GODAVARI INSTITUTE OF ENGINEERING & TECHNOLOGY

(AUTONOMOUS)

Approved by AICTE, Accredited by NBA & NAAC 'A' Grade, Recognized under 2(f) and 12(b) of UGC, Permanently Affiliated to JNTUK, Kakinada.

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

4 Years B.Tech. (Electrical & Electronics Engineering) Course Structure : (2017-18)

***

w.e.f. Academic Year : 2017-2018

I YEAR I SEMESTER

S. No.	Subject Code	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P		Int.	Ext.	Total
1.	17193104	Engineering Mechanics	3	1	-	3	40	60	100
2.	17195103	Computer Programming	4	-	-	3	40	60	100
3.	17195112	Computer Programming Lab	-	-	3	2	50	50	100
4.	17198101	English – I	3	1	-	3	40	60	100
5.	17198102	Mathematics-I	4	-	-	3	40	60	100
6.	17199105	Mathematics-II	4	-	-	3	40	60	100
7.	17199106	Professional Ethics & Human Values	3	1	-	1	40	60	100
8.	17199111	English Communication Skills Lab I	-	-	3	2	50	50	100
9.	17199113	Engineering Workshop & IT Workshop	-	-	3	2	50	50	100
Total			**21**	**03**	9	**22**	**390**	**510**	**900**

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w.e.f. Academic Year : 2017-2018

I YEAR **II SEMESTER**

S. No.	Subject Code	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P/D		Int.	Ext.	Total
1.	17199201	English-II	3	1	-	3	40	60	100
2.	17199202	Engineering Physics	3	1	-	3	40	60	100
3.	17193273	Engineering Drawing	-	-	3	3	40	60	100
4.	17199204	Environmental Studies	4	-	-	3	40	60	100
5.	17199205	Data Structures	3	1	-	3	40	60	100
6.	17199206	Engineering Chemistry	4	-	-	3	40	60	100
7.	17199211	English Communication Skills Lab II	-	-	3	2	50	50	100
8.	17199212	Engineering Physics Lab	-	-	3	2	50	50	100
9.	17195213	Data Structures Lab	-	-	3	2	50	50	100
Total			**17**	**03**	12	**24**	**390**	**510**	**900**

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***

w.e.f. Academic Year : 2017-2018

II YEAR **I SEMESTER**

S. No.	Subject Code	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P		Int.	Ext.	Total
1.	17120301	Electrical Circuits Analysis – I	3	1	-	3	40	60	100
2.	17120302	Electro Magnetic Field	3	1	-	3	40	60	100
3.	17120303	Electrical Machines – I	3	1	-	3	40	60	100
4.	17129304	Mathematics III	3	1	-	3	40	60	100
5.	17123305	Fluid Mechanics & Hydraulic Machinery	3	1	-	3	40	60	100
6.	17124306	Electronic Devices & circuits	3	1	-	3	40	60	100
7.	17129397	Soft Skills – I	1	2	-	1	100	-	100
8.	17124311	Electronic Devices & Circuits Lab	-	-	3	2	50	50	100
9.	17123312	Fluid Mechanics & Hydraulic Machines Lab	-	-	3	2	50	50	100
Total			**19**	**8**	**6**	**23**	**440**	**460**	**900**

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***

w.e.f. Academic Year : 2017-2018

II Year **II Semester**

S. No.	Subject Code	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P		Int.	Ext.	Total
1.	17120401	Electrical Circuit analysis – II	3	1	-	3	40	60	100
2.	17124405	Switching Theory and Logic Design	3	1	-	3	40	60	100
3.	17120402	Power Systems – I	3	1	-	3	40	60	100
4.	17120403	Electrical Machines – II (Through MOOCS)	3	1	-	3	40	60	100
5.	17120404	Electrical Measurements	3	1	-	3	40	60	100
6.	17124406	Pulse & Digital Circuits	3	1	-	3	40	60	100
7.	17120411	Electrical Machines – I Lab	-	-	3	2	50	50	100
8.	17120412	Electrical Circuits Lab	-	-	3	2	50	50	100
Total			**18**	**6**	**6**	**22**	**340**	**460**	**800**

Mini Project-I/Summer Internship / Training - To be done during summer vacation after II-II semester

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

4 Years B.Tech. (Electrical & Electronics Engineering) Course Structure : (2017-18)

***

w.e.f. Academic Year : 2017-2018

III Year **I Semester**

S. No.	Subject Code	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P		Int.	Ext.	Total
1.	17129505	Managerial Economics and Financial Analysis	3	1	-	3	40	60	100
2.	17120501	Control Systems	3	1	-	3	40	60	100
3.	17120502	Power Systems-II	3	1	-	3	40	60	100
4.	17120503	Special Electrical Machines	3	1	-	3	40	60	100
5.	17120504	Power Electronics	3	1	-	3	40	60	100
6.	17124506	Linear & Digital IC Applications	3	1	-	3	40	60	100
7.	17129597	Soft Skills - II	1	2	-	1	100	-	100
8.	17120511	Electrical Machines-II Lab	-	-	3	2	50	50	100
9.	17120512	Electrical Measurements Lab	-	-	3	2	50	50	100
10.	17120543	Mini Project - I		-	-	2	100	-	100
Total			**19**	**08**	**06**	**25**	**540**	**460**	**1000**

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w.e.f. Academic Year : 2017-2018

III Year **II Semester**

S. No.	Subject Code	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P		Int.	Ext.	Total
1.	17120601	Switch-gear and Protection	3	1	-	3	40	60	100
2.	17124606	Microprocessors & Micro-controllers and its Applications	3	1	-	3	40	60	100
3.	17120602	Power System Analysis	3	1	-	3	40	60	100
4.	17120603	Renewable Energy Sources and Systems	3	1	-	3	40	60	100
5.	17120604	Power Semiconductor Drives	3	1	-	3	40	60	100
6.	17120605	Signals and Systems	3	1	-	3	40	60	100
7.	17129611	Power Electronics Lab	-	-	3	2	50	50	100
8.	17120612	Control Systems Lab	-	-	3	2	50	50	100
9.	17129697	IPR & Patents	2	-	-	1	100	-	100
Total			**20**	**6**	**06**	**23**	**440**	**460**	**900**

Mini Project-II/Summer Internship / Training - To be done during summer vacation after III-II semester

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

4 Years B.Tech. (Electrical & Electronics Engineering) Course Structure : (2017-18)

***

w.e.f. Academic Year : 2017-2018

IV Year **I Semester**

S. No.	Subject Code	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P		Int.	Ext.	Total
1.	17120701	Utilization of Electrical Energy	3	1	-	3	40	60	100
2.	17124702	Principles of Signal Processing	3	1	-	3	40	60	100
3.	17120703	Power System Operation & Control	3	1	-	3	40	60	100
4.		**Elective-I**	3	1	-	3	40	60	100
	17120704a	High Voltage Engineering							
	17124704b	Electronic Instrumentation and Automation System							
	17120704c	HVDC Transmission							
	17120704d	Electrical Distribution Systems							
5.		**Elective – II**	3	1	-	3	40	60	100
	17120705a	Electrical Machine Modeling & Analysis							
	17120705b	Switching Mode Power Converters							
	17123705c	Optimization Techniques							
	17120705d	EHV Transmission							
6.		**Elective – III**	3	1	-	3	40	60	100
	17120706a	Advanced Control Systems.							
	17120706b	Flexible Alternating Current Transmission systems							
	17120706c	Power Quality							
	17120706d	Smart Grid							
7.	17120711	Power Systems Lab	-	-	3	2	50	50	100
8.	17124713	Microprocessors & Micro-Controllers and its Applications Lab	-	-	3	2	50	50	100
9.	17120712	Electrical Simulation Lab	-	-	3	2	50	50	100
10.	17120754	Mini Project II	-	-	-	2	100	-	100
Total			**18**	**6**	**9**	**26**	**490**	**510**	**1000**

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DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

4 Years B.Tech. (Electrical & Electronics Engineering) Course Structure : (2017-18)

***

w.e.f. Academic Year : 2017-2018

IV Year **II Semester**

S. No.	Subject Code	Subject Title	Periods per week			C	Scheme of Examination Maximum Marks		
			L	T	P		Int.	Ext.	Total
1.	17120801	Energy Audit, Conservation & Management	3	1	-	3	40	60	100
2.		**Elective – IV**	3	1	-	3	40	60	100
	17124802a	VLSI Design							
	17124802b	Embedded Systems							
	17120802c	Digital Control Systems							
	17120802d	PLC and its Applications							
	17125802e	OOPS through JAVA							
	17125802f	DBMS							
	17125802g	UNIX and Shell Programming							
	17120802h	Neural Fuzzy Systems							
3.	17120831	Project Work	-	-	-	9	60	140	200
Total			**6**	**2**	**-**	**15**	**140**	**260**	**400**

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	ENGINEERING MECHANICS / 17193104	3	1	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)	Engineering Physics				

Unit – I

Systems of Forces : Coplanar Concurrent Forces – Components in Space – Resultant – Moment of Force and its Application – Couples and Resultant of Force Systems. Introduction**,** limiting friction and impending motion, coulomb's laws of dry friction, coefficient of friction, cone of friction.

Unit - II

Equilibrium of Systems of Forces: Free Body Diagrams, Equations of Equilibrium of Coplanar Systems, Spatial Systems for concurrent forces. Lamis Theorm, Graphical method for the equilibrium of coplanar forces, Converse of the law of Triangle of forces, converse of the law of polygon of forces condition of equilibrium.

Unit – III

Centroid : Centroids of simple figures (from basic principles) – Centroids of Composite Figures.

Centre of Gravity : Centre of gravity of simple body (from basic principles), centre of gravity of composite bodies, pappus theorem.

Area moments of Inertia : Definition – Polar Moment of Inertia, Transfer Theorem, Moments of Inertia of Composite Figures, Products of Inertia, Transfer Formula for Product of Inertia. Mass Moment of Inertia : Moment of Inertia of Masses, Transfer Formula for Mass Moments of Inertia, mass moment of inertia of composite bodies.

Unit –IV

Kinematics : Rectilinear and Curvilinear motions – Velocity and Acceleration – Motion of Rigid Body – Types and their Analysis in Planar Motion. **Kinetics:** Analysis as a Particle and Analysis as a Rigid Body in Translation – Central Force Motion – Equations of Plane Motion – Fixed Axis Rotation – Rolling Bodies.

Unit – V

Work – Energy Method: Equations for Translation, Work-Energy Applications to Particle Motion, Connected System-Fixed Axis Rotation and Plane Motion. Impulse momentum method.

Torsional vibration- The compound pendulum- General case of moment proportional to angle of rotation- D'Alembert's principle in rotation.

Course Outcomes

After completion of this course, a successful student will be able to:

CO-1. Understand the concepts of forces and its resolution in different planes.

CO-2. Understand the concepts of Equilibrium of Systems of Forces, law of Triangle of forces and converse of the law of polygon of forces.

CO-3. Understand the concepts of Area moments of Inertia, Mass Moment of Inertia.

CO-4. Understand the concepts of Equations for Translation, D'Alembert's principle in rotation.

Text Books

1. Engg. Mechanics - S.Timoshenko & D.H.Young., 4th Edn - , Mc Graw Hill publications.
2. Engineering Mechanics statics and dynamics:A Nelson , Mc Graw Hill publications
3. Engineering Mechanics: GS Sawhney, PHI Learning Pvt. Ltd.
4. Engineering Mechanics: Basudeb Bhattacharyya, Oxford University Press

Reference Books

1. Engineering Mechanics: statics and dynamics – I.H.Shames, – Pearson Publ.
2. Mechanics For Engineers, dynamics: - F.P.Beer & E.R.Johnston –5th Edn Mc Graw Hill Publ.
3. Engineering Mechanics: Fedinand . L. Singer , Harper – Collins

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Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	COMPUTER PROGRAMMING Common to (CE, EEE, ME, ECE, CSE, AME, MIN)/17195103	4	0	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Basic knowledge about Computer, Algorithm and Flowchart.				

Unit–I

Introduction to Programming

Introduction to Computers: Introduction to computer programming,Algorithm,flow chart,Program development steps.

Computer languages: Machine level, Assembly level and High-level language.

Number System:conversions- decimal, binary, octal, hexadecimal.

'C' Fundamentals: Structure of a C-program,C-character set, C Tokens- variables, constants, identifiers, data types and sizes, operators.

Unit-II

Control Structures

I/O Functions: Header files, Standard I/O library functions-formatted I/O functions.

Decision making statements: simple if, if-else, nested if-else, else-if ladder, switch-case statements and sample programs.

Iterative Statements: for, while, do-while. Jump Statements-break, continue, goto

Unit-III

Introduction to Array, Structure and Pointer

Arrays- declaration, initialization, storing and accessing elements of 1-D, 2-D and dimensional arrays. **Array Applications**- addition, multiplication, transpose, symmetry of a matrix.

Structure: Declaration, initialization, storing and accessing elements by using structure and union.

Pointers: Introduction to pointers, defining a pointer variable, Pointer to Pointer, Examples of pointers, using pointers in expressions, pointers and arrays.

Unit-IV

Strings- declaration, initialization, reading and writing characters into strings, string operations, character and string manipulation functions.

Unit-V

Functions- declaration, definition, prototype, function call, return statement, types of functions, parameter passing methods, and function recursion.

Preprocessor: #define, #include Statement, #ifdef, #endif, and storage classes.

Course Outcomes

After completion of this course, a successful student will be able to:

CO-1. Obtain the knowledge about different languages used in computer programming and also about the number systems which will be very useful for bitwise operations and basic terminology used in the computer programming.

CO-2. Obtain knowledge about algorithm, flow chart, and structure of C program and different C tokens used inside C program.

CO-3. Develop program by using Control structure,different looping and Jump statement.

CO-4. Obtain knowledge about the application and implementation of 2-dimentionalArray and string inside the program.

CO-5. Obtain knowledge about different functionalities of Preprocessors and also to develop the program by using different type of function calls.

Text Books

1. "Programming in ANSI C" by E.Balagurusamy,McGraw Hill Publications.
2. "Programming in C" by Ashok N. Kamthane, 2/e Pearson, 2013.
3. "The C – Programming language" B.W.Kernighan, Dennis M. Ritchie.PHI.
4. "Let Us C", 12th Edition by Yashavant P. Kanetkar online in India.

Reference Books

1. Programming in C *by Ajay Mittal, Pearson.*
2. Programming with C, Bichkar, Universities press.
3. Programming in C, ReemaThareja, OXFORD.

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	**COMPUTER PROGRAMMING LAB/17195112** **Common to (CE, EEE, ME, ECE, CSE, AME, MIN)**	0	0	3	2
Teaching	**Total contact hours - 50**				
Prerequisite (s)	Basic knowledge about Computer, Algorithm and Flowchart.				

1. Write a C Program to
   a) Calculate the area of triangle using the formula
   Area = (s (s-a) (s-b) (s-c)) 1/2, where s= (a+b+c)/2
   b) To find the largest of three numbers using ternary operator.
   c) To swap two numbers without using a temporary variable.
2. Write a C program that uses functions to perform the following operations using Structure:
   a) Reading a complex number
   b) Writing a complex number
   c) Addition of two complex numbers
3. Write a C program to
   a) 2"s complement of a number is obtained by scanning it from right to left and complementing all the bits after the first appearance of a 1. Thus 2"s complement of 11100 is 00100. Write a C program to find the 2"s complement of a binary number.
   b) Find the roots of a quadratic equation.
   c) Take two integer operands and one operator form the user,
   Performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use Switch Statement)
4. Write a C Program to
   a) Check whether the given number is Armstrong number or not.
   b) Check whether the given number is palindrome or not.
5. Write a C program to
   a) Find the sum of individual digits of a positive integer and find the reverse of the given number.
   b) A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a C program to generate the first n terms of the sequence.
   c) Generate all the prime numbers between 1 and n, where n is a value supplied by the user.
6. Write a C Program to
   a) Print the multiplication table of a given number n up to a given value, where n is entered by the user.
   b) Enter a decimal number, and calculate and display the binary equivalent of that number.
   c) Enter a binary number, and calculate the decimalequivalent of that number.
7. Write a C program to

a) Interchange the largest and smallest numbers in the array.

b) Implement a liner search.

c) Implement binary search.

8. Write a C program to

   a) Examples which explore the use of structures, union and other user defined variables.

   b) Declare a structure for calculating the percentage achieved by 3 students, by considering the structure elements as name, pin no, mark1, mark2, mark3.

9. Write C Programs

   a) For the following string operations without using the built in functions

      i. to reversea strings
      ii. to append a string to another string
      iii. to compare two strings.

   b) Write C Programs for the following string operations without using the built in functions

      i. to find the length of a string
      ii. To find whether the given string "MADAM" is palindrome or not.

10. Write a C program

    a) Use functions to perform the following operations:

       i. To insert a sub-string in to given main string from a given position.
       ii. To delete n Characters from a given position in a given string.

    b) To replace a character of string either from beginning or ending or at a specified location

11. Write C Programs for the following string operations with and without using the built in functions

    a) Write C Program to reverse a string using pointers.

    b) Write a C program to concatenate two strings by using pointer.

12. Write C programs that use both recursive and non-recursive functions for the following

    a) To find the factorial of a given integer.

    b) To find the GCD of two given integers.

    c) To find Fibonacci sequence.

13. Write C programs to

    a) Find the area of triangle by using call by value and call by reference concepts.

    b) Pointer based function to exchange value of two integers using passing by address.

    c) Compare two strings by using call by address.

    d) Separate the even and odd elements of an array into two different arrays by using call by value.

Course Outcomes

After successful completion of this course, a successful student will be able to:

CO-1. To know the structure and syntax of a programming language.

CO-2. To develop code for simple mathematical problems.

CO-3. To write the programs using arrays, structures and pointers

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	ENGLISH –I / 17198101	3	1	0	3
Teaching	Total contact hours - 60				

Unit–I
Detailed Text: ‘Human Resources': from English for Engineers and Technologists
Non-Detailed Text: ‘An Ideal Family' by Katherine Mansfield

Unit-II
Detailed Text: Transport: Problems and Solutions'
Non-Detailed Text: ‘'War' by Luigi Pirandello from 'Panorama: A Course on Reading"

Unit-III
Detailed Text: 'Evaluating Technology' from English for Engineers and Technologists.
Non-Detailed Text: 'The Verger' by Somerset Maugham from Panorama: A Course on Reading'

Unit–IV
Detailed Text: 'Alternative Sources of Energy' from English for Engineers and Technologists.
Poetry: ' The Scarecrow' by Satyajit Ray from Panorama: A Course on Reading Frost

Unit – V
Detailed Text: 'Our Living Environment' from English for Engineers and Technologists.
Non-Detailed Text: 'A Village Host to Nation' from Panorama: A Course on Reading

Course Outcomes
After completion of this course, a successful student will be able to:
CO-1. Improve the exposure to universal happenings
CO-2. Communicate the necessity to exercise humor in the daily life
CO-3. Take inspiration by reading autobiographical issues
CO-4. Achieve high quality of life, strength and sovereignty of a developed nation

Text Books
Detailed textbook:
1. English For Engineers and Technologists, Published by Orient Blackswan Pvt Ltd

Non-detailed textbook:
2. Panorama: A Course On Reading, Published by Oxford University Press India

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	MATHEMATICS-I / 17198102	4	0	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Basic knowledge of algebra, trigonometry, differentiation and integration.				

Unit–I

Laplace transform

Laplace transforms of standard functions-Shifting Theorems, Transforms of derivatives and integrals – Unit step function –Dirac's delta function- Inverse Laplace transforms– Convolution theorem.(with out proof).

Applications: Solutions of ordinary differential equations using Laplace transforms.

Unit–II

Differential equations of first order and first degree

Linear-Bernoulli-Exact-Reducible to exact.Applications: Newton's Law of cooling-Law of natural growth and decay-orthogonal trajectories. (CO2)

Unit–III

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). Applications: LCR circuit, Simple Harmonic motion. (CO2)

Unit–IV

Partial differentiation

Introduction- Total derivative-Chain rule-Generalized Mean Value theorem for single variable (without proof)-Taylors and Mc Laurent's series for two variables– Functional dependence- Jacobian.

Applications: Maxima and Minima of functions of two variables with constraints and without constraints.(CO3)

Unit–V

First order & Higher order 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.

Classification of II order PDE- Method of separation of Variables

Applications: One- dimensional Wave, Heat equations - two-dimensional Laplace Equation.(CO4)

Detailed Text: 'Human Resources': from English for Engineers and Technologists

Non-Detailed Text: 'An Ideal Family' by Katherine Mansfield

Course Outcomes

After completion of this course, a successful student will be able to:

CO-1. Apply Laplace Transforms to solve Initial Value Problems

CO-2. Solve first and higher order ordinary differential equations (ODE) with applications by various techniques.

CO-3. Apply Partial Differentiation to solve Inequalities and to find Maxima and Minima.

CO-4. Solve First and Higher order PDE with their applications to Heat equation, Wave equation, Laplace equation

Text Books

1. **UM. Swamy, P.Vijaya Lakshmi, R.V.G.Ravi Kumar, M.Phani Krishna Kishore ,** Engineering Mathematics 1st Edition, Anurag Jain for Excel Books
2. **Dr.T.K.V.Iyengar, Dr.B.Krishna Gandhi, S.Ranganatham, M.V.S.S.N.Prasad,** 1st Edition, S.Chand Publication
3. **B.S.GREWAL,** Higher Engineering Mathematics, 42nd Edition, Khanna Publishers

Reference Books

1. **ERWIN KREYSZIG,** Advanced Engineering Mathematics, 9th Edition, Wiley-India
2. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.
3. **GREENBERG,** Advanced Engineering Mathematics, 2nd edition, Pearson edn
4. **DEAN G. DUFFY,** Advanced engineering mathematics with MATLAB, CRC Press
5. **PETER O'NEIL** advanced Engineering Mathematics, Cengage Learning.

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	MATHEMATICS-II / 17199105	4	0	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Basic knowledge of algebra, trigonometry, differentiation and integration.				

