQUENCING PROBLEM: Introduction – Optimal Solution for processing n jobs through two machines

- processing n jobs through three machines - processing n jobs through m machines - processing two jobs through m machines

UNIT – IV

REPLACEMENT: Introduction – replacement of items that deteriorate with time – when money value is not counted and counted – replacement of items that fail completely, group replacement.

UNIT – V

THEORY OF GAMES: Introduction – minimax (maxmin) – criterion and optimal strategy – solution of games with saddle points – rectangular games without saddle points – 2 x 2 games– dominance principle – m x 2 & 2 x n games -graphical method.

UNIT – VI

WAITING LINES: Introduction- Single channel-Possion arrivals-Exponential service times-with infinite population model (M/M/1:FIFO/∞/∞)

INVENTORY : Introduction – single item – deterministic models – purchase inventory models with one price break and multiple price breaks – shortages are not allowed .

TEXT BOOKS:

1. Operations Research / S.D.Sharma, Ramnath co, Meerut
2. Operations Research, P.K.Gupta, D.S.Hira, S.Chand

REFERENCE BOOKS:

1. Operations Research /A.M.Natarajan,P.Balasubramani, A. Tamilarasi/PearsonEducation.
2. Operations Research / R.Pannerselvam,PHI Publications.

B. TECH 6th / 8th SEMESTER	L	T	P	C
	3	-	-	3
16ECXO01 : INTRODUCTION TO NANO TECHNOLOGY AND ITS APPLICATIONS				

COURSE OUTCOMES: Students are able to

CO1. Define Nano materials and Nano Technology with properties
CO2. Explain Synthesis as Fabrication methods of Nano Technology
CO3. Demonstrate Characterization techniques of Nano Materials
CO4. Analyze carbon Nano technology and application of Nano technology.

UNIT-I :
INTRODUCTION: History of nano science, definition of nano meter, nano materials, nano technology. Classification of nano materials.Crystal symmetries, crystal directions, crystal planes.Band structure.**(T1)**

UNIT-II :
PROPERTIES OF MATERIALS: Mechanical properties, electrical properties, dielectric properties, thermal properties, magnetic properties, opto electronic properties. Effect of size reduction on properties, electronic structure of nano materials. .**(T1)**

UNIT-III :
SYNTHESIS & FABRICATIONMETHODS: Synthesis of bulk polycrystalline samples, growth of single crystals. Synthesis techniques for preparation of nano particle – Bottom Up Approach – sol gel synthesis, hydro thermal growth, thin film growth, PVD and CVD; Top Down Approach – Ball milling, micro fabrication, lithography. .**(T1)**

UNIT-IV :
CHARECTERIZATION TECHNIQUES: X-Ray diffraction and Scherrer method, scanning electron microscopy, transmission electron microscopy, scanning probe microscopy, atomic force microscopy, piezo response microscopy, X-ray photoelectron spectroscopy, XANES and XAFS, angle resolved photoemission spectroscopy, diffuse reflectance spectra, photoluminescence spectra, Raman spectroscopy. .**(T2)**

UNIT-V :
CARBON NANO TECHNOLOGY: Characterization of carbon allotropes, synthesis of diamond – nucleation of diamond, growth and morphology. Applications of nanocrystalling diamond films, grapheme, applications of carbon nanotubes, carbon nanotubes for nanoelectronics devices. .**(T2)**
UNIT-VI :
NANO TECHNOLOGYAPPLICATIONS: Applications in material science, biology and medicine, surface science, energy and environment. Applications of nano structured thin fins, applications of quantum dots. .**(T2)**

TEXT BOOKS

1.Nano science and nano technology by M.S RamachandraRao, Shubra Singh, Wiley publishers.
(Unit-I,II,III)

2.Fundamentals of nanoelectronics by George W Hanson Pearson publications, India 2008**(Unit-IV,V,VI)**

REFERENCE BOOKS

1.Introduction to Nano Technology by Charles P. Poole, Jr., Frank J.Owens, Wiley publishers.

2.Principles of Nanotechnology by Phani Kumar, Scitech.