Unit-I

Solution of Algebraic and Transcendental Equations

Introduction- Bisection Method – Method of False Position – Iteration Method – Newton-Raphson Method.(CO1)

Unit-II

Interpolation

Introduction- Errors in Polynomial Interpolation – Finite differences- Forward Differences-Backward differences –Central differences – Symbolic relations and separation of symbols-Differences of a polynomial-Newton‟s formulae for interpolation – Interpolation with unevenly
spaced points - Lagrange‟s Interpolation formula.(CO2)

Unit-III

Numerical solution of Ordinary Differential equations

Solution by Taylor‟s series-Picard‟s Method of successive Approximations-Euler‟s Method-Runge-Kutta Methods.(CO3)

Unit-IV

Functions of a complex variable

Complex function , Real and Imaginary parts of Complex function, Limit**,** Continuity and Derivative of complex function, Cauchy-Riemann equations, Analytic function, entire function, singular point, conjugate function**,** $C-R$ equations in polar form, Harmonic functions, Milne-Thomson method. (CO4)

Unit-V

Fourier Series & Transforms

Introduction- Determination of Fourier coefficients – even and odd functions –change of interval– Half-range sine and cosine series
application: Amplitude, spectrum of a periodic function
Fourier integral theorem (only statement) – Fourier sine and cosine integrals - sine and cosine transforms – properties – inverse transforms – Finite Fourier transforms.(CO4,CO5)

Course Outcomes

After completion of this course, a successful student will be able to:

- **CO-1.** apply Numerical Techniques to solve Algebraic and Transcendental Equations and also Initial Value Problems and ODE.
- **CO-2.** interpolate the tabulated data at the given values using various interpolation techniques
- **CO-3.** solve the IVPs in ODE using numerical techniques.
- **CO-4.** learn and apply C-R equations.
- **CO-5.** Express a given function satisfying certain conditions in Fourier series and Use finite and infinite Fourier Integral Transforms to solve BVPs.

Text Books

1. **Dr.T.K.V.Iyengar, Dr.B.Krishna Gandhi, S.Ranganatham, M.V.S.S.N.Prasad,** 1st Edition, S.Chand Publication
2. **UM. Swamy, P.Vijaya Lakshmi, R.V.G.Ravi Kumar, M.Phani Krishna Kishore** Engineering Mathematics 1st Edition, Anurag Jain for Excel Books
3. **B.S. GREWAL,** Higher Engineering Mathematics, 42nd Edition, Khanna Publishers.

Reference Books

1. **N.P.Bali**, Engineering Mathematics, Lakshmi Publications.
2. **V.RAVINDRANATH and P. VIJAYALAXMI,** Mathematical Methods, Himalaya Publishing House
3. **ERWYN KREYSZIG,** Advanced Engineering Mathematics, 9th Edition, Wiley-India
4. **DEAN G. DUFFY,** Advanced Engineering Mathematics with MATLAB, CRC Press

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	PROFESSIONAL ETHICS AND HUMAN VALUES / 17199106	3	1	0	1
Teaching	Total contact hours - 60				
Prerequisite (s)	Knowledge of Economics, Demand analysis, Production Analysis, Fundamentals of Accounting and Ratio analysis.				

Unit–I

Human values

Morals, Values and Ethics – Integrity – Work Ethics – Service Learning – Civic Virtue – Respect for others – Living Peacefully – Caring – Sharing – Honesty –Courage – Value time – Co-operation – Commitment – Empathy – Self-confidence – Spirituality- Character.

Unit - II

Engineering ethics:

The History of Ethics-Purposes for Engineering Ethics-Engineering Ethics-Consensus and Controversy –Professional and Professionalism –Professional Roles to be played by an Engineer –Self Interest, Customs and Religion-Uses of Ethical Theories-Professional Ethics-Types of Inquiry – Engineering and Ethics-Kohlberg‟s Theory – Gilligan‟s Argument – Heinz's Dilemma.

Unit - III

Engineering as social experimentation:

Comparison with Standard Experiments – Knowledge gained – Conscientiousness – Relevant Information – Learning from the Past – Engineers as Managers, Consultants, and Leaders – Accountability – Role of Codes – Codes and Experimental Nature of Engineering.

Globalization- Cross-culture Issues-Environmental Ethics-Computer Ethics-computers as the Instrument of Unethical behaviour-computers as the object of Unethical Acts-autonomous Computers-computer codes of Ethics-Weapons Development-Ethics and Research-Analysing Ethical Problems in Research-Intellectual Property Rights.

Unit - IV

Engineers' responsibility for safety and risk:

Safety and Risk, Concept of Safety – Types of Risks – Voluntary v/s Involuntary Risk- Short term v/s Long term Consequences – Expected Probability - Reversible Effects- Threshold Levels for Risk- Delayed v/s Immediate Risk – Safety and the Engineer - Designing for Safety – Risk - Benefit Analysis-Accidents

Unit - V

Engineer's responsibilities and rights:

Collegiality - Techniques for Achieving Collegiality –Two Senses of Loyalty-obligations of Loyalty – misguided – Loyalty - professionalism and Loyalty- Professional Rights – Professional Responsibilities – confidential and proprietary information-Conflict of Interest-solving conflict problems – Self Interest , Customs and Religion- Ethical egoism-Collective bargaining Confidentiality Acceptance of Bribes/Gifts-when is a Gift and a Bribe-examples of Gifts v/s Bribes-problem solving-interests in other companies-Occupational in other companies-Occupational - price fixing-endangering lives- Whistle Blowing-types of whistle blowing-when should it be attempted-preventing whistle blowing.

Course Outcomes

After completion of this course, a successful student will be able to:

CO-1. Equip the students with moral values which help them in engineering profession.

CO-2. Develop reasoning and analytical skills among engineering students.

CO-3. Make the engineering students aware of the safety measures, risk factors and risk analysis.

CO-4. Make the students to identify issues in engineering and management areas

Text Books

1. "Engineering Ethics includes Human Values" by M.Govindarajan, S.Natarajan and V.S.SenthilKumar-PHI Learning Pvt. Ltd-2009
2. "Professional Ethics and Morals" by Prof.A.R.Aryasri, Dharanikota Suyodhana - Maruthi - Publications
3. "Professional Ethics and Human Values" by A.Alavudeen, R.Kalil Rahman and M.Jayakumaran- Laxmi Publications
4. "Professional Ethics and Human Values" by Prof.D.R.Kiran-
5. "Indian Culture, Values and Professional Ethics" by PSR Murthy-BS Publication

Reference Books

1. "Ethics in Engineering" by Mike W. Martin and Roland Schinzinger – Tata McGraw-Hill – 2003.
2. "Engineering Ethics" by Harris, Pritchard and Rabins, CENGAGE Learning, India

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	ENGLISH - COMMUNICATION SKILLS LAB- I / 17199111	0	0	3	2
Teaching	Total contact hours - 48				
Prerequisite (s)	Learner should be equipped with basic language and communication skills like Reading,Writing,Listening and Speaking.				

Unit - I

1. WHY study Spoken English?
2. Making Inquiries on the phone, thanking and responding to Thanks
   Practice work.

Unit - II

1. Responding to Requests and asking for
Directions Practice work.

Unit - III

1. Asking for Clarifications, Inviting, Expressing Sympathy, Congratulating
2. Apologizing, Advising, Suggesting, Agreeing and Disagreeing
   Practice work.

Unit - IV

1. Letters and Sounds
   Practice work.

Unit-V

1. The Sounds of English
2. Pronunciation
3 Stress and Intonation

Unit - VI

Movie Reviews

Course outcomes

After completion of this course, a successful student will be able to:

CO-1. Enable the students to learn through practice the communication skills of listening, speaking, reading and writing.

Prescribed Lab Manual for Semester I

'INTERACT: English Lab Manual for Undergraduate Students' Published by Orient Blackswan Pvt Ltd

Reference Books

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. A Practical Course in effective english speaking skills, PHI
5. Word power made handy, Dr shalini verma, Schand Company
6. Professional Communication, Aruna Koneru, Mc Grawhill Education

Description	Subject Teaching Methodology	L	T	P	C
Course/ Code	**ENGINEERING WORKSHOP & IT WORKSHOP Common to (CE, EEE, ME, ECE, CSE, AME, MIN) / 17199113**	0	0	3	2
Teaching	**Total contact hours - 50**				
Prerequisite (s)	Basic knowledge about Computer				

Identify the components of a computer, components in a CPU and its functions. Every student must draw block diagram of the CPU along with the configuration of each peripheral.

1. Every student should disassemble and assemble the PC back to working condition.
2. Every student should individually install windows 7 (professional) on the personal computer. He/She must install the device driver's software, and basic application software's viz., adobe reader, ms-office etc.
3. Each student must able to configure the basic computer management settings of windows components. Each student must familiar to work with MS-DOS command prompt and basic DOS commands.
4. Every student should install Linux on the computer. This computer should have windows installed .The system should be configured as dual boot with both windows and Linux.
5. Several mini tasks would be that covers basic commands in Linux and basic system administration in Linux which includes: Basic Linux commands in Bash, Create hard and symbolic links .Text processing, using wildcards.
6. Web Browsers and Surfing the web: Students customize their web browsers with the LAN proxy settings, bookmarks, search toolbars and popup blockers. Also, plug-in like Macromedia Flash and JRE for Applets should be configured.
7. Search Engines and Netiquette: Students should know what search engines are and how to use the search engines. A few topics would be given to the students for which they need to search on Google.
8. Cyber Hygiene: Students would be exposed to the various threats on internet and would be asked to configure their computer to be safe on the internet. They need to first install antivirus software, configure their personal firewall and windows update on their computer. Then they need to customize their browsers to block popup, block activeX downloads to avoid virus and/or worms.
9. Each student will familiar with Microsoft word and different templates of it for design a RESUME. Creating Project Abstract features to be covered: Formatting styles, inserting table, bullets and numbering, changing text direction, cell alignment.
10. Excel orientation: The student must know the importance of Ms-Excel as a spreadsheet tool, give the details of the four tasks and features that would be covered in each using Excel-Accessing, Overview of toolbars, saving Excel files, using help and resources.
11. Students will be working on basic power point utilities and tools which help them create a basic power point presentation.

Course Outcomes

After successful completion of this course, a successful student will be able to:

CO-1. Identify various hardware components of a system

CO-2. Assemble the computer.

CO-3. Use various Microsoft tools.

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	ENGLISH –II / 17199201	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Learner should possess the primary communicative abilities suitable for global exposure				

Unit - I

Detailed Text:' The Greatest Resource- Education' from English Encounters
Non-Detailed Text: ' A P J Abdul Kalam' from The Great Indian Scientists.

Unit - II

Detailed Text:' A Dilemma' from English Encounters
Non-Detailed Text: 'C V Raman' from The Great Indian Scientists.

Unit - III

Detailed Text: 'Cultural Shock': Adjustments to new Cultural Environments from English Encounters.
Non-Detailed Text: 'Homi Jehangir Bhabha' from The Great Indian Scientists.

Unit - IV

Detailed Text: 'The Lottery' from English Encounter
Non-Detailed Text: 'Jagadish Chandra Bose' from The Great Indian Scientists.

Unit - V

Detailed Text :' The Health Threats of Climate Change' from English Encounters.
Non-Detailed Text: ' Prafulla Chandra Ray' from The Great Indian Scientists.

Course Outcomes

After completion of this course, a successful student will be able to:

- **CO-1.** Improve the language proficiency of the students in English with emphasis on LSRW skills.
- **CO-2.** Enable the students to study and comprehend the prescribed lessons and subjects more effectively relating to their theoretical and practical components.
- **CO-3.** Develop the communication skills of the students in both formal and informal situations.

Text Books

1. DETAILED TEXTBOOK: English Encounters Published by Maruthi Publishers.
2. DETAILED NON-DETAIL: The Great Indian Scientists Published by Cenguage learning

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	ENGINEERING PHYSICS / 17199202	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Knowledge of theoretical and experimental Physics from +2 level. Application of Physics theory and calculations to required course.				

Unit –I

Interference: Principle of Superposition – Coherence – Interference in thin films (reflection geometry) – Newton's rings - Applications (wavelength, refractive index of the material.

Diffraction: Fraunhofer diffraction double slit, N-slits -(Qualitative treatment only)-Grating spectrum –Rayleigh's criterion, Resolving power of a grating.

Unit –II

Polarization: Types of Polarization – Malu's law- Brewester's law- double refraction - Nicol Prism.

Lasers: Properties of lasers - absorption, spontaneous and stimulated emissions- Einsteins coeffecients, Population inversion - Solid state laser: Ruby laser, Gas laser: He-Ne laser, Applications of Lasers

Unit –III

Magnetic Properties: Basic definitions, B,H,I relation-Classification of magnetic materials – origin of magnetic moment – Weiss theory of Ferromagnetism - Hysteresis- Soft and Hard magnetic materials.

Acoustics: Reverberation time - Sabine's formula- Measurement of absorption coefficient – Factors affecting the acoustically good hall and their remedies.

Unit –IV

Crystallography & X-Ray Diffraction: Basis and lattice – Bravais systems- Symmetry elements- Unit cell- packing fraction – coordination number- Miller indices – Separation between successive (hkl) planes – Bragg's law.

Electromagnetic Fields: Introduction-Gauss and Stokes theorems(qualitative) – Fundamental laws of electromagnetism-Maxwell's equations of EM wave.

Unit – V

Band Theory Of Solids: Bloch's theorem (qualitative)–Kronig Penney model(qualitative) – energy bands in crystalline solids – classification of crystalline solids– effective mass of electron & concept of hole.

Semiconductor Physics: Introduction- Density of carriers in Intrinsic and Extrinsic semiconductors – Drift & Diffusion – relevance of Einstein's equation- Hall effect in semiconductors.

Course Outcomes

After completion of this course, a successful student will be able to:

CO-1. Impart Knowledge of Physical Optics phenomena like Interference, Diffraction involving to design instruments with higher resolution.

CO-2. Analyze the concept of Polarization, Coherent sources, its realization and utility in optical instrumentation.

CO-3. Study the concepts regarding the bulk response of Magnetic materials and their analytical properties.

CO-4. Taps the Simple harmonic motion and its adaptability for improved acoustic quality of concert halls.

CO-5. Study the Structure-property relationship exhibited by solid crystal materials and impart the concepts of EM fields to find velocity of light.

CO-6. Understands quantum picture of sub-atomic world dominated by electron and its presence.

CO-7. Apply the knowledge of physics of electronic transport at underlying mechanism

Text Books

1. A Text book of Engineering Physics – by P.K.Palanisamy, Scitech publications
2. Engineering Physics by Dr. M.N.Avadhanulu and Dr.P.G.Kshira sagar, S.Chand & Company Ltd., (2014)
3. Engineering Physics by D.K.Bhattacharya and Poonam Tandon, Oxford press (2015)

Reference Books

1. 'Solid State Physics' by A.J.Dekker, Mc Millan Publishers (2011)
2. Lasers and Non-Linear optics by B.B.Laud, New Age International Publishers (2008).
3. Engineering Physics by M. Arumugam, Anuradha Publication (2014)

Regulation	GR - 17 (B.Tech.)	L	T	P/D	C
Course/ Code	ENGINEERING DRAWING / 17193273	-	-	3	3
Teaching	Total contact hours - 64				
Prerequisite (s)	Aptitude to learn				

Unit- I

Introduction to drawing Instruments and uses. Lettering. Polygons : Construction of regular polygons using given length of a side; Curves used in Engineering Practice, conic sections, construction of conics by different methods, cycloidal curves, epi and hypo-cycloids. Involutes.

Unit - II

Scales : Vernier and Diagonal scales: Introduction to orthographic projections; projections of points; projections of straight lines parallel to both the planes; projections of straight lines – parallel to one plane and inclined to the other plane. Projections of straight lines inclined to both the planes, determination of true lengths and angle of inclinations and traces.

Unit - III

Projections of planes: Regular planes perpendicular/parallel to one plane and inclined to the other reference plane; inclined to both the reference planes.

Unit - IV

Projections of Solids: Prisms, Pyramids, Cones and Cylinders with the axis inclined to one of the planes.

Unit - V

Conversion of isometric views to orthographic views:Conversion of orthographic views to isometric views. Prospective Projection.

Course Outcomes

After completion of this course, a successful student will be able to:

CO-1. To understand the concepts and use of drawing Instruments and Curves used in Engineering Practice.

CO-2. To understand the concepts of Vernier and Diagonal scales and concepts of orthographic projections.

CO-3. To understand the concepts of Projections of isometric views to orthographic views.

Text Books

1. Engineering Graphics by PI Varghese, McGrawHill Publishers
2. Engineering Drawing by N.D. Butt, Chariot Publications
3. Engineering Drawing by K.L.Narayana & P. Kannaiah, Scitech Publishers.

Reference Books

1. Engineering Drawing by Agarwal & Agarwal, Tata McGraw Hill Publishers
2. Engineering Drawing by Shah & Rana, Pearson Publishers
3. Engineering Drawing AutoCad – K Venugopal, V. Prabhu Raja, New Age Publishers

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	ENVIRONMENTAL STUDIES / 17199204	4	0	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Knowledge to conserve Natural Resourses and to control Environmental Pollution.				

Unit –I

Multidisciplinary nature of Environmental Studies: Definition, Scope and Importance – Stockholm and Rio Summit–Global Environmental Challenges**:** Global warming and climate change, acid rains, ozone layer depletion, population growth and explosion, effects. Role of information Technology in Environment and human health.

Ecosystems: 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 - 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

Biodiversity and its conservation: 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-sports of biodiversity - Threats to biodiversity**:** habitat loss, man-wildlife conflicts. - Endangered and endemic species of India.Conservation of biodiversity**:** In situ, Ex situ conservation.

Unit –IV

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 – V

Social Issues and the Environment: Urban problems related to energy -Water conservation, rain water harvesting-Resettlement and rehabilitation of people; its problems and concerns.

Environmental ethics: Issues and possible solutions. Environmental Protection Act -Air (Prevention and Control of Pollution) Act. –Water (Prevention and control of Pollution) Act -Wildlife Protection Act -Forest Conservation Act-Issues involved in enforcement of environmental legislation. -Public awareness.

Environmental Management: Impact Assessment and its significance various stages of EIA, preparation of EMP and EIS, Environmental audit. Ecotourism The student should submit a report individually on any issues related to Environmental Studies course and make a power point presentation.

Course Outcomes

After completion of this course, a successful student will be able to:

- **CO-1.** Understand fundamental physical and biological principles that govern natural processes.
- **CO-2.** Demonstrate an integrative approach to environmental issues with a focus on sustainability of Natural resource utilization.
- **CO-3.** Basic understanding of the ecosystem diversity and its conservation.
- **CO-4.** Acquaintance on various environmental challenges induced due to unplanned anthropogenic activities.
- **CO-5.** Integrate and apply perspectives from across the natural sciences, social sciences, and the humanities in the context of complex environmental problems.
- **CO-6.** Provide students with technical and analytical skills that enable them to find employment in federal and state resource agencies, consulting firms, community-based education, and industrial firms tasked with environmental compliance.

Text Books

1. Environmental Studies by R. Rajagopalan, 2nd Edition, 2011, Oxford University Press.
2. A Textbook of Environmental Studies by Shaashi Chawla, TMH, New Delhi
3. Environmental Studies by P.N. Palanisamy, P. Manikandan, A. Geetha, and K. Manjula Rani; Pearson Education, Chennai

Reference Books

1. Text Book of Environmental Studies by Deeshita Dave & P. Udaya Bhaskar, Cengage Learning.
2. Environmental Studies by K.V.S.G. Murali Krishna, VGS Publishers, Vijayawada
3. Environmental Studies by Benny Joseph, Tata McGraw Hill Co, New Delhi
4. Environmental Studies by Piyush Malaviya, Pratibha Singh, Anoop singh: Acme Learning, New Delhi.

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	**DATA STRUCTURES / 17199205** **Common to (EEE, ECE, CSE)**	3	1	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Basic knowledge about mathematics and C-language.				

Unit -I

Data structure- Definition, types of data structures

Recursion: Definition, Design Methodology and Implementation of recursive algorithms, Linear and binary recursion, recursive algorithms for factorial function, GCD computation, Fibonacci sequence.Preliminaries of algorithm, Algorithm analysis and complexity.

Searching Techniques: Linear Search, Binary Search and Fibonacci Search.

Sorting Techniques: Insertion sort, selection sort, exchange-bubble sort, quick sort and merge sort Algorithms.

Unit -II

Stacks: Basic Stack Operations, Representation of a Stack using Arrays, Stack

Applications: Reversing list, Factorial Calculation, Infix to postfix Transformation, Evaluating Arithmetic Expressions.

Unit -III

Queues: Basic Queues Operations, Representation of a Queue using array, Implementation of Queue Operations using Stack.

Applications of Queues-Circular Queues, De-queue, PriorityQueues.

Unit -IV

Linked Lists: Introduction, single linked list, representation of a linked list in memory, Operations on a single linked list, reversing a single linked list, Circular linked listand Double linked list.

Unit -V

Trees-Binary Trees, terminology, representation and traversals-pre, post & in order traversals.

Graphs- terminology, representation and traversals (BFS&DFS).

Course Outcomes

After completion of this course, a successful student will be able to:

CO-1. Choose appropriate data structure as applied to specified problem definition.

CO-2. Apply operations like searching, insertion, deletion, traversing mechanism etc. on various data structures.

CO-3. Apply concepts learned in various domains like DBMS, compiler construction.

CO-4. Apply linear and non-linear data structures like stacks, queues, linked list etc.

Text Books

1. Data Structures with C, Seymour Lipscutz, Schaum's Outlines, TMH-special 2nd Edition
2. Data structures using C, 2nd Edition, ReemaThareja, Oxford higher education.

Reference Books

1. Data structures: A Pseudo code Approach with C, 2nd edition, R.F.Gilberg and B.A.Forouzan, Cengage Learning
2. Data structures A Programming Approach with C, D.S.Kushwaha and A.K.Misra, PHI.
3. Data structures and Algorithm Analysis in C, 2nd edition, M.A.Weiss, Pearson.
4. Data Structures using C, A.M.Tanenbaum, Y. Langsam, M.J.Augenstein, Pearson.

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	ENGINEERING CHEMISTRY / 17199206	4	0	0	3
Teaching	Total contact hours - 60				
Prerequisite (s)	Knowledge of theoretical and experimental from +2 level, Application of Chemistry theory and calculations to required course.				

Unit-I

Water technology: Hard water-Estimation of hardness by hardness by EDTA method – Potable water – Sterilization and Disinfection – Boiler feed water – Boiler troubles – Priming and forming, scale formation, corrosion, caustic embrittlement, turbine deposits – Softening of water – Lime soda, Zeolite processes and Ion exchange process – Reverse osmosis – Electro Dialysis,

Unit-II

Electrochemistry & Corrosion: Conductometic titrations–Elctrode potentials– Nernst equation – electrochemical series – Potentiometric titrations.Causes and effects of corrosion – theories of corrosion (dry, chemical and (electrochemical corrosion) – Factors effecting corrosion – Corrosion control methods – Cathodic protection – Sacrificial Anodic, Impressed current methods – Surface coating – Methods of application on metals (Hot dipping, Galvanizing, tinning, Cladding, Electroplating, Electro less, plating,), Organic coatings-Paints.

Unit-III

High polymers: Types of Polymerization – Stereo Polymers – Physical and mechanical properties of polymers – Plastics – Thermoplastics and thermo setting plastics – Compounding and Fabrication of plastics – preparation and properties of Polyethylene, PVC and Bakelite – Elastomers – Rubber and Vulcanization – Styrene butadiene rubber – Thiokol – applications.

Unit-IV

Fuels: Coal – Proximate and ultimate analysis – Numerical problems based on analysis – Calorific value – HCV and LVC – Problems based calorific values; petroleum – Refining – Cracking – Petrol – Diesel knocking: Gaseous fuels – Natural gas – LPG, CNG – Combustion – Problems on air requirements.

Unit-V

Chemistry of advanced materials: Nanomaterials– Properties of nanomaterials –Engineering applications) – Liquid crystals (Types – Application in LCD and Engineering Applications) – Fiber reinforced plastics – Biodegradable polymers – Conducting polymers –Green chemistry and Applications. Cement- Constituents, manufacturing, hardening and setting, deterioration of cement

Course Outcomes

After completion of this course, a successful student will be able to:

CO-1. For prospective engineers knowledge about water used in industries (boilers etc.) and for drinking purposes is useful; hence chemistry of water of hard water, boiler troubles and modern methods of softening hard water is introduced.

CO-2. Knowledge of galvanic cells, electrode potentials is necessary for engineers to understand corrosion problem and its control. The problems associated with corrosion are well known and the engineers must be aware of these problems and also how to counter them.

CO-3. Plastics are materials used very widely engineering materials. An understanding of properties particularly physical and mechanical properties of polymers / plastics / elastromers helps in selecting suitable materials for different purpose.

CO-4. A board understanding of the more important fuels employed on a large scale is necessary for all engineer to understand energy – related problems and solve them.

CO-5. With the knowledge available now, future engineers should know at least some of the advanced materials that are becoming available. Hence some of them are introduced here.

Text Books

1. Jain and Jain (Latest Edition), Engineering Chemistry, Dhanpat Rai Publishing company Ltd.,
2. N. Y. S. Murthy, V. Anuradha, K. RamaRao, "A Text Book of Engineering Chemistry" Maruthi Publications.
3. C. Parameswara Murthy, C. V. Agarwal, Adhra Naidu (2006) Text Book of Engineering Chemistry, B. S. Publications.
4. B. Sivasankar (2010), Engineering Chemistry, McGraw-Hill companies.
5. Ch. Venkata Ramana Reddy and Rama devi (2013), Engineering Chemistry, Cengage Learning.

Reference Books

1. S. S. Dara (2013) Text Book of Engineering Chemistry, S. Chand Technical Series.
2. K. Sesha Maheswaeamma and Mridula Chugh (2013), Engineering Chemistry, Pearson Publications.
3. R. Gopalan, D. Venkatappayya, Sulochana, Nagarajan (2011), Text Book of Engineering Chemistry, Vikas Publications.

4. B. Viswanathan and M. Aulice Scibioh (2009), Fuel cells, Principals and applications.

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	ENGLISH - COMMUNICATION SKILLS LAB- II / 17199211	0	0	3	2
Teaching	Total contact hours - 45				
Prerequisite (s)	Learner should be equipped with basic language and communication skills like Reading,Writing,Listening and Speaking				

Unit - I

1. Debating
   Practice work

Unit - II

1. Group Discussions
   Practice work

Unit - III

1. Presentation Skills
   Practice work

Unit - IV

1. Interview Skills
   Practice work

Unit - V

1. Email,
2. Curriculum Vitae
   Practice work

Unit - VI

1. Idiomatic Expressions
2. Common Errors in English Practice work

Course Outcomes

After completion of this course, a successful student will be able to:

CO-1. Enable the students to learn demonstratively the communication skills of listening, speaking, reading and writing.

Text Books

1. **'INTERACT**: English Lab Manual for Undergraduate Students' Published by Orient Blackswan Pvt Ltd.

Reference Books

1. Strengthen your communication skills by Dr M Hari Prasad, Dr Salivendra Raju and Dr G Suvarna Lakshmi, Maruti Publications.
2. English for Professionals by Prof Eliah, B.S Publications, Hyderabad.
3. Unlock, Listening and speaking skills 2, Cambridge University Press
4. Spring Board to Success, Orient BlackSwan
5. A Practical Course in effective english speaking skills, PHI
6. Word power made handy, Dr shalini verma, Schand Company

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	ENGINEERING PHYSICS LAB / 17199212	0	0	3	2
Teaching	Total contact hours - 45				
Prerequisite (s)	Engineering physics				

1. Determination of wavelength of a source-Diffraction Grating-Normal incidence
2. Newton‟s rings –Radius of Curvature of Plano Convex Lens.
3. Determination of thickness of a thin object using parallel interference fringes.
4. Determination of Rigidity modulus of a material- Torsional Pendulum.
5. Determination of Acceleration due to Gravity and Radius of Gyration- Compound Pendulum.
6. Melde's experiment – Transverse and Longitudinal modes.
7. Verification of laws of stretched string – Sonometer.
8. Determination of velocity of sound – Volume resonator.
9. L C R Series Resonance Circuit
10. Study of I/V Characteristics of Semiconductor diode
11. I/V characteristics of Zener diode
12. Thermistor characteristics – Temperature Coefficient
13. Magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
14. Energy Band gap of a Semiconductor p-n junction.
15. Hall Effect for semiconductor.

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	**DATA STRUCTURES LAB / 17195213** **Common to (EEE, ECE, CSE)**	0	0	3	2
Teaching	**Total contact hours - 45**				
Prerequisite (s)	Basic knowledge about mathematics and C-language.				

1. Write recursive program for the following
   a) Write recursive and non-recursive C program for calculation of GCD (n, m)
   b) Write a C program that use recursive function to perform Binary Search for a key value in a given list.
   c) Write a C program that use recursive function to perform Linear Search for a key value in a given list.

2. Write C program that implement
   a) Insertion sort, to sort a given list of integers in ascending order
   b) Selection sort to sort a given list of integers in ascending order
   c) Bubble sort, to sort a given list of integers in ascending order
   d) Quick sort, to sort a given list of integers in ascending order
   e) Merge sort, to sort a given list of integers in ascending order

3. Write C program that implement
   a) Stack (its operations) using arrays
   b) Stack operations to convert infix expression into equivalent postfix expression

4. Write C program that implement
   a) Queue (its operations) using arrays.
   b) Circular queue (its operations) using arrays.
   c) De-queue (its operations) using arrays.

5. Write a C program that uses functions to
   a) Create a singly linked list
   b) Perform insertion operations on a singly linked list
   c) Perform deletion operations on a singly linked list

Course Outcomes

After successful completion of this course, a successful student will be able to:

CO-1. Write the programs to implement Various Data Structures.

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	ELECTRICAL CIRCUIT ANALYSIS-I / 17120301	3	1	0	3
Teaching	Total contact hours - 65				
Prerequisite (s)	Mathematics-1				

Unit-I

Introduction to Electrical Circuits

Passive components and their V-I relations, Sources (DependentandIndependent)-Kirchoff's laws, Nodal analysis, mesh analysis-Numerical problems.Network reduction techniques (Series, parallel, series-parallel, star-to-delta or delta-to-star transformation), Source transformation technique.

Unit-II

Single Phase A.C Circuits: periodic wave forms (determination of RMS value, average value and form factor) , Concept ofPhase angle and Phase difference , Complex and polar forms of representations , Steady state analysis of R,L and C circuits , Power factor and its significance –Real ,Reactive and apparent Power.

Unit-III

Locus diagrams for various combinations of R, L and C- Resonance- concept of band width and Q factor.

Magnetic Circuits: 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-composite magnetic circuit-analysis of series and parallel magnetic circuits.

Unit-IV

Network theorems (DC & AC Excitations): Superposition theorem, Thevenin's theorem,Norton's theorem, Maximum Power Transfer theorem. Reciprocitytheorem, Millman's theorem and compensation theorem.

Unit-V

Network topology: Definitions – Graph – Tree, Basic cut-set and Basic tie-set matrices for planar networks.Loop and Nodal methods of analysis of Networks with dependent & independent voltage and current sources – Duality & Dual networks.

Course Outcomes

After successful completion of the course, a successful student will be able to-

CO1: Apply the basics of circuit analysis

CO2: Solve D.C. circuits by using KVL and KCL

CO3: Solve A.C. circuits by using KVL and KCL

CO4: Apply theorems for finding the solutions of network problems

CO5: Understand the basic graph theory

Text Books

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,McGraw Hill Company,6th edition
2. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd.

Reference Books

1. Introduction to circuit analysis and Design by TildonGlissonJr, Spinger Publications.
2. Electrical Circuits by K.S Suresh Kumar , Pearson Publications
3. Electrical Circuits by David A. Bell, Oxford Publications
4. Introductory circuit analysis by Robert L Boylestad , Pearson Publications
5. Circuit Theory (analysis and Synthesis) by A.Chakrabarthi, DhanpatRai&Co.

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	ELECTROMAGNETIC FIELDS / 17120302	3	1	0	3
Teaching	Total contact hours - 65				
Prerequisite (s)					

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 – Maxwell's first law, div(D)=$\frac{-\rho}{\varepsilon}$ Laplace's and Poison's equations – Solution of Laplace's equation in one variable.

Unit – II

Conductors - Dielectric & Capacitance: 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.

Polarization - Boundary conditions between conduction to dielectric and dielectric to dielectrics.

Capacitance – Capacitance of parallel plate and spherical and co-axial cables 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 & Ampere's law: 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.

Ampere's circuital law and its applications viz. MFI due to an infinite sheet of current and a long filament current carrying conductor - Point form of Ampere's circuital law – Maxwell's third equation, Curl (H)=J

Unit – IV

Force in Magnetic fields: 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: 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 – V

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.

Course Outcomes

After successful completion of the course, a successful student will be able to-

CO1: Understand the basics of electrostatics
CO2: Understand the capacitors
CO3: Understand statics and apply Ampere's law
CO4: Understand the force in magnetic fields
CO5: Understand time varying fields

Text books

1. "Engineering Electromagnetics" by William H. Hayt& John. A. Buck Mc. Graw-Hill Companies, 7th Editon.2006.
2. "Electro magnetic Fields" by Sadiku, Oxford Publications
3. "Introduction to Electro Dynamics" by D J Griffiths, Prentice-Hall of India Pvt.Ltd, 2nd editon

Reference books

1. "Electromagnetics" by J P Tewari.
2. "Electromagnetics" by J. D Kraus McGraw-Hill Inc. 4th edition 1992.
3. "Electromagnetic fields", by S. Kamakshaiah, Right Publishers, 2007.

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	ELECTRICAL MACHINES-I / 17120303	3	1	0	3
Teaching	Total contact hours - 65				
Prerequisite (s)	ECA-1, Mathematics-1				

Unit-I

D.C. Generators: Armature windings – lap and wave windings, Numerical problems, commutation Process – methods of improving commutation, Compensating windings – Interpoles

Types of DC generators: Types of DC generator: separately excited and self excitedgenerators.Numerical problems, O.C.C– build-up of E.M.F - critical field resistance and critical speed - causes for failure of inducing E.M.F and remedial measures.

Internal & External characteristics of shunt, series and Compound generator-Applications, Losses and Efficiency.applications of dc generators.

Unit – II

D.C. Motors:D.C Motors – Principle of operation – Back E.M.F. -–characteristics of shunt, series and compound motors – Armature reaction and commutation,

Torque equation, Speed torque characteristics, Losses and Efficiency, 3- point and 4- point starters – Numerical problems, applications of dc motors.

Unit – III

Speed Control and Testing of D.C. Machines

Speed control Methods: D.C. Shunt motor-Armature voltage and field flux control methods, speed control of D.C. Series motor.

Testing of D.C. machines: Brake test, Swinburne's test, Hopkinson's test(Regenerative method) - Retardation test and separation of losses. electrical braking methods: plugging, dynamic braking, regenerative braking.

Unit – IV

Single Phase Transformers: Construction & Operation – Construction details — types of transformers, Principle of operation- emf equation - operation on no-load and on-load-phasor diagrams for lagging, leading and unity power factors

Equivalent circuit –Regulation – losses and efficiency - effect of variations of frequency & supply voltage on iron losses-- All day efficiency

OC and SC tests - Sumpner's test -separation of losses -parallel operation- equal and unequal voltage ratios - auto transformers-equivalent circuit - comparison with two winding transformers, Numerical problems

Unit – V

3-phase Transformers: Poly phase connections - Y/Y, Y/Δ, Δ/Y, Δ/Δ and open Δ -- Third harmonics in phase voltages-three winding transformers : tertiary windings-determination of Zp, Zs and Zt -- transients in switching - off load and on load tap changers -- Scott connection.

Course Outcomes

After successful completion of the course, a successful student will be able to-

CO1: study the principle and types of DC generators
CO2: study the principle of operation of Dc motor
CO3: control the Speed of Dc motor and toTest the D.C. Machines
CO4: study the construction and performance characteristics of Transformers

Text books

1. Electric Machinary – A. E. Fritzgerald, C. Kingsley and S. Umans, McGraw-Hill Companies, 5th editon
2. Electrical Machines – P.S. Bimbra.,Khanna Publishers

Reference books

1. Performance and Design of D.C Machines – by Clayton & Hancock, BPB Publishers
2. Electric Machines by I.J. Nagrath& D.P. Kothari, Tata McGraw – Hill Publishers, 3rd edition,2004.
3. Electromechanics – I (D.C. Machines) S. Kamakshaiah Hi-Tech Publishers.

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	MATHEMATICS-III / 17129304	4	0	0	3
Teaching	Total contact hours - 65				
Prerequisite (s)	Basic knowledge of Algebra, Trigonometry,Differentiation, Integration, Vectors, co ordinate geometry and matrices.				

Unit-I

Linear systems of equations: Rank-Echelon form, Normal form – Solution of Linear Systems – Direct Methods- Gauss Elimination - Gauss Jordon and Gauss Seidal Methods.
Application: Finding the current in a electrical circuit. (CO1)

Unit-II

Eigen values - Eigen vectors and Quadratic forms: Eigen values - Eigen vectors– Properties – Cayley-Hamilton Theorem – **without proof** Inverse and powers of aMatrix by using Cayley-Hamilton theorem- Quadratic forms- Reduction of quadratic form to Canonical form – Rank - Positive, negative definite - semi definite - index – signature.Application: Free vibration of a two-mass system.(CO2)

Unit-III

Multiple integrals: Review concepts of Curve tracing (Cartesian - Polar and Parametric curves)- **No question from this part:**Applications of Integration to Lengths, Volumes and Surface areas of revolution in Cartesian and Polar Coordinates. Multiple integrals - double and triple integrals – change of variables – Change of order of Integration Application: Moments of inertia.(CO3)

Unit-IV

Special functions: Beta and Gamma functions- Properties - Relation between Beta and Gamma functions-Evaluation of improper integrals
Application: Evaluation of integrals.(CO4)

Unit-V

Vector Differentiation & Integration: Gradient- Divergence-Curl - Laplacian and second order operators -Vector identities (without proof)
Application: Equation of continuity, potential surfaces
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, Force.(CO5)

Course Outcomes

After successful completion of the course, a successful student will be able to-

CO-1. Use matrix theory to solve linear system of equations
CO-2. Find eigen values and Eigen vectors and use Cayley Hamilton theorem to find Inverse and Powers of a Matrix and also reduce a given Quadratic form to Canonical form.
CO-3. Learn applications of Integration and evaluation of Multiple Integrals.
CO-4. Use Beta, Gamma functions to evaluate Improper Integrals.
CO-5. Use vector differentiation and integration with vector integral theorems

Text Books

1.UM. Swamy, P.Vijaya Lakshmi, R.V.G.Ravi Kumar, M.Phani Krishna Kishore Engineering Mathematics 1st Edition, Anurag Jain for Excel Books
2. Dr.T.K.V.Iyengar, Dr.B.Krishna Gandhi, S.Ranganatham, M.V.S.S.N.Prasad, 1st Edition, S.Chand Publication
3. B.S.GREWAL, Higher Engineering Mathematics, 42nd Edition, Khanna

Reference books

1.N.P.Bali, Engineering Mathematics, Lakshmi Publications.
2. GREENBERG, Advanced Engineering Mathematics, 9th Edition, Wiley-India
3. B.V. RAMANA, Higher Engineering Mathematics, Tata McGraw-Hill
4. ERWIN KREYSZIG, Advanced Engineering Mathematics, 9th Edition, Wiley
5. PETER O'NEIL, Advanced Engineering Mathematics, Cengage Learning

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	**Fluid Mechanics & Hydraulic Machinery / 17123305**	3	1	0	3
Teaching	Total contact hours - 65				
Prerequisite (s)					

Unit-I

Fluid statics : Dimensions and units: physical properties of fluids- specific gravity, viscosity surface tension- vapor 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 and streak lines and stream tube, classification of flows-steady & Unsteady, uniform, non uniform, laminar, turbulent, rotational, and irrotational 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, venturimeter, and orifice meter, Flow nozzle, Turbine flow meter.

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 don and efficiency, flow over radial vanes.
Centrifugal pumps: Classification, working, work done – manomertic head- losses and efficiencies specific speed- pumps in series and parallel-performance characteristic curves, NPSH. Reciprocating pumps: Working, Discharge, slip, indicator diagrams.
Reciprocating Pumps: Working, Discharge, slip, indicator diagrams.

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.

Course Outcomes

CO-1. Describe basic working of single and multi-stage centrifugal pumps and blowers.
CO-2. Calculate performance and design of turbines
CO-3. Generate mathematical models of fluid motion including steady, unsteady flow and boundary layer theory
CO-4. State and visualize fluid kinematics. predict and design a fluid dynamical system based on inviscid theory.

Text Books

1. Fluid Mechanics and Hydraulic Machines by Rajput.
2. Hydraulics, fluid mechanics and Hydraulic machinery by Modi and Seth.

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.
3. Hydraulic Machines by Banga & Sharma, Khanna Publishers.

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	ELECTRONIC DEVICES & CIRCUTS / 17124306	3	1	0	3
Teaching	Total contact hours - 65				
Prerequisite (s)	Knowledge of Engineering physics related to semiconductor, mathematics like trigonometry, integration etc.				

Unit-I

Semi Conductor Physics :Insulators, Semi conductors and Metals classification using energy band diagrams, mobility and conductivity, electrons and holes in intrinsic semi conductors, extrinsic semi conductors, drift and diffusion, charge densities in semiconductors, Hall effect, continuity equation, law of junction, Fermi Dirac function, Fermi level in intrinsic and extrinsic Semiconductors.

Unit-II

Junction 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, Diode capacitance, energy band diagram of PN junction Diode.

Special Semiconductor Devices

Zener Diode, Breakdown mechanisms, Zener diode applications, LED, LCD, Photo diode, optocoupler Varactor diode, Tunnel Diode, DIAC, TRIAC, SCR, UJT Construction, operation and characteristics of all the diodes is required to be considered.

Unit-III

Rectifiers and Filters: Basic Rectifier setup, Half wave rectifier, full wave rectifier, bridge rectifier, derivations of characteristics of rectifiers, rectifier circuits-operation, input and output waveforms; Filters; Inductor filter, Capacitor filter, L- section filter, □- section filter, Multiple L - section and Multiple-section filter ,comparison of various filter circuits in terms of ripple factors, voltage regulators- series and shunt.

Unit-IV

Transistor Characteristics, Biasing and thermal stabilization: Bipolar Junction transistor, transistor current components, transistor equation, transistor configurations, transistor as an amplifier, and characteristics of transistor in Common Base, Common Emitter and Common Collector configurations, punch through/ reach through, Photo transistor. Need for biasing, operating point, load line analysis, BJT biasing- methods, Stability factors, (S, Si, S"), compensation, Thermal runaway, Thermal stability.

FET: FET types, construction, operation, characteristics, parameters, MOSFET-types, construction, operation, characteristics, FET biasing methods and stabilization.

Unit-V

Small Signal Low Frequency Transistor Amplifier Models:

BJT: Two port network, Transistor hybrid model, determination of h- parameters, conversion of h-parameters, genera lized 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.

Course Outcomes

After successful completion of the course, a successful student will be able to-

CO1: Apply the Knowledge of semiconductor physics for designing the circuits of electronic devices.

CO2: Obtain the characteristics of diode in forward and reverse bias and perform mathematical modeling of diode as a resistor and capacitor.

CO3: Perform analysis and design of a complete AC to DC converter (Eg: Mobile Charger) consisting of Rectifiers, Filters and regulators.

CO4: Describe the construction and working of a Transistor in various modes and design circuits for stabilization and compensation of both BJT and FET.

CO5: Gain Knowledge of Small Signal Low Frequency Transistor Amplifier Models.

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.