B. TECH 6th / 8th SEMESTER	L	T	P	C
	3	-	-	3
16ECXO02 : GLOBAL POSITIONING AND NAVIGATION SATELLITE SYSTEMS				

COURSE OUTCOMES: Students are able to

CO1: Describe the principles of GNSS based positioning methods, the main components in a satellite navigation system and their functions**.**
CO2: Estimate and represent the GPS coordinate frames & GPS orbits..
CO3: Analyze the influence of different error sources on the positioning precision.
CO4: Describe examples of the role of GNSS, or GNSS based products and services, in sustainable development**.**

UNIT - I
Overview of GPS: Basic concept, system architecture, space segment, user segment, services of GPS, applications of GPS.

UNIT - II
GPS Signals: Signal structure, anti spoofing (AS), selective availability, Difference between GPS and GALILEO satellite construction.

UNIT - III
GPS coordinate frames, Time references: Geodetic and Geo centric coordinate systems, ECEF coordinate world geodetic 1984 (WGS 84), GPS time.

UNIT - IV
GPS orbits and satellite position determination: GPS orbital parameters, description of receiver independent exchange format (RINEX) – Observation data and navigation message data parameters, GPS position determination.

UNIT - V
GPS Errors: GPS error sources – clock error, ionospheric error, tropospheric error, multipath, ionospheric error estimation using dual frequency GPS receiver.

UNIT - VI
GPS Aided Geo-Augmented Navigation (GAGAN) architecture, Indian Regional Navigation Satellite System. GNSS augmentation, Wide Area Augmentation System (WAAS), applications

TEXT BOOKS :

1. G S RAO, Global Navigation Satellite Systems, McGraw-Hill publications, New Delhi, 2010 **(Unit-I,III,IV,V,VI)**
2. B. Hoffman – Wellenhof, H. Liehtenegger and J. Collins, 'GPS – Theory and Practice', Springer – Wien, New York (2001). **(Unit-I,II,IV)**

REFERENCE BOOKS :

1. James Ba – Yen Tsui, 'Fundamentals of GPS receivers – A software Approach', John Wiley & Sons,2001.

B. TECH 6th / 8th SEMESTER	L	T	P	C
	3	1	-	4
16CSXO01: DATABASE MANAGEMENT SYSTEMS				

COURSE OUTCOMES: Student are able to

1. Identify the different issues involved in the design and implementation of a database system
2. Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data.
3. Predict different concurrency control techniques while implementing real time applications
4. Solve real time database issues through SQL concepts
5. Organaise the data from unstructured to structured using different normal forms
6. Justify various kinds of secondary storage devices to store data

UNIT-I

History of DBMS, File Systems vs DBMS, Advantages of DBMS, Describing and Storing Data in DBMS, Transaction Management, Structure of a DBMS, people who work with Databases, Database Design and ER Diagrams, Entities, Attributes and Entity Sets, Relationships and Relationship sets

UNIT-II

Additional Features of ER Models, Conceptual Design with ER Models, Conceptual Design for Large Enterprise. Relational Model- Introduction to Relational Model, Integrity constraints over relations, Enforcing Integrity constraints, Logical Database Design, Views.

UNIT-III

Relational Algebra-Selection and projection, Set Operators, Renaming, joins, divisions. Form of Basic SQL Query, Nested Queries, Correlated Nested Queries, Set Comparison Operators, Aggregate Operators, Logical Connectivity Operators, Joins and Types, introduction to Triggers.

UNIT-IV

Introduction to Schema Refinement, functional Dependencies, Normal forms-1NF, 2NF,3NF, BCNF, Properties of decompositions, Multivalued Dependencies, Fourth Normal Form and Fifth Normal Form, Transaction Management-ACID properties, Transaction and schedules, concurrent execution of transactions.

UNIT –V

Lock based Concurrency Control-Strict 2PL, Dead Locks. Concurrency Control without Locking, Crash Recovery-Introduction to ARIES, LOG, Write a Head Log Protocol, Check Point, Recovery from a System Crash.

UNIT-VI

Data on External Storage, File Organization and indexing, Index Data Structures, Comparison of File Organizations, Tree structured indexing-Indexed Sequential Access Method, B+ trees.