Reference Books

1. Electronic Devices and Circuits-Salivahanan, Kumar, Vallavaraj, Tata Mc-Graw Hill, Second Edition.

2. Electronic Devices and Circuit Theory-R.L. Boylestad and Louis Nashelsky, Pearson Publications, Tenth Edition

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	SOFTSKILLS – I / 17129397	1	2	0	1
Teaching	Total contact hours - 48				
Prerequisite (s)	Learner should be equipped with Functional grammatical skills and interactive ability				

Unit-1: Places	
Reading	Importance of reading skills. Scanning techniques
Writing	Punctuation marks, Writing descriptive sentences ,Writing positives and negatives about a place
Listening & Pronunciation	Video: Living in Alaska Predicting content through visuals, Listening for main ideas Distinguishing fact from opinion
Speaking	Organizing information for a presentation; Making a presentation about place
Grammar	Tense and aspect
Vocabulary	Vocabulary to describe places, suffixes and prefixes
Unit-II: Festivals and Celebrations	
Reading	Recognizing text types, skimming and scanning
Writing	Organizing sentences into a paragraph; writing first draft; writing paragraph: descriptive ,narrative etc.
Listening & Pronunciation	Video: Chinese New Year Listening and taking notes; listening for examples;Stressed words and unstressed sounds
Speaking	Giving a poster presentation, understanding intonation
Grammar	Present tense question forms, Adjectives
Vocabulary	Vocabulary to describe festivals; Collocations
Unit-III: School and Education	
Reading	Making inferences/Previewing techniques
Writing	Letter writing/Official letters
Listening & Pronunciation	Video: Education around the world following native accent and intonation
Speaking	Giving opinions in a debate: /agreeing and disagreeing, convincing
Grammar	Conjunctions, Subject pronouns
Vocabulary	Prepositional phrases, Basic verb patterns
Unit-IV: The Internet And Technology	
Reading	Understanding discourse
Writing	Essay writing
Listening & Pronunciation	Video: Virtual Reality Listening for reasons

Speaking	Presenting a new technology along with advantages and disadvantages
Grammar	Compound nouns, prepositions
Vocabulary	Vocabulary for Internet and technology
Unit-V: Language and Communication	
Reading	Scanning techniques, Observation of foreign languages
Writing	Information from flow charts
Listening & Pronunciation	Video: Languages in South America Listening for genre; Listening for instructions;
Speaking	Sequencing words to organize instructions; Planning and giving a set of instructions
Grammar	Quantifiers: some, many, a lot of, a few, a little; Imperative clauses;
Vocabulary	Analogies and idiomatic distortions

Text Books

1. UNLOCK SERIES from Cambridge University Press

2. Unlock Book-2: Reading and Writing

   Listening and Speaking

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course Code	**ELECTRONIC DEVICES AND CIRCUITS LAB / 17124311**	-	-	3	2
Teaching	**Total contact hours - 36**				
Prerequisite (s)	Knowledge of Engineering physics related to semiconductor, mathematics like trigonometry, integration etc.				

PART A: Electronic Workshop Practice

1. Identification, Specifications, Testing of R, L, C Components (Colour Codes), Potentiometers, Coils,
   Gang Condensers, Relays, Bread Boards.
2. Identification, Specifications and Testing of active devices, Diodes, BJTs, JFETs, LEDs, LCDs, SCR, UJT.
3. Soldering Practice- Simple circuits using active and passive components.
4. Study and operation of Ammeters, Voltmeters, Transformers, Analog and Digital Multimeter, Function Generator, Regulated Power Supply and CRO.

PART B: List of Experiments

(For Laboratory Examination-Minimum of Ten Experiments)

1. P-N Junction Diode Characteristics

   Part A: Germanium Diode (Forward bias& Reverse bias)

   Part B: Silicon Diode (Forward Bias only)

2. Zener Diode Characteristics

   Part A: V-I Characteristics

   Part B: Zener Diode as Voltage Regulator

3. Rectifiers (without and with c-filter)

   Part A: Half-wave Rectifier

   Part B: Full-wave Rectifier

4. BJ T Characteristics (CE Configuration)

   Part A: Input Characteristics

   Part B: Output Characteristics

5. FET Characteristics (CS Configuration)

Part A: Drain Characteristics

Part B: Transfer Characteristics

6. SCR Characteristics
7. UJ T Characteristics
8. Transistor Biasing
9. CRO Operation and its Measurements
10. BJT-CE Amplifier
11. Emitter Follower-CC Amplifier
12. FET-CS Amplifier

PART C: Equipment required for Laboratory

1. Bred boards.
2. Ammeters (Analog or Digital)
3. Voltmeters (Analog or Digital)
4. Active & Passive Electronic Components
5. Regulated Power supplies
6. Analog/Digital Storage Oscilloscopes
7. Analog/Digital Function Generators
8. Digital Multimeters
9. Decade resistance Boxes/Rheostats
10. Decade Capacitance

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	**Fluid Mechanics & Hydraulic Machinery Lab / 17123312**	-	-	3	2
Teaching	**Total contact hours - 48**				
Prerequisite (s)					

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 Venturimeter.
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. Turbine flow meter.

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

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	ELECTRICAL CIRCUIT ANALYSIS-II / 17120401	3	1	0	3
Teaching	Total contact hours - 65				
Prerequisite (s)					

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.

Unbalanced Three phase circuits: Analysis of Three Phase unbalanced circuits-Loop Method- Application of Mill man's Theorem- Star Delta Transformation Technique – Two Wattmeter Method of measurement of three phase power.

Unit-II

Transient Analysis: Transient response of R-L, R-C, R-L-C series circuits for D.C excitation, solution using differential equation and Laplace transforms.
Transient response of R-L, R-C, R-L-C series circuits for A.C excitation, solution using differential equation and Laplace transforms.

Unit-III

Two Port Networks: Two port network parameters – Z, Y, ABCD, Inverse transmission parameters- 'h' parameters and 'g 'and- their relations- Cascaded networks-Poles and zeros of Network functions.

Unit-IV

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

Unit-V

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.Fourier Integrals and Fourier Transforms – properties of Fourier Transforms and Application to Electrical Circuits.

Course Outcomes

After completion of this course, a successful student will be able to:

- **CO-1.** Solve three- phase circuits under balanced condition. Unbalanced condition.
- **CO-2.** Find out transient response of electrical networks with different types of excitations. Estimate the different types of two port network parameters.
- **CO-3.** Represent electrical equivalent network for a given network transfer function.

Text Books

1. Engineering Circuit Analysis by William Hayt and Jack E.Kemmerley,McGraw Hill Company,6 th edition.
2. Network synthesis: VanValkenburg; Prentice-Hall of India Pvt. Ltd.
3. Circuit Theory (Analysis and Synthesis) - A. Chakrabarti, DhanpatRai& Co.

Reference Books

1. Network Theory by A. Sudhakar and Shyammohan S Palli, Tata McGraw- Hill Publications,first edition.
2. Network Analysis by N.C.Jagan, C.LakshmiNarayana,BS Publications,2nd edition
3. Network Analysis: Van Valkenburg; Prentice-Hall of India Private Ltd

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	SWITCHING THEORY AND LOGIC DESIGN / 17124405	3	1	0	3
Teaching	Total contact hours - 65				
Prerequisite (s)					

Unit-I

Review of number systems & codes: Representation of different radix, Number systems base conversion methods, complements of numbers, r's, r – 1's compliment of signed numbers, problem solving.4-bit codes, BCD, excess-3, alphanumeric code, self-complement codes, 2421, 8421.

Logic operations: Basic Logic gates- NOT, OR,AND, Universal building blocks, EX-OR, EX-NOR gates, standard SOP and standard POS. Minimization of logic functions using theorems, gray code, error detection and correction codes, Parity checking codes, Hamming codes. Multi-level NAND – NAND, NOR – NOR realizations.

Unit-II

Minimization of switching functions: Boolean theorems, complements and duality of logic expressions, De-morgan theorems, Minimization of switching functions using Boolean theorem, K – map up to 6-variables, code converters and binary multiplier is using K –map, tabular minimization (QuineMcCluskey method).

Unit-III

Minimization of switching functions: Design of half adder, full adder, half sub tractor, full subtractor, applications of full adders, 4-bit binary adder, 4-bit binary subtractor, BCD adder, excess – 3 adder, carry look – a – head adder. Design of decoder, encoder, multiplexer, de-multiplexer, priority encoder, comparators and seven segment display, realization of Boolean functions using decoders and Multiplexers, Priority encoder, 4-bit digital comparator.

Introduction of PLD's:PROM, PAL, PLA- Basic structures, realization of Boolean functions with PLD's, programming tables of PLDs, merits & demerits of PROM, PAL,PLA, comparision, realization of Boolean functions using PROM, PAL, PLA, programming tables of PROM, PAL, PLA.

Unit-IV

Sequential logic circuits I: Classification of sequential circuits, flip-flops with truth tables and excitation tables. Conversion of flip-flops. Design of ripple counters, synchronous counters, Johnson and ring counters. Design of buffer register, control buffer register, shift register, bi – directional shift register and universal shift register.

Unit-V

Sequential logic circuits II: Finite state machines, analysis of clocked sequential circuits,state diagrams, state tables, reduction of state tables and state assignments, design procedure. Realization of circuits using various flipflops. Mealay to Moore conversion and vice-versa.

Course Outcomes

After completion of this course, a successful student will be able to:

CO-1. Understand different number systems, its conversions and different types of logic gates.

CO-2. Know the fundamentals of and Karnaugh maps. ,Learn combinational logic circuits design.

CO-3. Learn the concepts of flip-flops and registers. And state diagram, state table and realization of circuits using flip-flops.

Text Books

1. .Anandkumar. A 8th printing (second edition) – January 2015.
2. Digital design – Moris Mano, PHI, 2/e.

Reference Books

1. Switching and Finite automata theory – ZviKohavi, Tata Mcgraw – Hill, 1978, 2/e.
2. Fundamentals of Logic Design – Charles H.RothJr, Jaico Publishers.

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	POWER SYSTEMS-I / 17120402	3	1	0	3
Teaching	Total contact hours - 65				
Prerequisite (s)	Electrical circuit analysis-I				

Unit-I

Thermal Power Stations: Layout of a thermal power plant- path of coal, steam, water, air, ash and flue gasses,- ash handling system- Description of components: Boilers, Super heaters, Economizers, electrostatic precipitators, -steam Turbines: Impulse and reaction turbines, Condensers, feed water circuit, Cooling towers, and Chimney.

Nuclear Power Stations: Nuclear fission- Nuclear fuels, chain reaction- Nuclear reactor Components: Moderators, Control roads, Reflectors and Coolants. Types of Nuclear reactors - description of PWR, BWR and FBR. -Radiation: Radiation hazards and Shielding, nuclear waste disposal.

Unit-II

D.C.distribution : 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 / unequal voltages), ring main distributor, with inter connector- stepped distributor
AC distribution: Voltage drop calculations: AC distributor- fed at one end -fed at both ends (equal / unequal voltages)- ring main distributor- with inter connector. Comparison of DC and AC distribution.

Unit-III

Substations: Classification of substations: **Air insulated substations -** Indoor & Outdoor substations: Substations layout of 33/11KV showing the location of all the substation equipment.Bus bar arrangements in the Sub-Stations: Simple arrangements like single bus bar, sectionalized single bus bar, double bus bar with one and two circuit breakers main and transfer bus bar system with relevant diagrams.
Gas insulated substations (GIS) – Advantages of Gas insulated substations, different types of gas insulated substations, single line diagram of gas insulated substations, bus bar, construction aspects of GIS, Installation and maintenance of GIS, Comparison of Air insulated substations and Gas insulated substations.

Unit-IV

Underground Cables: Types of Cables, Construction, Types of insulating materials, Calculations of insulation resistance and stress in insulation, and power factor of cable, Numerical Problems Capacitance of single and 3-Core belted Cables, Numerical Problems Grading of Cables-Capacitance grading, Numerical Problems, Description of Intersheath –Grading.

Unit-V

Economic Aspects: Load curve, load duration and integrated load duration curves, discussion on economic aspects: connected load, maximum demand, demand factor, load factor, diversity factor, power capacity factor, plant use factor, Base and peak load plants - Numerical Problems.

Tariff Methods : Costs of Generation and their division into Fixed, Semi-fixed and Running Costs, Desirable Characteristics of a Tariff Method, Tariff Methods: Simple rate, Flat Rate, Block-Rate, two-part, three –part, and power factor tariff methods, numerical problems

Course Outcomes

After completion of this course, a successful student will be able to:

- **CO-1.** Understand the Thermal Power station and its components Nuclear and Gas Power station principles
- **CO-2.** Understand the AC and DC Distribution systems and estimation of voltage drop calculations.
- **CO-3.** Understand the concepts of Air and Gas insulated substations,know the concepts of underground cables understand the economic aspects of power generation and tariff.

Text Books

1. . A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S.Bhatnagar and A.Chakraborti, DhanpatRai& Co. Pvt. Ltd., 1999.
2. Principles of Power Systems by V.K Mehta and Rohit Mehta S.CHAND& COMPANY LTD., New Delhi 2004.

Reference Books

1. Elements of Power Station design and practice by M.V. Deshpande, Wheeler Publishing.
2. Electrical Power Systems by C.L.Wadhawa New age International (P) Limited, Publishers 1997.
3. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.
4. Gas turbine performance, by PP Wals, P.Fletcher, Blackwell Publisher, 2004.

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	ELECTRICAL MACHINES – II / 17120403	3	1	0	3
Teaching	Total contact hours - 65				
Prerequisite (s)					

Unit-I

3-phase Induction Motors: Construction details: squirrel cage and wound rotors-skewing-production of rotating magnetic field - principle of operation - slip- rotor induced e.m.f and rotor frequency - rotor current and p.f. at standstill and running conditions, Numerical problems. Rotor input power, rotor copper loss, mechanical power developed - equivalent circuit - Numerical problems, Torque equation- expressions for maximum torque and starting torque – slip-torque characteristics.

Unit-II

No load and blocked rotor tests- Circle diagram for predetermination of efficiency-Starting methods-from stator side and rotor side- Induction generator- double cage rotor - crawling and cogging.

Unit-III

Construction and operation of Synchronous generator: Constructional features of non–salient and salient pole type – Armature windings –Distributed and concentrated windings – Distribution– Pitch and winding factors –E.M.F equation–Improvements of waveform and armature reaction– Numerical problems.

Unit-IV

Voltage regulation of synchronous generator: Voltage regulation by synchronous impedance method– MMFmethod and Potier triangle method–Phasor diagrams– Two reaction analysis of salient pole machines and phasor diagram– Numerical problems.

Parallel operation of synchronous generators: Parallel operation with infinite bus and other alternators – Synchronizing power – Load sharing –Transfer of real and reactive power– Numerical problems.

Unit-V

Synchronous motor – operation: Synchronous Motor principle and theory of operation– Phasor diagram – Starting torque–Variation of current and power factor with excitation – Synchronous condenser – Mathematical analysis for power developed– Numerical problems.

Starting methods and performance of Synchronous motor: Excitation and power circles – Hunting and its suppression – Methods of starting – Synchronous induction motor.

Course Outcomes

After completion of this course, a successful student will be able to:

- **CO-1.** Calculate the e.m.f, losses and efficiency of Single Phase Transformers. ,perform the tests on Single Phase Transformers.
- **CO-2.** Analyze the torque slip characteristics and calculate the torque developed.
- **CO-3.** Determine circle diagram by conducting No load and Blocked rotor tests on induction motor.

Text Books

1. Electrical Machines – P.S. Bimbra., Khanna Publishers.
2. Electric machinery - A.E. Fitzgerald, C.Kingsley and S.Umans, McGraw Hill Companies, 5th edition.
3. Electrical Machines by R.K.Rajput, Lakshmi publications,Fifth edition.

Reference Books

1. Electrical Machines by D P.Kothari, I .J .Nagarth,McGrawHill Publications, 4th edition.
2. Electrical Machines by J.B.Guptha. S.K.Kataria& Sons.
3. Performance and Design of AC Machines by MG.Say, BPB Publishers.

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	ELECTRICAL MEASUREMENTS / 17120404	3	1	0	3
Teaching	Total contact hours - 65				
Prerequisite (s)					

Unit-I

Measuring Instruments: Classification – deflecting, control and damping torques – Ammeters and Voltmeters – PMMC, moving iron type instruments – expression for the deflecting torque and control torque – Errors and compensations.Extension of range using shunts and series resistance -CT and PT: Ratio and phase angle errors – design considerations.

Unit-II

Measurement of Power and Energy: Single phase and three phase dynamometer wattmeter, LPF and UPF, expression for deflecting and control torques – Extension of range of wattmeter using instrument transformers – Measurement of active and reactive powers in balanced and unbalanced systems.. Type of P.F. Meters – 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 – trivector meter, maximum demand meters.

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.

Measurement of Parameters: Method of measuring low, medium and high resistance – sensitivity of Wheatstone's bridge – Carey Foster's bridge- Kelvin's double bridge for measuring low resistance– loss of charge method for measurement of high resistance. Measurement of inductance, Quality Factor - Maxwell's bridge, Hay's bridge, Anderson's bridge, Owen's bridge. Measurement of capacitance and loss angle - Desauty bridge-Wien's bridge – Schering Bridge- Wagner's erthing device.

Unit-IV

Magnetic Measurements: Ballistic galvanometer – equation of motion – flux meter – constructional details. Determination of B-H Loop methods of reversals six point method – A.C. testing – Iron loss of bar samples– core loss measurements by bridges and potentiometers.

Unit-V

Digital Meters: Digital Voltmeter-Successive approximation, ramp and integrating type-Digital frequency meter-Digital multimeter-Digital Tachometer.

Course Outcomes

After completion of this course, a successful student will be able to:

- **CO-1.** Know principles of different electrical measurement instruments and to measure voltage and current and different types of instruments for measurement of Power and Energy.
- **CO-2.** Understand about different types of A.C and D. C Potentiometers.
- **CO-3.** Measure resistance, capacitance, inductance and frequency by using various bridges.

Text Books

1. Electrical Measurements and measuring Instruments – by E.W. Golding and F.C. Widdis, fifth Edition,Wheeler Publishing.
2. Electrical & Electronic Measurement & Instruments by A.K.SawhneyDhanpatRai& Co. Publications.
3. Electrical Measurements: Fundamentals, Concepts, Applications – by Reissland, M.U, New AgeInternational (P) Limited, Publishers.

Reference Books

1. Electrical Measurements – by Buckingham and Price, Prentice – Hall
2. Electrical Measurements by Harris.
3. Electronic Instrumentation-by H S Kalsi, Tata McGraw-Hill Education

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	PULSE & DIGITAL CIRCUITS / 17124406	3	1	0	3
Teaching	Total contact hours - 65				
Prerequisite (s)					

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

Multivibrators: Analysis & Design of BistableMultivibrators : Fixed bias& self-biased transistor binary, Commutating capacitors, Triggering in binary, Schmitt trigger circuit, applications,Analysis & design of Monostable Multivibrator: Collector-coupled and Emitter-coupled Monostablemultivibrators, Triggering in monostable multivibrator, Analysis & design of Astable multivibrator (Collector coupled and Emitter-coupled) using transistors.

Unit-IV

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.

Blocking oscillators: Monostable blocking oscillators (Basetiming& Emitter timing): Astable blocking oscillators (Diode-Controlled & RC controlled), Applications.

Unit-V

Synchronization and Frequency Division: Principles of Synchronization, Frequency division in sweep circuit, Astable relaxation circuits, Monostable relaxation circuits, Phase delay& phase jitters; Synchronization of a sweep circuit with symmetrical signals, Sine wave frequency division with a sweep circuit.

Sampling gates: 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.

Course Outcomes

After completion of this course, a successful student will be able to:

CO-1. Design linear and non-linear wave shaping circuits.

CO-2. Apply the fundamental concepts of wave shaping for various switching and signal generating circuits.

CO-3. Gain the knowledge of various multivibrator using BJT,Understand the synchronization and frequency division techniques.

Text Books

1. J. Millman and H. Taub, "Pulse, Digital and Switching Waveforms", McGraw-Hill, 1991.
2. A. Anand Kumar, "Pulse and Digital Circuits", PHI, 2008.Second Edition.

Reference Books

1. Venkat Rao. K. Ramasudha K, Manmadha Rao G, "Pulse and Digital Circuits," Pearson Education, 2010.
2. David J.Comer,"Digital Logic State Machine Design', Oxford University Press, 2008, Third Edition.
3. MS Prakash Rao – "Pulse and Digital Circuits "TataMcGrawHill.

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	ELECTRICAL MACHINES – I LAB / 17120411	0	0	3	2
Teaching	Total contact hours - 36				

Any 10 of the following experiments are to be conducted

1. Magnetization characteristics of DC Shunt Generator. Determination of critical field resistance and critical speed
2. Load test on DC Shunt Generator. Determination of Characteristics
3. Load test on DC Series Generator. Determination of Characteristics
4. Load test on DC compound Generator. Determination of Characteristics
5. Hopkinson's test on DC shunts machines. Predetermination of efficiency
6. Field's test on DC series machines. Determination of efficiency.
7. Swinburne's Test and Predetermination of efficiency as Generator and Motor
8. Brake Test on DC compound motor. Determination of performance curves
9. Brake Test on DC shunt motor. Determination of Performance curves
10. Separation of losses in DC shunt motor
11. Speed Control of DC shunt Motor by Field and Armature control

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	**ELECTRICAL CIRCUITS LAB / 17120412**	0	0	3	2
Teaching	Total contact hours - 36				

Any **10** of the following experiments are to be conducted

1. Verification of Thevenin's and Norton's theorem
2. Verification of superposition theorem and Maximum power transfer theorem
3. Verification of Compensation theorem
4. Verification of Reciprocity, Milliman's theorem
5. Locus diagrams of RL and RC series circuits
6. Series and parallel resonance
7. Determination of self, mutual inductances and co-efficient f coupling
8. Z and Y parameters
9. Transmission and hybrid parameters
10. Measurement of active power for star & delta connected balanced loads
11. Measurement of reactive power for star & delta connected balanced loads
12. Measurement of 3-ph power by 2- wattmeter method for unbalanced loads

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	CONTROL SYSTEMS	3	1	0	3
Teaching	Total contact hours – 48+16				
Prerequisite (s)	Mathematics-1				

UNIT – I

Mathematical modeling of control systems: Introduction of control systems, Classification of control systems, Open Loop and closed loop control systems and their differences, Feed-Back Characteristics, transfer function of linear system, Differential equations of electrical networks, Translational and Rotational mechanical systems, Transfer Function of DC Servo motor - AC Servo motor- Synchro-transmitter and Receiver, Block diagram algebra – Representation by Signal flow graph - Reduction using Mason's gain formula.

UNIT-II

Time response analysis: Standard test signals - Time response of first order systems –Time response of second order systems - Time domain specifications - Steady state errors and error constants – Effects of P, PI, PD, PID controllers.

UNIT – III

Stability and rootlocus technique: The concept of stability – Routh's stability criterion – limitations of Routh's stability – The root locus concept - construction of root loci (Simple problems).

UNIT–IV

Frequency response analysis and Classical control design techniques: Introduction, Frequency domain specifications-Bode diagrams- transfer function from the Bode Diagram-Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, Nyquist Stability criterion- Lag, Lead, Lag-Lead compensators, design of compensators – using Bode plots.

UNIT–V

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 it's Properties – Concepts of Controllability and Observability.

Course Outcomes

After successful completion of this course, a student will be able to:

CO-1. derive the transfer function of physical systems and determination of overall transfer function using block diagram algebra and signal flow graphs.

CO-2. determine time response specifications of second order systems and to determine error

constants.

CO-3. analyze absolute and relative stability of LTI systems using Routh's stability criterion and the root locus method

CO-4. analyze the stability of LTI systems using frequency response methods

CO-5. represent physical systems as state models and determine the response. Understanding the concepts of controllability and observability.

Text Books

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

Reference Books

1. Control Systems, ManikDhanesh N, Cengagepublications .
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.

CONTROL SYSTEMS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
	Co5	√											
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	LINEAR & DIGITAL IC APPLICATIONS	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Electronic devices & circuits				

UNIT–I

Introduction to Operational Amplifier:

Block diagram of Typical Op–Amp With Various Stages– BJT Differential Amplifier With R_E DC Analysis– AC Analysis –BJT differential amplifier with constant current source – Analysis Different input/output configurations dual input balanced output–Dual input unbalanced output– Signal input balanced output–Signal input unbalanced output–AC analysis with r– parameters – Current repeater circuits–Current mirror circuits–Analysis– Level translator – Cascade differential amplifier– FET differential amplifier.

UNIT–II

OP–AMP Parameters:

Input offset voltage – Input off–set current–Input bias current–Differential input resistance– Common mode rejection ratio–Slew ratio–PSRR–Large signal voltage gain–Output voltage swing transient's response–definitions and explanations. Measurement of bias current– Measurement of offset currents– Measurement of offset voltage –Measurement of slew rate – Output offset voltage balancing circuits–Bias current compensations circuit–Dual power suppliers with shunt capacitance filter– Ideal operational amplifier properties–Ideal assumptions–Basic circuits such as non inverting type comparator–Inverting type comparator– Voltage follower– Inverting amplifier–Non–inverting amplifier.

UNIT–III

Ideal Operational Amplifier Theory and Basic Circuits:

Summing amplifier– Non–inverting summing amplifier–sub-tractor– Differentiator–Integrator– Scale changer–Instrumentation amplifier– V to I and I to V convertors–Log and Anti–log amplifiers-Zero crossing detector– Schmitt-trigger peak detector– Half-wave and full-wave rectifiers– Precision diode–Non-ideal operational amplifier non–inverting amplifier– inverting amplifier– closed-loop gain–Input and output resistance equivalent circuits. Fix voltages Regulators 78XX–79XX sering and as currents sources– Dual power supply using 78XX and 79XX sering.

UNIT–IV

Wave form generation using op–amps and PLL:

Design of Astable multivibrator –Monostable multivibrator usingsignal op-amp–Trigring waveform generator 555 timer**:**Introduction– Pindiagram–Functional diagram for 8pin DIP– Design of Astable and monostable multi– Astableapplicatio–Monostable applications– PLL**:**Introduction,basicblockdiagram– Furctions of each block–566 VCO– 565 PLL block diagram –Function of each block–Applications of PLL–Frequency multiplier role of each pin frequency transalation– AM–FM and FSK demodulators.

UNIT–V

Digital Logic Families

Introduction to logic families,CMOS logic, CMOS steady state and dynamic electrical behavior, CMOS logic families. Bipolar logic, transistor-transistor logic, TTL families.

D to A and A to D Convertors:

Digital to Analog Convertors(D to A) – Introduction–Specifications–Basic DAC techniques– Weighted resistor DAC– R–2R ladder DAC–Invested R– 2R –Output expression for each type.

Analog to Digital Convertors

Introduction–Specifications–Parallel comparator type–Counter type–Dual slope–Successive approximation type ADCs– Merits and demerits of each type, Comparison of different types.

Course Outcomes

After successful completion of this course, student will be able to:

CO-1. Analyze the concepts of integrated circuits and differential amplifiers and demonstrate the AC and DC characteristics of OP-AMPs and acquire knowledge about linear and non-linear applications of OP-AMPs.

CO-2. Generate waveforms using OP-AMPs and PLL and acquire knowledge about IC 555 timer and its applications.

CO-3. Understand D to A and A to DC Convertors and know about the digital logic families.

Text Books

1. OP–AMPS and liner integrator circuits by RamakanthAGayakwad (PHI).
2. Linear Integrated Circuits by D.Roychowdary, New age international.
3. Op–amp and linear integrated circuits by sanjaysharma, S.K.Kataria& son's New Delhi.
4. Digital Design Principles & Practices – John F.Wakerly, PHI/ Pearson Education Asia, 3rd Edition, 2005

Reference Books

1. Micro Electronics– MillimanMcGraw Hill.
2. Analog Electronics– L.K.Maheswari, PHI.
3. Linear Integrated circuits by S.Salivahan, TMH.

LINEAR & DIGITAL IC APPLICATIONS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR – 17 (B.Tech.)	L	T	P	C
Course/ Code	MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS	3	0	0	3
Teaching	Total contact hours – 48				

UNIT-I

Introduction to Managerial Economics and demand Analysis:

Definition of Managerial Economics and Scope-Managerial Economics and its relation with other subjects-Concepts of Demand-Types-Determents-Law of Demand its Exception-Elasticity of Demand-Types and Measurement-Demand forecasting and its Methods.

UNIT-II

Production and Cost Analyses:

Production function-Isoquants and Isocosts-Law of Variable proportions-Cobb-Douglas Production function-Economics of Scale-Cost Concepts-Opportunity Cost-Fixed Vs Variable Costs-Explicit Costs Vs Implicit Costs-Out of Pocket Costs Vs Imputed Costs-Cost Volume Profit analysis-Determination of Break-Even Point (Simple Problem).

UNIT-III

Introduction to Markets, Theories of the Firm & Pricing Policies:

Market Structures: Perfect Competition, Monopoly and Monopolistic and Oligopoly – Features – Price, Output Determination – Managerial Theories of firm: Maris and Williamson's models – Methods of Pricing: Limit Pricing, Market Skimming Pricing, And Internet Pricing: Flat Rate Pricing, Usage sensitive, Transaction based pricing, Priority Pricing.

UNIT-IV

Types of Business Organization and Business Cycles:

Features and Evaluation of Sole Trader – Partnership – Joint Stock Company– State/Public Enterprises and their forms – Business Cycles – Meaning and Features – Phases of Business Cycle.

UNIT-V

Introduction to Accounting & Financing Analysis, Capital and Capital Budgeting:

Introduction to Double Entry Systems, Preparation of Journal – Subsidiary Books- Ledger – Cash Book – Trail Balance – Preparation of Financial statements, Analysis if Financial statements through Ratio Analysis (Simple Problems), Capital, Significance of Capital, Sources for finance (Capital) – Meaning of Capital Budgeting Need for Capital Budgeting – Techniques of Capital Budgeting – Traditional and Modern Methods.

Course Outcomes

After successful completion of this course, student will be able to:

CO-1. Know economic activities performed by the businessmen.

CO-2. Aware the significance of demand , its analysis, measurement of demand and its forecasting.

CO-3. Understand the different structures of market covering how price is determined under different market structures.

CO-4. Gain the knowledge how double entry book keeping will give an exposure to the maintenance of books of records and allocation of profits in an enterprise?

CO-5. Know how all allocation of capital plays a vital role in a business organization?

Text Books

1. Prof.J.V.Prabhakara Rao, Prof.P.Venkata Rao. "Managerial Economics and Financial Analysis" ,Ravindra publication.
2. Dr.A.R.Aryasri- Managerial Economics and Financial Analysis – TMH Publications.
3. Dr.N.Appa Rao, Dr.P.Vijay Kumar 'managerial Financial Analysis', Cengage Publications New Delhi

Reference Books

1. Dr. B. Kuberudu and Dr. T. V. Ramana : Managerial Economics & Financial Analysis, Himalaya Publishing House Dr.P.V.V.Satyanayana, "Managerial Economics & Financial Analysis" New Delhi

MANAGERIAL ECONOMICS AND FINANCIAL ANALYSIS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
	Co5	√											
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	POWER ELECTRONICS	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Electronic devices & circuits				

UNIT–I:

Power Semi-Conductor Devices

Thyristors– static characteristics of Silicon controlled rectifiers (SCR's) and TRIAC

Turn on and turn off Methods–Dynamic characteristics of SCR– Snubber circuit design– Basic requirements of Gating circuits for SCR – series and parallel operation of SCR

Characteristics of power MOSFET and Power IGBT– Basic theory of operation of SCR– Static characteristics- gate driving circuits.

UNIT–II:

AC-DC Single-Phase Converters

1-phase half wave controlled rectifiers – R - load and RL - load with and without freewheeling Diode – 1-phase full wave controlled rectifiers – center tapped configuration and bridge Configuration- R - load and RL - load with and without freewheeling diode – continuous and Discontinuous conduction – single phase semi converter– Effect of source inductance in 1-phase fully controlled bridge Rectifier with continuous conduction.

UNIT–III:

AC-DC 3-Phase Converters and AC-AC voltage regulators

3-phase half wave and Full wave uncontrolled rectifier – 3-phase half wave controlled Rectifier with R and RL - load – 3-phase fully controlled rectifier with R and RL - load – 3-phase Semi controlled rectifier with R and RL - load- 1-phase AC-AC regulator - phase angle control and integrated cycle control with R and RL - load – For continuous and discontinuous conduction- 3-Phase AC-AC regulators with R - load only

UNIT–IV:

DC–DC Converters

Analysis of Buck, boost, buck-boost converters in Continuous Conduction Mode (CCM) and Discontinuous conduction Modes (DCM) – Output voltage equations using volt-sec balance in CCM & DCM, output voltage ripple & inductor current, ripple for CCM only – Principle of operation of forward and fly back converters in CCM.

UNIT – V:

DC–AC Converters

1- Phase half-bridge and full bridge inverters with R and RL - loads – 3-phase square wave Inverters – 120^0 conduction and 180^0 conduction modes of operation – PWM inverters – Quasi-square wave pulse width modulation – Sinusoidal pulse width modulation – Prevention of shoot through fault in Voltage Source Inverter (VSI) – Current Source Inverter (CSI) – Introduction to Auto Sequential Commutated Current Source Inverter (ASCCSI).

Course Outcomes

After successful completion of this course, a student will be able to:

CO-1. Demonstrate the characteristics of various power semiconductor devices.

CO-2. Analyse different electrical parameters of single phase AC-DC converters and semi converters for different loads and to evaluate the converters performance.

CO-3. Analyse different electrical parameters of three phase AC-DC converters, 3-phase controlled rectifiers, DC-DC converters for different loads and to evaluate the converters performance.

CO-4. Understand the working of AC-AC voltage regulators, inverters and application of PWM techniques for voltage 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 Ned Mohan, 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. Power Electronics – Devices, Converters and Applications", by Vedam Subramanyam Revised 2nd edition, New Age Publications
2. Power electronics By M D Singh and K B Khanchandani by TMH publication 2 edition.

POWER ELECTRONICS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
											√		
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	POWER SYSTEMS–II	3	1	0	3
Teaching	Total contact hours – 48+16				
Prerequisite (s)	Power systems-I, Mathematics-1				

UNIT–I

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 and GMD–Symmetrical and asymmetrical conductor configuration with and without transposition– Numerical Problems–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–Numerical Problems.

UNIT–II

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 – Numerical Problems.

UNIT–III

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 – Representation of Long Lines – Equivalent-T and Equivalent Pie network models (Numerical Problems).

UNIT–IV

Performance of transmission lines under transients: Types of System Transients – Travelling or Propagation of Surges – Termination of lines with different types of conditions – Open Circuited Line–Short Circuited Line – T-Junction– Lumped Reactive Junctions-Skin and Proximity effects – Description and effect on Resistance of Solid Conductors –Ferranti effect – Charging Current – Effect on Regulation of the Transmission Line–Corona – Description of the phenomenon–Factors affecting corona–Critical voltages and power loss – Radio Interference-Shunt Compensation –Power factor improvement methods-numerical problems.

UNIT–V

Sag and Tension Calculations and Overhead Line Insulators: Sag and Tension calculations with equal and unequal heights of towers– Effect of Wind and Ice on weight of Conductor– Numerical Problems – Stringing chart and sag template and its applications–Types of Insulators – String efficiency and Methods for improvement–Numerical Problems – Voltage distribution– Calculation of string efficiency–Capacitance grading and Static Shielding.

Course Outcomes

After successful completion of this course, a student will be able to:

CO-1. Understand the parameters of various types of transmission lines and to understand the performance of short, medium, long transmission lines.

CO-2. Understand the effects of skin, proximity, Ferranti, corona effects on transmission lines

CO-3. Understand the power system transients & sag, mechanical design of overhead lines and insulators.

Text Books

1. Electrical power systems – by C.L. Wadhwa, New Age International (P) Limited, Publishers, 1998.
2. Modern Power System Analysis by I.J. Nagarath and D.P.Kothari, Tata McGraw Hill, 2nd Edition.
3. Electrical Power Systems by P.S.R. Murthy, B.S. Publications.

Reference Books

1. Power system Analysis–by John J Grainger William D Stevenson, TMC Companies, 4th edition
2. Power System Analysis and Design by B.R. Gupta, Wheeler Publishing.
3. A Text Book on Power System Engineering by M.L.Soni, P.V.Gupta, U.S. Bhatnagar A .Chakrabarthy, DhanpatRai& Co Pvt. Ltd.

POWER SYSTEMS–II													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po1 0	Po1 1	Po1 2
Course outcomes	Co1		√					√					
	Co2			√								√	
	Co3					√							
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
											√		
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	SPECIAL ELECTRICAL MACHINES	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Basic Knowledge on Electrical Machines				

UNIT I

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

UNIT II

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 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 (BLDC) Motor: Construction – Principle of operation – Theory of brushless DC motor as variable speed synchronous motor – sensor based and Sensor less control of BLDC motors

UNIT V

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

Course Outcomes

After successful completion of this course, a student will be able to:

- **CO-1.** Explain theory of operation and control of switched reluctance motor.
- **CO-2.** Explain the performance and control of stepper motors, and their applications
- **CO-3.** Describe the operation and characteristics of permanent magnet dc motor
- **CO-4.** Understand operation and characteristic of brush less dc motor**.**
- **CO-5.** Explain the theory of travel-ling magnetic field and applications of linear motors.

Text Books:

1. Special Electrical Machines, K.Venkata Ratnam, University press, 2009, New Delhi.
2. Brush less 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. Fractional and Sub fractional HP electric motors- Cyril G. Veinott - TMH Intrrnational 1987

2.

SPECIAL ELECTRICAL MACHINES													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
	Co5	√											
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	ELECTRICAL MACHINES – II LAB	0	0	3	2
Teaching					
Prerequisite (s)	Electrical Machines 1&2				

All the experiments are to be done compulsorily

1. O.C. & S.C. Tests on Single phase Transformer
2. Sumpner's test on single phase transformers
3. Scott connection of transformers
4. No–load & Blocked rotor tests on three phase Induction motor
5. Regulation of a three –phase alternator by synchronous impedance
6. V and Inverted V curves of a three—phase synchronous motor.
7. Equivalent Circuit of a single phase induction motor
8. Brake test on three phase Induction Motor
9. Separation of core losses of a single phase transformer
10. Determination of X_d and X_q of a salient pole synchronous machine
11. Regulation of three–phase alternator by Potier triangle method
12. Regulation of three–phase alternator by M.M.F. Methods
13. Separation of core losses of a three phase induction motor
14. Load test on single phase induction motor
15. Measurement of sequence impedance of a three–phase alternator
16. Brake test on three phase slip ring Induction Motor
17. Parallel operation of Single phase Transformers
18. Circle diagram of three phase SQIM
19. Synchronization of three phase alternator with infinite bus bars.
20. Efficiency of a three–phase alternator

Course Outcomes

After successful completion of this course, a student will be able to:

CO-1. Determine the efficiency and regulation of transformers and asses their performance.

CO-2. Determine the regulation of three–phase alternator by various methods, find X_d / X_q ratio of alternator and asses the performance of three–phase synchronous machine.

CO-3. Experiment various tests on Induction motor for assessing its performance.

Text Books

1. Electrical Machines – by P.S. Bhimbra, Khanna Publishers.
2. The Performance and Design of AC Machines – by M.G.Say, ELBS and Ptiman& Sons.

Reference Books

1. Electric Machinery – by A.E. Fitzgerald, C. Kingsley and S.Umans-by McGraw–Hill Companies, 5th edition, 1990. Theory of Alternating Current Machinery by Langsdorf, Tata McGraw–Hill, 2nd edition.

ELECTRICAL MACHINES – II LAB													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	ELECTRICAL MEASUREMENTS LAB	0	0	3	2
Teaching					
Prerequisite (s)	Electrical Measurements & Instruments				

All the experiments are to be done compulsorily

1. Calibration and Testing of single phase energy meter
2. Calibration of dynamometer wattmeter using phantom loading UPF
3. Crompton D.C. Potentiometer – Calibration of PMMC ammeter and PMMC voltmeter
4. Calibration of LPF wattmeter – by direct loading
5. LVDT and capacitance pickup – characteristics and Calibration
6. A.C. Potentiometer – Polar form/Cartesian form – Calibration of AC Voltmeter, Parameters of Choke
7. Kelvin's double Bridge – Measurement of resistance – Determination of Tolerance
8. Capacitance Measurement using Schering bridge
9. Inductance Measurement using Anderson bridge
10. Resistance strain gauge – strain measurements and Calibration
11. Polar curve using Lux meter, Measurement of intensity of illumination of fluorescent lamp
12. Transformer turns ratio measurement using AC. bridge
13. Parameters of a choke coil
14. Optical bench – Determination of polar curve measurement of MHCP of electrical lamp
15. Measurement of 3 phase reactive power with single–phase wattmeter for balanced loading
16. Measurement of complex power with Trivector meter and verification
17. Measurement of 3 phase power with single watt meter and 2 No's of C.T
18. Measurement of Power by 3 Voltmeter and 3 Ammeter methods
19. C.T. testing using mutual Inductor – Measurement of % ratio error and phase angle of given C.T. by Null method

20. P.T. testing by comparison – V.G. as Null detector – Measurement of % ratio error and phase angle of the given P.T

21. Dielectric oil testing using H.T. testing Kit

Course Outcomes

After successful completion of this course, student will be able to:

CO-1. Measure accurately the electrical parameters voltage, current, power, energy and electrical characteristics of resistance, inductance and capacitance.
CO-2. Measure illumination of electrical lamps.
CO-3. Measure dielectric strength of transformer oil.
CO-4. Measure the parameters of inductive coil.

Text Books

1. "Electrical and Electronics Measurements and Instrumentation" by Prithwiraj Purkait and Budhaditya Biswas
2. "Electrical and Electronics Measurements and Instrumentation" by Rajput RK
3. Electrical & Electronic Measurement & Instruments by A.K.Sawhney DhanpatRai& Co. Publications.

ELECTRICAL MEASUREMENTS LAB													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
											√		
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	MINI PROJECT-I	0	0	3	2
Teaching					
Prerequisite (s)					

IV Year B.Tech. (AME) – I Sem.

	GR17(B.Tech.)	L	T	P	C
Course/ Code	HYBRID VEHICLES (Not for AME Students) (17177665f)	3	-	-	3
Teaching	Total contact hours - 64				
Prerequisite (s)					

COURSE OBJECTIVES

1. Analyzing various aspects of hybrid and electric drive trains such as their configuration, types of electric machines that can be used, energy storage devices, etc.
2. Get exposed to research and development challenges involved in various types of fuel cells.

UNIT I - FUELCELL TECHNOLOGY

Structures, Operations and properties of Fuel cells – (Phosphoric Acid Fuel cell, Proton Exchange membrane Fuel cell, Direct Methanol fuel cell Alkaline Fuel Cells, Solid Oxide Fuel Cell, Molten Carbonate Fuel Cell) -Characteristics. Electrochemical energy conversion – Theoretical efficiency – Factors affecting electrochemical energy conversion- Helmholtz double layer model

UNIT II - FUEL CELL BASED VEHICLES STRUCTURE

PEMFC: Operating principle (membranes, electrodes and electrolysis, optimization of membrane and electrode assembly, impurities) – Technology development (single cell and stacks, composite plates) – Fuel processing – Modeling studies (membrane, electrode, membrane-electrode assembly, fuel cell, stack and system) – Technology development and applications. DMFC: Operating principle – Noble metal issue – Electro-oxidation of methanol (Catalysts, oxygen electroreduction, electrolyte, non-catalytic aspects) - Methanol crossover.

UNIT III - HYBRID ELECTRIC TECHNOLOGY

Impact of modern drive-trains on energy supplies. Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

ELECTRIC DRIVETRAINS

Basic concept of electric traction, introduction to various electric drive-train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis. Electric Propulsion unit: Introduction to electric components used in electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

UNIT IV - HYBRID ELECTRIC VEHICLES

Principles of Hybrid Electric Drivetrains, Architectures – Electrical distribution, Hybrid control Strategies – Parallel Hybrid, Series Hybrid - (Charge Sustaining, Charge Depleting),

Practical Models – Toyota Prius, Honda Insight. Hybridization Effects. 42 V System for Traction Applications - Lightly Hybridized vehicles, Low –Voltage Storage System, Low – Voltage main system with High voltage bus for propulsion. Heavy Vehicles Hybrid Electric Heavy Duty Vehicles, Fuel cell Heavyduty vehicles.

UNIT V - HYBRID VEHICLE TECHNOLOGY

Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems. Energy Management Strategies in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV).

TEXT BOOKS

1. Basu .S, *"Recent Trends in Fuel cell Science and Technology",* Anamaya Publishers, New Delhi.,2007.
2. Viswanathan, B. and AuliceScibioh, M., *"Fuel Cells Principles and Applications*", Universities Press (India) Pvt. Ltd., Hyderabad, 2006.
3. Hoogers, G., Edr. *"Fuel Cell Technology Handbook*", CRC Press, Washington D. C., 2003.

REFERENCES

1. Larminie, J. and Dicks, A., "*Fuel Cell Systems Explained"* John Wiley & Sons, Ltd., New York, 2001.
2. Ali Emadi, Mehrdad Ehsani, John M. Muller, "*Vehicular Electric PowerSystems"*, Marcel Dekker, Inc., 2004.