Text Books:

1. Database Management Systems- Raghurama Krishnan, Johannes Gehrke, Tata McGraw-Hill., 3rd Edition.

Reference Books:

1. Database System Concepts, Silberschatz, Korth, McGraw hill, 5th edition.
2. Database Management Systems, Elmasri Navathe-5th Edition.

B. TECH 6th / 8th SEMESTER	L	T	P	C
	3	-	-	3
16CSXO02: BIG DATA ANALYTICS				

Course Outcomes: Students are able to

1. Distinguish efficient big data solutions for various application areas using appropriately selected algorithms and data structures.
2. Analyze methods and algorithms, to compare and real-world problems.
3. Explain trade-offs in big data processing technique.
4. Explain the Big Data Fundamentals, including the evolution and the characteristics of Big Data
5. Solve non-relational databases, the techniques for storing and processing large volumes of structured and unstructured data.
6. Apply the novel architectures and platforms introduced for Big data.

UNIT-I

Introduction to Big Data Analytics:
Definition of Big data, Big data characteristics and considerations, Unstructured data fueling big data analytics, Analyst perspective data repositories, Key roles of the New Data Eco system, applications.

UNIT-II
Data Analytics Life Cycle: Data analytics life cycle, Roles of Successful Analytics project

UNIT-III
Working with Big Data using R: How to use R Graphical user interface, How to get data into R, Data types used in R, and the basic operations, generic functions, Data analytic methods in R

UNIT-IV
Advanced Analytics Theory and methods: Categorization: K-means clustering, association rules, Regression: Linear & Logistic Classification: Nave Bayesian, Decision trees, time series analysis, text analysis.

UNIT-V
Advanced Analytics _Technology and tools: Mapreduce and Hadoop, HDFS, Using R with Hadoop

UNIT-VI
Hadoop Ecosystem: Using Query Languages HIVE and PIG for data analytics, HBASE, Mahout-machine learning algorithms using Hadoop mapreduce HDFS

Text Books:
1 Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data by EMC Education Services- Wiley

2 Big Data Analytics with R, by Simon Walkowiak

Reference:

1 R For data science-Dan Toomey
2 Big Data Analyticswith R and Hadoop-Vignesh Prajapati

B. TECH 6th & 8th SEMESTER	L	T	P	C
	3	-	-	3
16ITXO01: SOFTWARE PROJECT MANAGEMENT				

COURSE OUTCOMES: Students are able to

1. Explain the basic concepts of Software Engineering and Process framework.
2. Define the various software process models and its requirements.
3. Outline software project management principles based on conventional software project Management.
4. Distinguish different Software Management life cycle phases
5. Define the artifacts and knowledge on Model Based Software Architecture.
6. Illustrate various software workflows and checkpoints of the process.

UNIT-I

Introduction to Software Engineering: The evolving role of software, Software Characteristics, Changing Nature of Software, Software myths.
A Generic view of Process: Software engineering- A layered technology, a Process framework, The Capability Maturity Model Integration (CMMI), Process assessment, Product and Process.

UNIT-II

Process models: The waterfall model, Incremental process models, Evolutionary process models, The Unified process.
Software Requirements: User requirements, System requirements, Functional and non-functional requirements, the Software Requirements Document (SRS).

UNIT–III

Conventional Software Management and Economics: Conventional software Management performance, Software Economics.
Improving Software Economics: Reducing Software product size, improving software processes, improving team effectiveness, improving automation, Achieving required quality, peer inspections.

UNIT–IV

The old way and the new: The principles of conventional software Engineering, principles of modern software management, transitioning to an iterative process.
Life cycle phases: Engineering and production stages, inception, Elaboration, construction, transition phases.

UNIT-V

Artifacts of the process: The artifacts sets, Management artifacts, Engineering artifacts, programmatic artifacts.
Model based software architectures: A Management perspective and technical perspective.

UNIT-VI

Work Flows of the process: Software process workflows, Iteration workflows.

Checkpoints of the process: Major mile stones, Minor Milestones, Periodic status assessments.

Text Books:

1. Software Engineering, A practitioner's Approach- Roger S. Pressman, 6th edition, McGraw Hill International Edition.
2. Software Project Management, Walker Royce: Pearson Education, 2005.