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	INTELLECTUAL PROPERTY RIGHTS AND PATENTS	2	0	0	1
Teaching	Total contact hours - 48				
Prerequisite (s)					

UNIT I

Introduction to Intellectual Property Law – Evolutionary past – Intellectual Property Law Basics - Types of Intellectual Property - Innovations and Inventions of Trade related Intellectual Property Rights – Agencies Responsible for Intellectual Property Registration – Infringement - Regulatory – Over use or Misuse of Intellectual Property Rights - Compliance and Liability Issues.

UNIT II

Introduction to Copyrights – Principles of Copyright – Subject Matters of Copyright – Rights Afforded by Copyright Law –Copyright Ownership – Transfer and Duration – Right to Prepare Derivative Works –Rights of Distribution – Rights of performers – Copyright Formalities and Registration– Limitations – Infringement of Copyright – International Copyright Law- Semiconductor Chip Protection Act.

UNIT III

Introduction to Patent Law – Rights and Limitations – Rights under Patent Law – Patent Requirements – Ownership and Transfer – Patent Application Process and Granting of Patent – Patent Infringement and Litigation – International Patent Law – Double Patenting – Patent Searching – Patent Cooperation Treaty – New developments in Patent Law- Invention Developers and Promoters.

UNIT IV

Introduction to Trade Mark – Trade Mark Registration Process – Post registration procedures – Trade Mark maintenance – Transfer of rights – Inter parties Proceedings – Infringement – Dilution of Ownership of Trade Mark – Likelihood of confusion – Trade Mark claims – Trade Marks Litigation – International Trade Mark Law.

UNIT V

Introduction to Trade Secrets – Maintaining Trade Secret – Physical Security– Employee Access Limitation – Employee Confidentiality Agreement –Trade Secret Law – Unfair Competition – Trade Secret Litigation – Breach of Contract – Applying State Law.

Introduction to Cyber Law – Information Technology Act - Cyber Crime and E-commerce – Data Security – Confidentiality – Privacy - International aspects of Computer and Online Crime

REFERENCE BOOKS:

1. Deborah E.Bouchoux: “Intellectual Property”. Cengage learning , New Delhi
2. Kompal Bansal &Parishit Bansal "Fundamentals of IPR for Engineers", BS Publications (Press)
3. Cyber Law. Texts & Cases, South-Western’s Special Topics Collections
4. PrabhuddhaGanguli: ‘ Intellectual Property Rights” Tata Mc-Graw – Hill, New Delhi
5. Richard Stim: "Intellectual Property", Cengage Learning, New Delhi.
6. R. Radha Krishnan, S. Balasubramanian: "Intellectual Property Rights", Excel Books. New Delhi.
7. M. Ashok Kumar and Mohd. Iqbal Ali: “Intellectual Property Right” Serials Pub.

INTELLECTUAL PROPERTY RIGHTS AND PATENTS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
	Co5	√											
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
											√		
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	MICROPROCESSORS AND MICROCONTROLLERS AND ITS APPLICATIONS	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Basic knowledge on digital circuits				

UNIT–I

Introduction to Microprocessor Architecture

Introduction and evolution of Microprocessors– Architecture of 8086– Register Organization of 8086– Memory organization of 8086– General bus operation of 8086–Introduction to 80286–80386 and 80486 and Pentium.

UNIT–II

Minimum and Maximum Mode Operations

Instruction set, Addressing modes– Minimum and Maximum mode operations of 8086–8086 Control signal interfacing–Read and write cycle timing diagrams Assembly Directives–Macro's

UNIT–III

I/O Interface

8255 PPI– Architecture of 8255–Modes of operation– Interfacing I/O devices to 8086 using 8255– Interfacing A to D converters– Interfacing D to A converters– Stepper motor interfacing– Static memory interfacing with 8086– DMA controller (8257)–Architecture–Interfacing 8257 DMA controller– Programmable Interrupt Controller (8259)–Command words and operating modes of 8259– Interfacing of 8259–Keyboard/display controller (8279)– Architecture–Modes of operation–Command words of 8279– Interfacing of 8279.

UNIT–IV

Introduction to 8051 Micro Controller

Overview of 8051 Micro Controller– Architecture– Register set–I/O ports and Memory Organization– Interrupts–Timers and Counters–Serial Communication.

UNIT–V

Assembly Language Programming

Algorithms for Implementation of FOR Loop–WHILE–REPEAT and IF-THEN-ELSE Features– Addressing modes and Instruction set of 8051–Assembly language programming of 8051– Development systems and tools.

Cyber physical systems and industrial applications of 8051

Applications of Micro Controllers– Interfacing 8051 to LED's–Push button– Relay's and Latch Connections– Keyboard Interfacing– Interfacing Seven Segment Display–ADC and DAC Interfacing

Course Outcomes

After completion of this course, a successful student will be able to:

CO-1. Understand concepts of microprocessor, different addressing modes and programming of 8086.

CO-2. Understand interfacing of 8086, with memory and other peripherals.

CO-3. Understand concept of DMA, USART RS-232 and PIC controller.

CO-4. Understand the features of advanced processors and Pentium processors.

CO-5. Understand the features of 8051 microcontroller, its instruction set and also other controllers.

Text Books

1. Microprocessors and Interfacing, Dpouglas V Hall, Mc–Graw Hill, 2nd Edition.
2. Kenneth J Ayala, "The 8051 Micro Controller Architecture, Programming and Applications", Thomson Publishers, 2nd Edition.
3. Ray and Burchandi, "Advanced Micro Processors and Interfacing", Tata McGraw–Hill.

Reference Books

1. R.S. Kaler, " A Text book of Microprocessors and Micro Controllers", I.K. International Publishing House Pvt. Ltd.
2. Ajay V. Deshmukh, "Microcontrollers – Theory and Applications", Tata McGraw–Hill Companies –2005.
3. Ajit Pal, "Microcontrollers – Principles and Applications", PHI Learning Pvt Ltd, 2011.

MICROPROCESSORS & MICROCONTROLLERS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po10	Po11	Po 12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4					√							
	Co5										√		
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
											√		
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	POWER SYSTEM ANALYSIS	3	1	0	3
Teaching	Total contact hours – 48+16				
Prerequisite (s)	Basic Knowledge On Mathematics, Electric Circuit Theory				

UNIT –I:
Graph Theory Concepts:
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 – Power flow solution methods: Gauss-Seidel Method – Newton Raphson Method (Rectangular and polar coordinates form) –Decoupled and Fast Decoupled methods – Algorithmic approach – Numerical Problems (3–bus system only.)

UNIT –III:
Z–Bus formulation
Formation of Z–Bus**:** Partial network– Algorithms for the Modification of Z_{bus} Matrix under addition of link and branch (Derivations and Numerical Problems).– Modification of Z–Bus for the changes in network (Problems).

UNIT – IV:
Symmetrical Fault Analysis
Transients on a Transmission line-Short circuit of synchronous machine(on no-load) - 3– Phase short circuit currents and reactances of synchronous machine–Short circuit MVA calculations - Series reactors – selection of reactors.
Symmetrical Components & Unsymmetrical Fault analysis
Definition of symmetrical components - symmetrical components of unbalanced three phase systems – Power in symmetrical components – Sequence impedances – Synchronous generator – Transmission line and transformers – Sequence networks –Various types of faults LG– LL– LLG on unloaded alternator–unsymmetrical faults on power system.

UNIT – V:
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 Methods to improve steady state and transient stability.

Course Outcomes

After completion of this course, a successful student will be able to:

CO-1: Draw an impedance diagram and SLD for a power system network and form a Y_{bus} matrix for a power system network with or without mutual couplings.

CO-2: find out the load flow solution of a power system network using different types of load flow methods.

CO-3: formulate the Zbus for a power system network.

CO-4:find out the fault currents for all types faults with a view to provide data for the design of protective devices

CO-5: analyze the steady state, transient and dynamic stability concepts of a power system.

Text Books

1. Electrical Power Systems by P.S.R.Murthy, B.S.Publications
2. Modern Power system Analysis – by I.J.Nagrath&D.P.Kothari: Tata McGraw–Hill Publishing Company, 2nd edition.
3. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
4. Power System Analysis and Design by J.Duncan Glover, M.S.Sarma, T.J. Overbye – CengageLearning publications.

Reference Books

1. Power System Analysis by B.R.Gupta, Wheeler Publications.
2. Power System Analysis – by A.R.Bergen, Prentice Hall, Inc.
3. Power System Analysis by HadiSaadat – TMH Edition.

POWER SYSTEM ANALYSIS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
	Co5	√											
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	POWER SEMICONDUCTOR DRIVES	3	1	0	3
Teaching	Total contact hours – 48+16				
Prerequisite (s)	Power Electronics, Electrical Machines-1&2				

UNIT–I

Fundamentals of Electric Drives: Electric drive – Fundamental torque equation – Load torque components – Nature and classification of load torques – Steady state stability – Load equalization– Four quadrant operation of drive (hoist control) – Braking methods**:** Dynamic – Plugging – Regenerative methods.

UNIT–II

Three Phase Converter Controlled DC Motor Drives: Revision of speed control techniques – Separately excited and series motors controlled by full converters – Output voltage and current waveforms – Speed-torque expressions – Speed-torque characteristics – Numerical problems – Four quadrant operation using dual converters.

UNIT–III

DC-DC converters Controlled DC Motor Drives: Single quadrant – Two quadrant and four quadrant chopper fed separately excited and series excited motors – Continuous current operation– Output voltage and current waveforms – Speed–torque expressions – Speed–torque characteristics –Four quadrant operations – Closed loop operation (Block diagram only).

UNIT–IV

Control of Induction Motor Drives

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).

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

UNIT–V

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

Course Outcomes

After successful completion of this course, a student will be able to:

CO-1. Know the fundamentals of electric drive and different electric braking methods.

CO-2. Analyse the operation of three phase converter controlled dc motors and four quadrant operation of dc motors using dual converters.

CO-3. Know the converter control of dc motors in various quadrants.

CO-4. Know the concept of speed control of induction motor by using AC voltage controllers and voltage source inverters.

CO-5. Know the principles of static rotor resistance control and various slip power recovery schemes

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 Applications, 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.

POWER SEMICONDUCTOR DRIVES													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
	Co5	√											
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
											√		
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	SWITCHGEAR AND PROTECTION	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Power systems-1				

UNIT–I

Circuit Breakers: Elementary principles of arc interruption– Restrike Voltage and Recovery voltages– Restrike phenomenon– Average and Max. RRRV– Current chopping and Resistance switching– Miniature Circuit Breaker(MCB)– Introduction to oil circuit breakers– Description and operation of AirBlast, 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: Over current– Carrier current and three zone distance relay using impedance relays–Translay relay–Protection of bus bars– Differential protection.

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

UNIT–V

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.

Course Outcomes

After completion of this course, a successful student will be able to:

- **CO-1.** understand the principles of arc interruption for application to high voltage circuit breakers of air, oil, vacuum, SF_6 gas type.
- **CO-2.** to understand the working principle and constructional features of different types of electromagnetic protective relays.
- **CO-3.** knowledge of faults that is observed to occur in high power generator and transformers and protective schemes used for all protections.
- **CO-4.** understandabout static relaysand various types of protective schemes used for feeders and bus bar protection.
- **CO-5.** understand the different types of over voltages appearing in the system, including existing protective schemes required for insulation co–ordination.

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.

SWITCHGEAR AND PROTECTION													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
	Co5	√											
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	SIGNALS & SYSTEMS	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Mathematics-1				

UNIT 1: Introduction to Signals and Systems:
Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.

UNIT 2: Behavior of continuous and discrete-time LTI systems:
Impulse response and step response, convolution, input-output behavior with aperiodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations. State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix andits Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

UNIT 3: Fourier, Laplace and z- Transforms:
Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete-Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem.

UNIT 4: Fourier, Laplace and z- Transforms:
Review of the Laplace Transform for continuous time signals and systems, system functions, poles and zeros of system functions and signals, Laplace domain analysis, solution to differential equations and system behavior. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.

UNIT 5: Sampling and Reconstruction:
The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.

Course Outcomes:
At the end of this course, students will demonstrate the ability to
CO-1: Understand the concepts of continuous time and discrete time systems.
CO-2: Analyse systems in complex frequency domain.
CO-3: Understand sampling theorem and its implications.

Text/References:

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, “Signals and systems”, Prentice Hall India, 1997.
2. J. G. Proakis and D. G. Manolakis, “Digital Signal Processing: Principles, Algorithms, and Applications”, Pearson, 2006.
3. H. P. Hsu, “Signals and systems”, Schaum’s series, McGraw Hill Education, 2010.
4. S. Haykin and B. V. Veen, “Signals and Systems”, John Wiley and Sons, 2007.
5. A. V. Oppenheim and R. W. Schafer, “Discrete-Time Signal Processing”, Prentice Hall, 2009.
6. M. J. Robert “Fundamentals of Signals and Systems”, McGraw Hill Education, 2007.
7. B. P. Lathi, “Linear Systems and Signals”, Oxford University Press, 2009.

SIGNALS & SYSTEMS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	CONTROL SYSTEMS LAB	0	0	3	2
Teaching					
Prerequisite (s)	Control Systems				

All the experiments are to be done compulsorily

1. Time response of Second order system
2. Lag compensation – Magnitude and phase plot
3. Lead compensation – Magnitude and phase plot
4. Potentiometer as an error detector
5. To study the Characteristics of magnetic amplifier-series connection
6. To study the Characteristics of magnetic amplifier-parallel connection
7. To study the Characteristics of magnetic amplifier-self saturated
8. Study of DC position control system
9. Effect of P controller on a second order system
10. Effect of PD controller on a second order system
11. Effect of PI controller on a second order system
12. Effect of PID Controller on a second order system
13. Study the Temperature controller using PID
14. Experimentally determine Transfer function of DC motor
15. To study Characteristics of DC servo motor
16. Study the effect of feedback on DC servo motor
17. To study the characteristics of AC servo motor
18. To study the characteristics of Synchros
19. Programmable logic controller – characteristics of stepper motor
20. Frequency response of second order system

Course Outcomes

After successful completion of this course, a student will be able to:

CO-1. Understand the performance of basic control system components such as magnetic amplifiers, D.C. servo motors, A.C. Servo motors, stepper motor and potentiometer.

CO-2. Understand time and frequency responses of control systems with and without controllers and compensators.

CONTROL SYSTEMS LAB													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	POWER ELECTRONICS LAB	0	0	3	2
Teaching					
Prerequisite (s)	Power Electronics				

All the experiments are to be done compulsorily

1. Experimental study of input output Characteristics of SCR,
2. Experimental study of input output Characteristics of MOSFET
3. Experimental study of input output Characteristics of IGBT
4. Experimental study of different types of Gate firing circuits for SCR's- half wave triggering
5. Experimental study of different types of Gate firing circuits for SCR's- full wave triggering
6. Experimental study of different types of Gate firing circuits for SCR's-UJT
7. Experimental study of Single -Phase Half controlled converter with RL load
8. Experimental study of Single -Phase Half controlled converter with RL load
9. Experimental study of Single -Phase fully controlled bridge converter with R load
10. Experimental study of Single -Phase fully controlled bridge converter with RL load
11. Experimental study of Single -Phase AC Voltage Controller with R load
12. Experimental study of Single -Phase AC Voltage Controller with RL load
13. Experimental study of Single -Phase Cyclo–converter with R and RL loads
14. Experimental study of Single -Phase Bridge Inverter with R and RL Loads
15. Experimental study of Single -Phase dual converter with RL loads
16. Experimental study of Three -Phase half controlled bridge converter with RL load.
17. Experimental study of Three- Phase full converter with RL–load.
18. Experimental study of DC–DC buck converter.
19. Experimental study of DC–DC boost converter.
20. Experimental study of Single -phase PWM inverter.

Course Outcomes

After successful completion of this course, student will be able to:

CO 1. know the characteristics of various power electronic devices and analyze firing circuits and commutation circuits of SCR

CO 2. analyze the performance of single–phase and three–phase full– wave bridge converters, single–phase dual converter with both resistive and inductive loads.

CO 3. understand the operation of AC voltage controller and cyclo converter with resistive and inductive loads.

CO 4. understand the working of Buck converter, Boost converter, single–phase bridge inverter and PWM inverter.

<table>
<tr><td colspan="13">POWER ELECTRONICS LAB</td></tr>
<tr><td colspan="13">COURSE DESIGNED BY: Department of Electrical & Electronics Engineering</td></tr>
<tr><td></td><td>Program outcomes</td><td>Po1</td><td>Po2</td><td>Po3</td><td>Po4</td><td>Po5</td><td>Po6</td><td>Po7</td><td>Po8</td><td>Po9</td><td>Po10</td><td>Po11</td><td>Po12</td></tr>
<tr><td rowspan="4">Course outcomes</td><td>Co1</td><td></td><td>√</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>√</td><td></td><td></td></tr>
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<tr><td>Co3</td><td></td><td></td><td>√</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td>Co4</td><td></td><td></td><td></td><td>√</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></tr>
<tr><td colspan="2">CATEGORY</td><td colspan="2">General Humanities</td><td colspan="2">Basic sciences</td><td colspan="3">Engineering sciences and Technical</td><td colspan="4">Professional subjects</td></tr>
<tr><td colspan="2"></td><td colspan="2"></td><td colspan="2"></td><td colspan="3"></td><td colspan="4">√</td></tr>
<tr><td colspan="2">Mode of Evaluation</td><td colspan="11">Quiz, Assignment, Seminar, Written Examination</td></tr>
</table>

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	ADVANCED CONTROL SYSTEMS	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	knowledge on Linear Control Systems				

UNIT – I

State space analysis: State Space Representation – Solution of state equation – State transition matrix, –Canonical forms – Controllable canonical form – Observable canonical form, Jordan Canonical Form.

UNIT – II

Controllability, observability and design of pole placement: Tests for controllability and observability for continuous time systems – Time varying case – Minimum energy control – Time invariant case – Principle of duality – Controlled and observability form Jordan canonical form and other canonical forms – Effect of state feedback on controllability and observability – Design of state feedback control through pole placement.

UNIT – III

Describing function analysis: Introduction to nonlinear systems, Types of nonlinearities, describing functions, Introduction to phase–plane analysis.

Stability analysis: Stability in the sense of Lyapunov – Lyapunov's stability and Lypanov's instability theorems – Direct method of Lypanov for the linear and nonlinear continuous time autonomous systems.

UNIT–IV

Calculus of variations: Minimization of functional of single function – Constrained minimization – Minimum principle – Control variable inequality constraints – Control and state variable inequality constraints – Euler lagrangine equation.

UNIT –V

Optimal control: Linear quadratic optimal regulator (LQR) problem formulation – Optimal regulator design by parameter adjustment (Lyapunov method) – Optimal regulator design by continuous time algebraic riccatti equation (CARE) - Optimal controller design using LQG framework.

Course Outcomes

After successful completion of this course, a student will be able to:

CO1-State space representation of control system and formulation of different state models are reviewed.

CO2-Design of control system using the pole placement technique is given after introducing the concept of controllability and observability.

CO3-Analyses of nonlinear system using the describing function technique and phase plane analysis.
CO4-Analyze the stability analysis using lypnov method.
CO5-Minimization of functions using calculus of variation studied.

Text Books:

1. Modern Control Engineering – by K. Ogata, Prentice Hall of India, 3rd edition, 1998
2. Automatic Control Systems by B.C. Kuo, Prentice Hall Publication

Reference Books:

1. Modern Control System Theory – by M. Gopal, New Age International Publishers, 2nd edition, 1996
2. Control Systems Engineering by I.J. Nagarath and M.Gopal, New Age International (P) Ltd.
3. Digital Control and State Variable Methods – by M. Gopal, Tata Mc Graw– Hill Companies, 1997.
4. Systems and Control by Stainslaw H. Zak , Oxford Press, 2003.

   Optimal control theory: an Introduction by Donald E.Kirk by Dover publications.

ADVANCED CONTROL SYSTEMS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
	Co5	√											
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	**OPTIMIZATION TECHNIQUES**	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Management skills required and critical thinking				

UNIT – I

Introduction to Optimization Techniques

Statement of an Optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of Optimization problems.

UNIT – II

Classical Optimization Techniques

Single variable Optimization – multi variable Optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable Optimization with equality constraints. Solution by method of Lagrange multipliers – multivariable Optimization with inequality constraints– Kuhn – Tucker conditions.

UNIT – III

Linear Programming

Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm - Duality in Linear Programming – Dual Simplex method.

UNIT – IV

Transportation Problem

Finding initial basic feasible solution by north – west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems – Special cases in transportation problem.

NIT – V

Nonlinear Programming:

Unconstrained cases - One – dimensional minimization methods:Classification, Fibonacci method and Quadratic interpolation method - Univariate method, Powell's method and steepest descent method.

Constrained cases - Characteristics of a constrained problem, Classification,Basic approach of Penalty Function method; Basic approaches of Interior and Exterior penalty function methods. Introduction to convex Programming Problem.

Dynamic Programming

Dynamic programming multistage decision processes – types – concept of sub optimization and the principle of optimality – computational procedure in dynamic programming – examples illustrating the calculus method of solution - examples illustrating the tabular method of solution.

Course Outcomes:

After successful completion of this course, a student will be able to:

CO-1. Formulate and apply Dynamic programming technique to inventory control, production planning, engineering design problems etc. to reach a final optimal solution from the current optimal solution.

CO-2. State and formulate the optimization problem, without and with constraints, by using design variables from an engineering design problem.

CO-3. Formulate a mathematical model and apply linear programming technique by using Simplex method. Also extend the concept of dual Simplex method for optimal solutions.

Text Books:

1. "Engineering optimization: Theory and practice"-by S. S.Rao, New Age International (P) Limited, 3rd edition, 1998.
2. "Introductory Operations Research" by H.S. Kasene & K.D. Kumar, Springer (India), Pvt. LTd.

Reference Books:

1. "Optimization Methods in Operations Research and systems Analysis" – by K.V. Mital and C. Mohan, New Age International(P) Limited, Publishers, 3rd edition, 1996.
2. Operations Research – by Dr. S.D.Sharma, Kedarnath, Ramnath & Co
3. "Operations Research : An Introduction" – by H.A.Taha,PHI pvt. Ltd., 6th edition
4. Linear Programming–by G. Hadley.

OPTIMIZATION TECHNIQUES													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
											√		
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	POWER QUALITY	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Power systems				

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.

PQ 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.

COURSE OUTCOMES:

After successful completion of this course, a student will be able to:

CO 1. Understand the concepts of power quality and voltage imperfections in power systems and power factor improvement

CO 2. Know the concepts of harmonic distortion and distributed generation and power quality issues

CO 3. Know the power quality monitoring and instrumentation, applications of intelligence systems

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 Reinhold, New York.
4. Power Quality c.shankaran, CRC Press, 2001
5. Harmonics and Power Systems –Franciso C.DE LA Rosa–CRC Press (Taylor & Francis).

POWER QUALITY													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	POWER SYSTEM OPERATION AND CONTROL	3	1	0	3
Teaching	Total contact hours – 48+16				
Prerequisite (s)	Power System Analysis				

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 Commitment: Optimal unit commitment problem – Need for unit commitment – Constraints in unit commitment – Cost function formulation – Solution methods – Priority ordering – Dynamic programming.

UNIT–III

Load Frequency Control (LFC): Modeling of steam turbine – Generator – Mathematical modeling of speed governing system – Transfer function – Modeling 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 – Load frequency control of two area system – Uncontrolled case and controlled case – Tie–line bias control.

UNIT–IV

Load Frequency Controllers: Proportional plus Integral control of single area and its block diagram representation – Steady state response – Load Frequency Control and Economic dispatch control.

UNIT–V

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 – Need for FACTS controllers.

Course Outcomes:

After successful completion of this course, a student will be able to:
CO-1: Compute optimal scheduling of Generators
CO-2: Understand hydrothermal scheduling
CO-3: Understand importance of the frequency

Text Books:

1. Electric Energy systems Theory – by O.I.Elgerd, Tata McGraw–hill Publishing Company Ltd., Second edition.
2. Power System stability & control, PrabhaKundur,TMH
3. Modern Power System Analysis – by I.J.Nagrath&D.P.Kothari Tata McGraw – 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. Power System Analysis by Grainger and Stevenson, Tata McGraw Hill.
3. Power System Analysis by HadiSaadat – TMH Edition.

POWER SYSTEM OPERATION AND CONTROL													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	RENEWABLE ENERGY SOURCES AND SYSTEMS	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	POWER SYSTEMS				

UNIT–I

Fundamentals of Solar 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 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, Incremental conductance method.

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

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–IV

Hydro and Tidal Power Systems: Hydro systems**:** Basic working principle –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–V

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.

Course outcomes

After successful completion of this course, a student will be able to:

CO-1. Analyze solar radiation data, extraterrestrial radiation, radiation on earth's surface.
CO-2. Design solar thermal collections.
CO-3. Develop maximum power point techniques in solar PV and wind

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. Non conventional energy source –B.H. Khan- TMH-2nd edition.

RENEWABLE ENERGY SOURCES AND SYSTEMS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
											√		
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Description	Subject Teaching Methodology	L	T	P	C
Course/ Code	SWITCHED MODE POWER CONVERTERS	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Power Electronics				

UNIT-1:
DC/DC Converters and Current Mode and Current Fed Topologies
Basic topologies of buck, boost converters, buck-boost converters and cuk converter, isolated DC/DC converter topologies: forward, and fly-back converters, half and full bridge topologies, modeling of switching converters. Voltage mode and current mode control of converters, peak and average current mode control, its advantages and limitations, voltage and current fed converters.

UNIT-2:
Resonant Converters
Need for resonant converters, types of resonant converters, methods of control, phase-modulation technique with ZVS in full-bridge topology, series resonant converter and resonant transition converter.

UNIT-3:
Converter Transfer Functions
Application of state-space averaging to switching converters, derivation of converter transfer functions for buck, boost, and fly-back topologies.

UNIT-4:
Power Converter Design
Design of filter inductor & capacitor, and power transformer, Ratings for switching devices, current transformer for current sensing, design of drive circuits for switching devices, considerations for PCB layout.

UNIT-5:
Controller Design
Introduction, mechanisms of loop stabilization, shaping E/A gain vs. frequency characteristic, conditional stability in feedback loops, stabilizing a continuous mode forward converter and discontinuous mode fly- back converter, feed-back loop stabilization with current mode control, the right-half plane zero.

Course Outcomes:
After successful completion of this course, a student will be able to:

CO-1: Analyze the operation of DC-DC converters with current and voltage mode control
CO-2: Analyze resonant converters and their control techniques
CO-3: Design DC-DC converters and evaluate the stability of the system
Co-4: Design feedback loops for the power converters.

TEXT BOOKS:

1. Ned Mohan Tore M. Undeland: Power Electronics: Converters, Applications, and Design, 3rd Edition, John Wiley & Sons, 2007.
2. Abraham I. Pressman, "Switching Power Supply Design", Mc Graw Hill International, Third Edition, 2009.
3. P.C. Sen: Modern Power Electronics, S.Chand-2005.
4. Andrzej M. Trzynadlowski Introduction to Modern Power Electronics, 2nd Edition, illustrated Publisher John Wiley & Sons, 2010.
5. Muhammad H. Rashid, Power electronics hand book, ISBN: 81 8147 3671.
6. Bin Wu: High-power Converters and AC Drives, IEEE Press, John Wiley & Sons, 2006.

Course Code : Switched Mode Power Conversion													
Course designed By: Department of Electrical and Electronics Engineering													
	Program Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
Course Outcomes	**CO1**	✓											
	CO2			✓									
	CO3					✓							
	CO4					✓							

Category	**General Humanities**	**Basic Sciences**	**Engineering Sciences and Technical**	**Professional Subjects**
			✓	

Mode of Evaluation: Quiz, Assignment, Seminar, Written Examination.

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	UTILIZATION OF ELECTRICAL ENERGY	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Power Systems				

UNIT – I

Electric Heating: Advantages and methods of electric heating–Resistance heating, induction heating and dielectric heating.

Electric Welding: Electric welding–Resistance and arc welding–Electric welding equipment–Comparison between AC and DC Welding

UNIT – II

Illumination Fundamentals: Introduction, terms used in illumination–Laws of illumination–Polar curves– Integrating sphere–Lux meter–Sources of light

Various Illumination Methods: 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 – III

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 – 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.

COURSE OUTCOMES:

After succesful completion of this course a student will be able to:

CO-1: identify most appropriate heating or welding techniques for suitable applications

CO-2: understand various level of illuminosity produced by different illuminating sources

CO-3: identify a suitable motor for electric drives and industrial applications

Text Books:

1. Utilization of Electric Energy – by E. Openshaw Taylor, Orient Longman.
2. Art & Science of Utilization of electrical Energy – by Partab, DhanpatRai& 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.
   Generation, Distribution and Utilization of electrical Energy – by C.L. Wadhwa, New Age

UTILIZATION OF ELECTRICAL ENERGY													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	DATABASE MANAGEMENT SYSTEMS	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)					

UNIT-I

Introduction: Data base System Applications, data base System VS file System, Advantages of a DBMS View of Data, Data Abstraction, instances and Schemas, data Models, the ER Model, Relational Model, Other Models

UNIT-II

Database Languages: DDL, DML, DCL. Database Access for applications Programs, Storage Manager, the Query Processor, Transaction Management, data base System Structure, data base Users and Administrator

UNIT-III

History of Data base Systems::Data base design and ER diagrams, Beyond ER Design Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Concept Design with the ER Model, and Conceptual Design for Large enterprises.

UNIT- IV

Basic SQL Query: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, Set ,Comparison Operators, NULL values , Comparison using Null values, sub queries, grouping, aggregation, ordering, implementation of different types of joins, Simple Database schema, data types, table definitions, different types of DML and DDL operations

UNIT-V

SQL and PL/SQL: Creating tables with relationship, implementation of key and integrity constraints, views. Introduction to PL/SQL, PL/SQL procedures, functions, triggers, cursors, exception handling, packages, varrays, table types. SQL constructs that grant access or revoke access from user or user groups.

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form (BCNF), Lossless join and dependency preserving decomposition, Fourth normal form (4NF).

Course Outcomes:

1. define a Database Management System
2. give a description of the Database Management structure understand the applications of Databases
3. know the advantages and disadvantages of the different models
4. compare relational model with the Structured Query Language (SQL)
5. know the constraints and controversies associated with relational database model. know the rules guiding transaction ACID

Text Books:

1. Database System Concepts 6e By Abraham Silberschatz, Henry Korth and S Sudarshan
2. Database Management Systems, 3/e Raghuram Krishnan, Johannes Gehrke, TMH

Reference Books:

1. Introduction to Database Systems, 8/e C J Date, PEA
2. The Database book principles & practice using Oracle/MySqlNarainGehani, University Press.
3. Oracle Database 11g. The complete reference (oracle press)

DATABASE MANAGEMENT SYSTEMS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
	Co5	√											
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
											√		
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	ELECTRICAL DISTRIBUTION SYSTEMS	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Power systems				

UNIT – I

General Concepts: Introduction to distribution systems, Load modeling and characteristics – Coincidence factor – Contribution factor loss factor – Relationship between the load factor and loss factor – Classification of loads (Residential, commercial, Agricultural and Industrial) and their characteristics.

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.

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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, fuse-fuse, recloser-fuse, circuit breaker-fuse, circuit breaker-recloser, recloser-recloser.

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.

Voltage Control

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

COURSE OUTCOMES:

After successful completion of this course, a student will be able to:

CO-1: Understand the various factors of distribution system

CO-2: Design the substation and feeders.

CO-3: Understand the protection and its coordination.

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.

<table>
<tr><td colspan="14">ELECTRICAL DISTRIBUTION SYSTEMS</td></tr>
<tr><td colspan="14">COURSE DESIGNED BY: Department of Electrical & Electronics Engineering</td></tr>
<tr><td></td><td>Program outcomes</td><td>Po1</td><td>Po2</td><td>Po 3</td><td>Po 4</td><td>Po 5</td><td>Po 6</td><td>Po 7</td><td>Po 8</td><td>Po 9</td><td>Po10</td><td>Po11</td><td>Po12</td></tr>
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<tr><td colspan="2">Mode of Evaluation</td><td colspan="12">Quiz, Assignment, Seminar, Written Examination</td></tr>
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Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	EXTRA HIGH VOLTAGE TRANSMISSION	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Basic knowledge on Transmission lines				

UNIT – I

Introductionof EHVAC Transmission: Necessity of EHV AC transmission – advantages and problems–power handling capacity and line losses, mechanical considerations – resistance of conductors – properties of bundled conductors – bundle spacing and bundle radius- Numerical problems

UNIT – II

Voltage Gradients of Conductors: Electrostatics – field of sphere gap – field of line changes and properties – charge – potential relations for multi-conductors – surface voltage gradient on conductors – distribution of voltage gradient on sub-conductors of bundle – Numerical problems

UNIT – III

Corona Effects : Power loss and audible noise (AN) – corona loss formula – charge voltage diagram – generation, characteristics - limits and measurements of AN – relation between 1-phase and 3-phase AN levels – Numerical problems

Radio interference (RI) - corona pulses generation, properties, limits – frequency spectrum – modes of propagation – excitation function – measurement of RI, Radio Influence Voltage (RIV) and excitation functions – Numerical problems

UNIT –I V

Basic Concepts Of HVDC Transmission Systems: Types of HVDC Links – Apparatus required for HVDC Systems – Comparison of AC &DC Transmission, Application of DC Transmission System – Planning & Modern trends in D.C. Transmission.

UNIT – V

Harmonics and Filters : Generation of Harmonics –Characteristics of harmonics, calculation of AC Harmonics, adverse effects of harmonics – Calculation of voltage & Current harmonics – Effect of Pulse number on harmonics. Types of AC filters, Design of Single tuned filters – Design of High pass filters.

Course Outcomes

After successful completion of this course, a student will be able to:

- **CO-1.** Implement State space representation of control system and formulation of different state models are reviewed
- **CO-2.** Design a control system using the pole placement technique is given after introducing the concept of controllability and observability.

CO-3. Analyses a nonlinear system using the describing function technique and phase plane analysis.
CO-4. Analyse the stability analysis using lypnov method.
CO-5. Minimization of functions using calculus of variation studied.

TEXT BOOKS:

1. EHVAC Transmission Engineering by R. D. Begamudre, New Age International (p) Ltd.
2. HVDC Transmission – J.Arrillaga.
3. Direct Current Transmission – by E.W.Kimbark, John Wiley & Sons.

REFERENCE BOOKS:

1. HVDC Power Transmission Systems: Technology and system Interactions – by K.R.Padiyar, New Age International (P) Limited, and Publishers.
2. EHVAC and HVDC Transmission Engineering and Practice – S.Rao.
3. Power Transmission by Direct Current – by E.Uhlmann, B.S.Publications
4. HVAC and DC Transmission by S. Rao.

EXTRA HIGH VOLTAGE TRANSMISSION													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po1 0	Po1 1	Po1 2
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
	Co5	√											
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	ELECTRICAL MACHINE MODELLING & ANALYSIS	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Electrical machines-I & II				

UNIT – I

Basic Two-pole DC machine - primitive 2-axis machine – Voltage and Current relationship – Torque equation.

UNIT – II

Mathematical model of separately excited DC motor and DC Series motor in state variable form Transfer function of the motor - Numerical problems.
Mathematical model of D.C. shunt motor D.C. Compound motor in state variable form – Transfer function of the motor - Numerical Problems

UNIT – III

Liner transformation – Phase transformation (a, b, c to α, β, o) – Active transformation (α .β, o to d, q). Circuit model of a 3 phase Induction motor – Linear transformation - Phase Transformation – Transformation to a Reference frame – Two axis models for induction motor.

UNIT–IV

Voltage and current Equations in stator reference frame – equation in Rotor reference frame – equations in a synchronously rotating frame – Torque equation - Equations I state – space form.

UNIT –V

Circuits model of a 3ph Synchronous motor – Two axis representation of Syn. Motor.
Voltage and current Equations in state – space variable form – Torque equation.

Course Outcomes

After successful completion of this course, a student will be able to:
CO1-Model DC machines and obtain its transfer function
CO2-Model induction machine
CO3- Model synchronous machine

Text Books:

1. Generalised theory of electrical machines P.S. Bimbhra Khanna Publications.
2. Analysis of electric machinery and Drives systems - Paul C. Krause, Oleg wasynezuk, Scott D. Sudhoff.

ELECTRICAL MACHINE MODELLING													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 14 (B.Tech.)	L	T	P	C
Course/ Code	**Electronic Instrumentation and Automation systems**	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Basics of Principles of Sensors and Transducers, Control System Electronic processing of the Doppler signal: Time domain and Frequency.				

UNIT–I

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 – Gauge factor, Thermistors – Thermocouples – Synchros – Piezo electric transducers – Photo diodes, MEMS-nano sensor digital transducers.

UNIT–III

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.

Automation system structure

Definition, sub-systems, data acquisition control unit(DAC),data analysis, decision making and control execution, control actuation, final control elements, control strategies, stand alone and communicability.

UNIT–IV

Special purpose DAC

PID, PLC, loop controller, remote terminal unit.

Types of automation system

Need, centralized control system, distributed control system, network control system, supervisory control and data acquisition system (SCADA),evolution, similarities with DCS and NCS, automation system functionalities.

UNIT–V

Practical automation system case study

Traffic signal automation with PLC, engine, speed automation with loop controller, electrical sub-station automation with DCS, power plant automation with DCS, railway traction power supply automation with MCS.

Course outcomes

After successful completion of this course, a student will be able to:

CO-1. Understand different types of test signals and modulation techniques
CO-2. Understand different trtansducers and measurement of various non electrical quantities
CO-3: Understand variation automation systems and thier practical implementations

Text Books:

1. Electronic Instrumentation–by H.S. Kalsi Tata McGraw–Hill Edition, 1995.
2. Process control instrumentation technical, CD JHONSON
3. Instrument engineering Hand book-vol1, vol2, BG LIPTAK.

Reference Books:

1. Overview of industrial process Automation, K.L.S. Sharma, IIIT Bangalore.
2. Fundamentals of industrial control, D.E. Coggan.
3. Understanding distributed processor systems for control- SM Herb, ISA

Electronic Instrumentation and Automation syste													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Power Electronics				

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

Compensation Methods: 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.

Shunt Compensators: Thyristor Switched Capacitor(TSC)– Thyristorcontrolled Reactor(TCR), Thyristor Switched Reactor (TSR), Static VAR compensator(SVC) and Static Compensator(STATCOM)**.** The regulation and slope transfer function and dynamic performance –Operating point control and summary of compensation control.

UNIT–IV

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–V

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.

COURSE OUTCOMES:

After successful completion of this course, a student will be able to:

CO-1: Learn the basics of power flow control in transmission lines by using FACTS controllers

CO-2: Understand the operation and control of voltage source converter

CO-3: Understand the operation of two modern power electronic controllers (Unified Power

Quality Conditioner and Interline Power Flow Controller).

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.

Reference Books :

1. Thyristor-based FACTS Controllers for Electrical Transmission Systems, by R.MohanMathur and Rajiv K.Varma, Wiley.

FLEXIBLE ALTERNATING CURRENT TRANSMISSION SYSTEMS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
											√		
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	HVDC TRANSMISSION SYSTEMS	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Power Electronics				

UNIT 1: DC Transmission Technology:
Comparison of AC and DC Transmission (Economics, Technical Performance and Reliability). Application of DC Transmission. Types of HVDC Systems. Components of a HVDC system. Line Commutated Converter and Voltage Source Converter based systems.
Line Commutated Converters (LCCs): Six pulse converter, Analysis neglecting commutation overlap, harmonics, Twelve Pulse Converters. Inverter Operation. Effect of Commutation Overlap Expressions for average DC voltage, AC current, Reactive power absorbed by the converters. Effect of Commutation Failure, Misfire and Current Extinction in LCC links

UNIT 2: Analysis of Voltage Source Converters:
Voltage Source Converters (VSCs): Two and Three-level VSCs. PWM schemes: Selective Harmonic Elimination, Sinusoidal Pulse Width Modulation. Analysis of a six pulse converter. Equations in the rotating frame. Real and Reactive power control using a VSC.

UNIT 3: Control of HVDC Converters:
Principles of Link Control in a LCC HVDC system. Control Hierarchy, Firing Angle Controls – Phase-Locked Loop, Current and Extinction Angle Control, Starting and Stopping of a Link. Higher level Controllers Power control, Frequency Control, Stability Controllers. Reactive Power Control. Principles of Link Control in a VSC HVDC system: Power flow and DC Voltage Control. Reactive Power Control/AC voltage regulation.

UNIT 4: Components of HVDC systems:
Smoothing Reactors, Reactive Power Sources and Filters in LCC HVDC systems DC line: Corona Effects. Insulators, Transient Over-voltages. DC line faults in LCC systems. DC line faults in VSC systems. DC breakers. Monopolar Operation. Ground Electrodes.

UNIT 5:Stability Enhancement using HVDC Control:
Basic Concepts: Power System Angular, Voltage and Frequency Stability. Power Modulation: basic principles – synchronous and asynchronous links. Voltage Stability Problem in AC/DC systems.

Course Outcomes:
After successful completion of this course, a student will be able to:
CO-1: Understand the advantages of DC transmission over ac transmission.
CO-2: Understand the operation of Line Commutated Converters and Voltage Source Converters.
CO-3: Understand the control strategies used in HVDC transmission system.
CO-4: Understand the improvement of power system stability using an HVDC system.

Text/References:

1. K. R. Padiyar, “HVDC Power Transmission Systems”, New Age International Publishers, 2011.
2. J. Arrillaga, “High Voltage Direct Current Transmission”, Peter Peregrinus Ltd., 1983.
3. E. W. Kimbark, “Direct Current Transmission”, Vol.1, Wiley-Interscience, 1971.

HVDC TRANSMISSION SYSTEMS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
	Co5	√											
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
											√		
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	HIGH VOLTAGE ENGINEERING	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Power Systems-II, Switchgear & Protection				

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 in practice – Breakdown in 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 – Generation of impulse currents – Tripping and control of impulse generators.

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–IV

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

UNIT–V

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.

COURSE OUTCOMES:

After successful completion of this course, a student will be able to:

CO-1: Understand theory of breakdown and withstand phenomena of all types of dielectric materials.

CO-2: Acquaint with the techniques of generation of AC,DC and Impulse voltages

CO-3: Know the techniques of testing various equipment's used in HV engineering.

Text Books:

1. High Voltage Engineering by M.S.Naidu and V. Kamaraju – TMH Publications, 3rd Edition.
2. High Voltage Engineering : Fundamentals by E.Kuffel, W.S. Zaengl, J. Kuffel by Elsevier, 2nd Edition.
3. High Voltage Engineering and Technology by Ryan, IET Publishers.

Reference Books:

1. High Voltage Engineering by C.L.Wadhwa, New Age Internationals(P) Limited, 1997.
2. High Voltage Insulation Engineering by Ravindra Arora, Wolfgang Mosch, New.Age International (P) Limited, 1995.

HIGH VOLTAGE ENGINEERING													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	MICROPROCESSORS & MICROCONTROLLERS AND ITS APPLICATIONS LAB	0	0	3	2
Teaching					
Prerequisite (s)	MPMC				

All the experiments are to be done compulsorily

1. Signed Arithmetic operation – Multi byte addition and subtraction
2. Multiplication and division – Signed
3. Uunsigned arithmetic operation, ASCII – Arithmetic operation
4. Logic operations – Shift and rotate
5. Converting packed BCD to unpacked BCD, BCD to ASCII conversion
6. By using string operation and Instruction prefix**:** Move block, Reverse string Sorting, Inserting, Deleting, Length of the string, String comparison
7. Modular Program: Procedure
8. Near and Far implementation, Recursion
9. Dos/BIOS programming: Reading keyboard (Buffered with and without echo)
10. Dos/BIOS programming : Display characters, Strings
11. Interfacing 8255–PPI
12. Programs using special instructions like swap, bit/byte, set/reset etc
13. Programs based on short, page, absolute addressing
14. Interfacing 8259 – Interrupt Controller
15. Interfacing 8279 – Keyboard Display
16. Stepper motor control using 8253/8255
17. Reading and Writing on a parallel port
18. Timer in different modes
19. Serial communication implementation.
20. Understanding three memory areas of 00 – FF (Programs using above areas).Using external interrupts

Course Outcomes:

After successful completion of this course, a student will be able to:

CO-1. Do assembly language programming.