Reference Books:

1. Software Engineering- Somerville, 9th edition, Pearson education.
2. Software Project Management, Bob Hughes and Mike Cotterell: Tata McGraw-Hill Edition.
3. Software Project Management, Joel Henry, Pearson Education.

B. TECH 6th / 8th SEMESTER	L	T	P	C
	3	-	-	3
16ITXO02: INTERNET OF THINGS				

COURSE OUTCOMES: Students are able to

1. Define the fundamentals of IoT.
2. Illustrate the IoT design methodology.
3. Explain the Microcontroller and various IoT Platforms.
4. Construct the IoT using Raspberry Pi
5. Explain the basics of IoT sensors and communications.
6. Analyze applications of IoT in real time scenario.

UNIT-I

Fundamentals of IoT: Introduction-Characteristics-Physical design - Protocols – Logical design – Enabling technologies – IoT Levels – Domain Specific IoTs – IoT vs. M2M.

UNIT-II

IoT Design Methodology: IoT systems management – IoT Design Methodology – Specifications Integration and Application Development.

UNIT-III

8051 Microcontroller: Introduction to Microcontrollers, The 8051 Instruction Set, AT89S8253 Microcontroller, Assembly Language, Examples, Development systems.
IoT Platform: IoT Platform overview, Overview of IoT supported Hardware platforms such as: Raspberry pi, ARM Cortex Processors, Arduino and Intel Galileo boards.

UNIT-IV

Building IoT With Raspberry PI: Physical device – Raspberry Pi Interfaces – Programming – APIs / Packages – Web services.

UNIT-V

Programming The Microcontroller For IoT Basics of Sensors & Actuators: Basics of Sensors and actuators – examples and working principles of sensors and actuators – Cloud computing and IoT – RASPBERRY PI /Equivalent Microcontroller platform – Setting up the board - Programming for IOT – Reading from Sensors;
Communication: Connecting microcontroller with mobile devices – communication through Bluetooth and USB – connection with the internet using wifi / Ethernet.

UNIT-VI

Case Studies and Advanced Topics: Various Real time applications of IoT- Connecting IoT to cloud – Cloud Storage for IoT – Data Analytics for IoT – Software & Management Tools for IoT

Text Books:

1. ArshdeepBahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015.

2. Charalampos Doukas "Building Internet of Things With the Arduino", CreateSpace Independent Publishing Platform, 2012.
3. Milan Verle, "Architecture and Programming of 8051 Microcontrollers" 1st Edition mikro
4. Dieter Uckelmann et.al, "Architecting the Internet of Things", Springer, 2011
5. Matt Richardson & Shawn Wallace, "Getting Started with Raspberry Pi" O'Reilly (SPD), 2014.

Reference Books:

1. Luigi Atzor et.al, "The Internet of Things: A survey", Journal on Networks, Elsevier Publications, October, 2010
2. Web Link 1: http://postscapes.com/(Accessed on 16 February 2016).
3. Web Link 2: http://www.theinternetofthings.eu/what-is-the-internet-of-things(Accessed on 16 February 2016).

B. TECH 6th / 8th SEMESTER	L	T	P	C
	3	-	-	3
16BMXO01: INNOVATION AND ENTREPRENEURSHIP				

COURSE OUTCOMES: Students are able to

CO1: Comprehend the concept and levels of Innovation. [K2]
CO2: Discriminate the Micro &Macro perspectives & Innovation. [K4]
CO3: Appraise the creative Intelligence abilities. [K4]
CO4: Define and explain the basic concepts of Entrepreneurship & social responsibilities of an entrepreneur [K1 &K2]
CO5: Estimates the importance of training for Entrepreneurs, Use feedback and Performance of trainees. [K2 & K3]
CO6: Discover the Challenges and Sickness in MSMEs.[K2]

UNIT-I

Innovation Management: Concept of Innovation –Levels of Innovation –Incremental Vs Radical Innovation -Inbound and Outbound Ideation –Open and Other Innovative Ideation Methods-Systems approach to innovation- Innovation in the context of emerging economies-leadership and innovation.

UNIT-II

Creative Intelligence: Creative Intelligence Abilities – A Model Of Creative Intelligence – Convergent Thinking Ability – Traits Congenial To Creativity – Creative Personality And Forms Of Creativity.

UNIT-III

Entrepreneurship: Entrepreneurship characteristics –classification Of Entrepreneurship – Incorporation of Business - Role of Entrepreneurship in economic development – startups.

UNIT-IV

Idea generation and opportunity assessment: Ideas in entrepreneurship – sources of new ideas-Techniques for generating ideas- Opportunity recognition – Steps in tapping opportunities

UNIT-V

Project Formulation and Appraisal: Preparation of Detailed project Report (DPR) – content-Guidelines for Report preparation – project Appraisal techniques-economic- steps Analysis; Financial analysis; Market analysis; Technical feasibility.

UNIT-VI

Institutions promoting small Business Enterprises: Central level Institutions; NABARD, SIDBI,NIC,KVIC,SIDIO,NSIC - State level Institutions- DICs – SFC- SSIDC- other financial assistance,Government policy and taxation benefits- government policy for SSIs – tax incentives and concessions- Non –tax concessions- Rehabilitation investment and Allowances

Text Books:

- Vasanth Desai, "Entrepreneurship' Himalaya Publishing House, New Delhi, 2012
- Arya Kumar: "Entrepreneurship", Pearson, Publishing House, New Delhi, 2012.

REFERENCES:

1. Pradip N Khandwalla, Lifelong Creativity, An Unending Quest, Tata McGraw Hill, 2004.
2. Vinnie Jauhari, Sudanshu Bhushan, Innovation Management, Oxford Higher Education, 2014

B. TECH 6th / 8th SEMESTER	L	T	P	C
	3	-	-	3
16BMXO02: INDUSTRIAL SOCIOLOGY AND PSYCHOLOGY				

COURSE OUTCOMES: Students are able to

CO1: Demonstrate an appreciation on different areas of Industrial Psychology and Sociology that have contributed to organizational effectiveness.(K3)
CO2: Identify critical factors that affect behavior of individual and groups in an organization.(K2)
CO3: Analyze the importance of organizational design and culture prevailing in an organization.(K4)
CO4: Interpret the role and importance of Leadership and Motivation towards achieving objectives of individuals and groups in work environment.(K3)
CO5: Appraise the concept of change in the dynamic business organization (K5)

UNIT I:
Industrial Sociology : Nature and Scope of Industrial Sociology-Development of Industrial Sociology, Factors of social change – the technological factors, the cultural factors, effects of technology on major social institutions, social status system, social relations in industry.

UNIT II:
Group Dynamics: Work Teams & Groups, Group Behavior, Group formation & development, Decision Making by Individuals , Groups Decision making process, individual influences, group decision process, Group dynamics

UNIT III:
Organizational Conflicts: Concept - Causes and Consequences of Conflict-Conflict handling techniques-Emotional Intelligence - Inter Group Behavior and Collaboration.

UNIT IV:
Industrial Psychology : Nature and Meaning of Industrial Psychology, Role of Industrial Psychology, Organizational Attitude, Motivation at work-Theories of Motivation (Theory X and Y, McClelland's Theory, Maslow's Need Theory, Herzberg's Two Factor Theory) Cultural Differences in Motivation

UNIT V:
Organizational Design and Leadership : Organizational Design & Structure- Key organizational design process, Structural differentiations, factors influencing design of organizations, Leadership, Leadership vs. Management, Leadership Theories, Emerging issues in Leadership

UNIT VI:
Organizational Culture: Functions of organizational culture, Organizational Socialization, Assessing Cultural Values and Fit, Cross Cultural issues, Managing Change Forces for change in Organization, Resistance to change and change management.

Text Books:

1. Nelson, Quick and Khandelwal, ORGB : An innovative approach to learning and teaching Organizational Behaviour. A South Asian Perspective, Cengage Learning, 2012
2. Luthans, Fred, Organizational Behavior, McGraw Hill 2008

REFERENCES:

1. Gisbert Pascal, Fundamentals of Industrial sociology, Tata McGraw Hill Publishing Co., New Delhi, 1972.
2. Schneider Engno V., Industrial Sociology 2nd Edition, McGraw Hill Publishing Co., New Delhi,