CO-2. Do interfacing design of peripherals like I/O, A/D, D/A, timer etc.

CO-3. Develop systems using different microcontrollers

MICROPROCESSORS & MICROCONTROLLERS AND ITS APPLICATIONS LAB													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	ELECTRICAL SIMULATION LAB	0	0	3	2
Teaching					
Prerequisite (s)	MAT LAB				

All the experiments are to be done compulsorily

1. Simulation of step response of RLC circuits
2. Simulation of impulse response of RLC circuits
3. Simulation of transient response of RLC circuits to sinusoidal input
4. Plotting of Bode plots for the transfer functions of systems up to 5^{th} order
5. Plotting of root locus for the transfer functions of systems up to 5^{th} order
6. Plotting of nyquist plots for the transfer functions of systems up to 5^{th} order
7. Integrator circuit using op–amp.
8. Differentiator circuits using op–amp.
9. Simulation of separately excited DC motor using transfer function approach
10. Analysis of three phase circuit representing the generator transmission line and load.
11. Power system load flow using Newton–Raphson technique.
12. Modeling of transformer and simulation of lossy transmission line
13. Transient analysis of single machine connected to infinite bus (SMIB).
14. Simulation of three phase full converter with RL & RLE load
15. Simulation of Boost converter
16. Simulation of single phase inverter with PWM control
17. Simulation of single–phase full converter using RLE loads
18. Simulation of single phase AC voltage controller using RL loads.
19. Simulation of Buck converter
20. Modeling of transformer and simulation of lossless transmission line

COURSE OUTCOMES:

After successful completion of this course, a student will be able to:

CO-1: simulate control systems & machine models

CO-2: simulate transmission line models

CO-3: perform transient analysis of RLC circuit and single machine connected to infinite bus (SMIB).

CO-4: Simulate power electronic converters

ELECTRICAL SIMULATION LAB													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	POWER SYSTEMS LAB	0	0	3	2
Teaching					
Prerequisite (s)	Power Systems-II, Power System Analysis, MATLAB				

All the experiments are to be done compulsory

1. Determination of Sequence impedances of three phase alternator by fault analysis
2. Determination of Sequence impedances of three phase transformer
3. Determination of ABCD parameters of Transmission line
4. Dielectric strength of Transformer oil.
5. Calibration of Tong Tester.
6. Load frequency control without controller
7. Load frequency control with controller
8. Load flow study using GS method
9. Economic load dispatch without considering losses
10. Economic load dispatch with considering losses
11. Determination of Sequence impedances of three phase alternator by direct method
12. Load flow study by Fast decoupled method
13. Active power control of synchronous machine connected to infinite bus
14. Reactive power control of synchronous machine connected to infinite bus
15. Voltage control by capacitor compensation and tap changing transformers
16. Study of corona phenomenon
17. Power Angle Characteristics of 3phase Alternator with infinite bus bars.
18. Comparison of different Load flow methods.
19. Economic load dispatch considering losses
20. Transient Stability Analysis

Course Outcomes:

After successful completion of this course, a student will be able to:

CO-1. Understand the parameters of various types of transmission lines and to understand the performance of short, medium, long transmission lines.

CO-2. Understand the effects of skin, proximity, Ferranti, corona effects on transmission lines

POWER SYSTEMS LAB													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	MINI PROJECT-II	0	0	3	2
Teaching					
Prerequisite (s)					

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	DATABASE MANAGEMENT SYSTEMS	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)					

UNIT-I

Introduction: Data base System Applications, data base System VS file System, Advantages of a DBMS View of Data, Data Abstraction, instances and Schemas, data Models, the ER Model, Relational Model, Other Models

UNIT-II

Database Languages: DDL, DML, DCL. Database Access for applications Programs, Storage Manager, the Query Processor, Transaction Management, data base System Structure, data base Users and Administrator

UNIT-III

History of Data base Systems::Data base design and ER diagrams, Beyond ER Design Entities, Attributes and Entity sets, Relationships and Relationship sets, Additional features of ER Model, Concept Design with the ER Model, and Conceptual Design for Large enterprises.

UNIT- IV

Basic SQL Query: Basic SQL querying (select and project) using where clause, arithmetic & logical operations, Set ,Comparison Operators, NULL values , Comparison using Null values, sub queries, grouping, aggregation, ordering, implementation of different types of joins, Simple Database schema, data types, table definitions, different types of DML and DDL operations

UNIT-V

SQL and PL/SQL: Creating tables with relationship, implementation of key and integrity constraints, views. Introduction to PL/SQL, PL/SQL procedures, functions, triggers, cursors, exception handling, packages, varrays, table types. SQL constructs that grant access or revoke access from user or user groups.

Schema Refinement (Normalization): Purpose of Normalization or schema refinement, concept of functional dependency, normal forms based on functional dependency (1NF, 2NF and 3 NF), concept of surrogate key, Boyce-codd normal form (BCNF), Lossless join and dependency preserving decomposition, Fourth normal form (4NF).

Course Outcomes:

1. define a Database Management System
2. give a description of the Database Management structure understand the applications of Databases
3. know the advantages and disadvantages of the different models
4. compare relational model with the Structured Query Language (SQL)
5. know the constraints and controversies associated with relational database model. know the rules guiding transaction ACID

Text Books:

1. Database System Concepts 6e By Abraham Silberschatz, Henry Korth and S Sudarshan
2. Database Management Systems, 3/e Raghuram Krishnan, Johannes Gehrke, TMH

Reference Books:

1. Introduction to Database Systems, 8/e C J Date, PEA
2. The Database book principles & practice using Oracle/MySqlNarainGehani, University Press.
3. Oracle Database 11g. The complete reference (oracle press)

DATABASE MANAGEMENT SYSTEMS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
	Co5	√											
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
											√		
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	DIGITAL CONTROL SYSTEMS	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Control Systems				

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 andobservability – 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 lead compensators – Root locus technique in the z–plane.

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

Course Outcomes:
After successful completion of this course, a student will be able to:
CO-1: learn the advantages of discrete time control systems and the "know how" of various associated accessories.
CO-2: understand z–transformations and their role in the mathematical analysis

of different systems(like Laplace transforms in analog systems).

CO-3: learn stability criterion for digital systems and methods adopted for testing

CO-4: understand the conventional and state space methods of design

Text Book:

1. Discrete–Time Control systems – K. Ogata, Pearson Education/PHI, 2nd Edition.
2. Digital Control and State Variable Methods by M.Gopal, TMH, 4th Edition.

Reference Books:

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

DIGITAL CONTROL SYSTEMS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
											√		
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	ENERGY AUDIT, CONSERVATION & MANAGEMENT	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)					

UNIT 1: Energy Scenario

Commercial and Non-commercial energy, primary energy resources, commercial energy production, final energy consumption, energy needs of growing economy, long term energy scenario, energy pricing, energy sector reforms, energy and environment, energy security, energy conservation and its importance, restructuring of the energy supply sector, energy strategy for the future, air pollution, climate change. Energy Conservation Act-2001 and its features.

UNIT 2: Basics of Energy and its various forms

Electricity tariff, load management and maximum demand control, power factor improvement, selection & location of capacitors, Thermal Basics-fuels, thermal energy contents of fuel, temperature & pressure, heat capacity, sensible and latent heat, evaporation, condensation, steam, moist air and humidity & heat transfer, units and conversion.

UNIT 3: Energy Management & Audit

Definition, energy audit, need, types of energy audit. Energy management (audit) approach-understanding energy costs, bench marking, energy performance, maximizing system efficiencies, optimizing the input energy requirements, fuel & energy substitution, energy audit instruments. Material and Energy balance: Facility as an energy system, methods for preparing process flow, material and energy balance diagrams.

UNIT 4: Energy Efficiency in Electrical Systems

Electrical system: Electricity billing, electrical load management and maximum demand control, performance assessment of PF capacitors, distribution and transformer losses. Electric motors: Types, losses in induction motors, motor efficiency, factors affecting motor performance, rewinding and motor replacement issues, energy saving opportunities with energy efficient motors.

UNIT 5: Energy Efficient Technologies in Electrical Systems

Maximum demand controllers, automatic power factor controllers, energy efficient motors, soft starters with energy saver, variable speed drives, energy efficient

transformers, electronic ballast, occupancy sensors, energy efficient lighting controls, energy saving potential of each technology.

Course Outcomes:

After successful completion of this course, a student will be able to:

CO-1: Understand the current energy scenario and importance of energy conservation.

CO-2: Understand the concepts of energy management.

CO-3: Understand the methods of improving energy efficiency in different electrical systems.

CO-4: Understand the concepts of different energy efficient devices.

Text/Reference Books

1. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-1, General Aspects (available online)
2. Guide books for National Certification Examination for Energy Manager / Energy Auditors Book-3, Electrical Utilities (available online)
3. S. C. Tripathy, "Utilization of Electrical Energy and Conservation", McGraw Hill, 1991. Success stories of Energy Conservation by BEE, New Delhi (www.bee-india.org)

Energy Audit, Conservation & Management													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
											√		
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	EMBEDDED SYSTEMS	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)					

UNIT I

INTRODUCTION:

Embedded systems-, Definition, History, Classification, Application areas and purpose of embedded system, the typical embedded system – Core of the embedded system, Memory, Sensors and Actuators, Communication Interface, Embedded firmware, PCB and passive components. Characteristics, Quality attributes of embedded systems, Application-specific and Domain-Specific examples of an embedded system.

UNIT II

Embedded Hardware Design:

Analog and digital electronic components, I/O types and examples, Serial communication devices, parallel device ports, Wireless devices, Timer and counting devices, Watchdog timer, Real time clock.

Embedded Firmware Design:

Embedded Firmware Design approaches, Embedded Firmware development languages, ISR concept, Interrupt sources, Interrupt servicing mechanism, Multiple interrupts, DMA, Device driver programming, Concepts of C versus Embedded C and Compiler versus Cross-compiler.

UNIT III

Real Time Oprating System:

Operating, system basics, Types of operating systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Threads, Processes and Scheduling, Task Scheduling, Communication, Synchronization, Device Drivers, How to choose anRTOS.

Hardware Software Co-Design:

Fundamental Issues in Hardware Software Co-Design, Computational models in embedded design, Hardware software Trade offs, Intergration of Hardware and Firmware, ICE.

UNIT IV

Embedded system development:

The integrated development environment, Types of files generated on cross-compilation, Deassembler/Decompiler, Simulators, Emulators and Debugging, Target hardware debugging, Boundary Scan, Embedded Software development process and Tools.

UNIT V

Embedded system Implementation and Testing:

The main software utility tool, CAD and te hardware, Translation toos-Pre-processors, Interpreters, Compilers and Linkers, Debugging tools, Quality assurance and testing of the design, Testing on host machine, Simulators, Laboratory Tools.

COURSE OBJECTIVES:

1. Understand the basics in typical embedded system
2. Understand the concepts of communication devices and basics integrated circuit design
3. Understand concepts of firmware design approaches, ISR concept and interrupt servicing mechanism.

TEXT BOOKS:

1. Embedded systems Architecture by Tammy Noergaard, Elsevier Publications,2005
2. Embedded system Design, Frank Vahid, Tony Givargis, John Wiley publication

REFERENCE BOOKS:

1. Embedded Systems, Raj Kamal-Tata McGraw Hill Education Private Limited, Second Edition, 2008
2. Embedding system building blocks By Labrosses, CMP publishe.

WEB REFERENCES

1. NPTEL online courses.

2. MOOCS online courses nt JNTUK.rs.

EMBEDDED SYSTEMS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	NEURAL FUZZY SYSTEMS	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)					

UNIT – I: Introduction to Neural Networks

Introduction, Humans and Computers, Organization of the Brain, Biological Neuron, Biological and Artificial Neuron Models, Hodgkin-Huxley Neuron Model, Integrate-and-Fire Neuron Model, Spiking Neuron Model, Characteristics of ANN, McCulloch-Pitts Model, Historical Developments, Potential, Applications of ANN.

UNIT- II: Essentials of Artificial Neural Networks

Artificial Neuron Model, Operations of Artificial Neuron, Types of Neuron Activation Function, ANNArchitectures, Classification Taxonomy of ANN – Connectivity, Neural Dynamics (Activation and Synaptic), Learning Strategy (Supervised, Unsupervised, Reinforcement), Learning Rules, Types of Application

UNIT–III:

Multilayer feed forward Neural Networks

Credit Assignment Problem, Generalized Delta Rule, Derivation of Back propagation (BP) Training, Summary of Backpropagation Algorithm, Kolmogorov Theorem, Learning Difficulties and Improvements, Radial Basis Function (RBF) Neural Network – Kohonen Self Organising feature Map (KSOM).

Associative Memories

Bidirectional Associative Memories (BAM)-Architecture of Hopfield Network: Discrete and Continuous versions, Storage and Recall Algorithm, Stability Analysis, Capacity of the Hopfield Network, Summary and Discussion of Instance/Memory Based Learning Algorithms, Applications.

UNIT – IV: Classical & Fuzzy Sets

Introduction to classical sets - properties, Operations and relations; Fuzzy sets, Membership, Uncertainty, Operations, properties, fuzzy relations, cardinalities, membership functions.

UNIT V: Fuzzy Logic Modules

Fuzzification, Membership value assignment, development of rule base and decision making System, Defuzzification to crisp sets, Defuzzification methods.

Neural network applications: Process identification, control, fault diagnosis and load forecasting.

Fuzzy logic applications: Load frequency control and Fuzzy classification.

Course Outcomes:

Students should able to:

1. Know different models of artificial neuron.
2. Use learning methods of ANN.
3. Use different paradigms of ANN.
4. Classify between classical and fuzzy sets.
5. Use different modules of Fuzzy logic controller.

Text Book:

1. Neural Networks, Fuzzy logic, Genetic algorithms: synthesis and applications by RajasekharanandRai – PHI Publication.
2. Introduction to Neural Networks using MATLAB 6.0 - S.N.Sivanandam, S.Sumathi, S.N.Deepa, TMH,2006

Reference Book:

1. Neural Networks – James A Freeman and Davis Skapura, Pearson Education, 2002.
2. Neural Networks – Simon Hakins , Pearson Education
3. Neural Engineering by C.Eliasmith and CH.Anderson, PHI
4. Neural Networks and Fuzzy Logic System by Bart Kosko, PHI Publications.

NEURAL FUZZY SYSTEMS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
	Co5	√											
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17(B.Tech.)	L	T	P	C
Course/ Code	**Oops through JAVA**	3	0	0	3
Teaching	**Total contact hours - 48**				
Prerequisite (s)	Basic knowledge on Java				

UNIT-I

Introduction to OOP: Introduction, Need of Object Oriented Programming, Principles of Object Oriented Languages, Procedural languages Vs OOP, Applications of OOP, History of JAVA, Java Virtual Machine, Java Features, Program structures, Installation of JDK1.6

UNIT-II

Programming Constructs: Variables, Primitive Datatypes, Identifiers- Naming Coventions, Keywords, Literals, Operators-Binary, Unary and ternary, Expressions, Precedence rules and Associativity, Flow of control-Branching, Conditional, loops.

UNIT-III

Classes and Objects- classes, Objects, Creating Objects, Methods,constructors-Constructor overloading, cleaning up unused objects-Garbage collector, Class variable and Methods-Static keyword, this keyword, Arrays, Command line arguments,

UNIT-IV

Inheritance: Types of Inheritance, Deriving classes using extends keyword,Method overloading, super keyword, final keyword, Abstract class, Interfaces & Packages

UNIT-V

Exceptions & Assertions - Introduction, Exception handling techniques-try... catch, throw, throws, finally block, user defined exception, Exception Encapsulation and Enrichment, Assertions, Multithreading- Using isAlive() and join(), Synchronization

Applets-Applet class, Applet structure, An Example Applet Program, AppletLife Cycle, paint , update and repaint .

Course Outcomes

After completion of this course, a successful student will be able to:

- **CO-1.** nderstand the format and use of objects.
- **CO-2.** Understand basic input/output methods and their use.
- **CO-3.** Understand object inheritance and its use.
- **CO-4.** Understanding of Thread concepts and I/O in Java.
- **CO-5.** Understand development of JAVA applets vs. JAVA applications.

Text Books:

1. The Complete Refernce Java, 8ed, Herbert Schildt, TMH
2. Programming in JAVA, Sachin Malhotra, Saurabh choudhary, Oxford.
3. JAVA for Beginners, 4e, Joyce Farrell, Ankit R. Bhavsar, Cengage Learning.
4. Object oriented programming with JAVA, Essentials and Applications, Raj Kumar

Bhuyya, Selvi, Chu TMH.
5. Introduction to Java rogramming, 7th ed, Y Daniel Liang, Pearson.

Reference Books:

1. JAVA Programming, K. Rajkumar. Pearson.
2. Core JAVA, Black Book, Nageswara Rao, Wiley, Dream Tech
3. Core JAVA for Beginners, Rashmi Kanta Das, Vikas.
4. Object Oriented Programming through JAVA , P Radha Krishna, University Press.

Oops through JAVA													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
	Co5	√											
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
											√		
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.TECH.)	L	T	P	C
Course/ Code	PLC AND ITS APPLICATIONS	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Computer Organization, Control Systems				

UNIT – I:
PLC Basics: PLC system, I/O modules and interfacing, CPU processor, programming Equipment, programming formats, construction of PLC ladder diagrams, Devices connected to I/O modules. PLC Programming: Input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation.

UNIT–II:
Digital logic gates, programming in the Boolean algebra system, conversion examples Ladder Diagrams for process control: Ladder diagrams & sequence listings, ladder diagram construction and flowchart for spray process system.

UNIT–III:
PLC Registers: Characteristics of Registers, module addressing, holding registers, Input Registers, OutputRegisters. PLC Functions: Timer functions & Industrial applications, counters, counter function industrial applications, Arithmetic functions, Number comparison functions, number conversion functions

UNIT – IV:
Data Handling functions: SKIP, Master control Relay, Jump, Move, FIFO, FAL, ONS, CLR & Sweep functions and their applications Bit Pattern and changing a bit shift register, sequence functions and applications controlling of two-axis & three axis Robots with PLC, Matrix functions

UNIT – V:
Analog PLC operation: Analog modules& systems, Analog signal processing, Multi bit Data Processing,
Analog output Application Examples, PID principles, position indicator with PID control, PID Modules, PID tuning, PID functions.

Text Book:
1. Programmable Logic Controllers- Principles and Applications by John W. Webb & Ronald A. Reiss, Fifth Edition, PHI
2. Programmable Logic Controllers- Programming Method and Applications –JR. Hackworth &F.D Hackworth Jr. –Pearson, 2004

COURSE OUTCOMES:
After successful completion of this course, a student will be able to:
CO-1. Gain knowledge on programmable logic controllers

CO-2. Understand various types of PLC registers
CO-3. Create ladder diagrams for process control
CO-4. Use different types of data handling functions
CO-5. Understand analog PLC operations

PLC AND ITS APPLICATIONS													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po 1	Po 2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	**Unix And Shell Programming**	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)	Basic knowledge on Architecture				

UNIT-I

Introduction to Unix:- Architecture of Unix, Features of Unix, Unix Commands – PATH, man, echo, printf, script, passwd, uname, who, date, stty, pwd, cd, mkdir, rmdir, ls, cp, mv, rm, cat, more, wc, lp, od, tar, gzip.

Unix Utilities:- Introduction to unix file system, vi editor, file handlingutilities, security by file permissions, process utilities, disk utilities, networking commands, unlink, du, df, mount, umount, find, unmask, ulimit, ps, w, finger, arp, ftp, telnet, rlogin.Text processing utilities and backup utilities, detailed commands to be covered are tail, head, sort, nl, uniq, grep, egrep, fgrep, cut, paste, join, tee, pg, comm, cmp, diff, tr, awk, cpio.

UNIT-II

File Management: File Structures, System Calls for File Management –create, open, close, read, write, lseek, link, symlink, unlink, stat, fstat, lstat, chmod, chown, Directory API – opendir, readdir, closedir, mkdir, rmdir, umask.

Introduction to Shells: Unix Session, Standard Streams, Redirection, Pipes,Tee Command, Command Execution, Command- Line Editing, Quotes, Command Substitution, Job Control, Aliases, Variables, Predefined Variables, Options, Shell/Environment Customization.

Filters : Filters and Pipes, Concatenating files, Display Beginning and Endof files, Cut and Paste, Sorting, Translating Characters, Files with Duplicate Lines, Count characters, Words or Lines, Comparing Files.

UNIT-III

Grep: Operation, grep Family, Searching for File Content.

Sed: Scripts, Operation, Addresses, commands, Applications, grep and sed.

awk: Execution, Fields and Records, Scripts, Operations, Patterns, Actions,Associative Arrays, String.

Functions, String Functions, Mathematical Functions, User – Defined Functions, Using System commands, in awk, Applications, awk and grep, sed and awk.

UNIT-IV

Interactive Korn Shell: Korn Shell Features, Two Special Files, Variables,Output, Input, Exit Status of a Command, eval Command, Environmental Variables, Options, Startup Scripts, Command History, Command Execution Process.

Korn Shell Programming: Basic Script concepts, Expressions, Decisions:Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

UNIT-V

Interactive C Shell: C shell features, Two Special Files, Variables, Output,Input, Exit Status of a Command, eval Command, Environmental Variables, On-Off Variables, Startup and Shutdown Scripts, Command History, Command Execution Scripts.

C Shell Programming: Basic Script concepts, Expressions, Decisions:Making Selections, Repetition, special Parameters and Variables, changing Positional Parameters, Argument Validation, Debugging Scripts, Script Examples.

Course Outcomes

After completion of this course, a successful student will be able to:

- **CO-1.** Describe and use the UNIX operating system.
- **CO-2.** Describe and use the fundamental UNIX system tools and utilities.
- **CO-3.** Describe and write shell scripts in order to perform basic shell programming.
- **CO-4.** Describe and understand the UNIX file system.

Text Books:

1. Unix and shell Programming Behrouz A. Forouzan, Richard F. Gilberg. Thomson.
2. Your Unix the ultimate guide, Sumitabha Das, TMH. 2nd Edition. 2007-2008 Page 34 of 95.

References Books:

1. Unix for programmers and users, 3rd edition, Graham Glass, King Ables, Pearson Education.
2. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education.
3. The Complete Reference Unix, Rosen, Host, Klee, Farber, Rosinski, Second Edition, TMH.

Unix And Shell Programming

COURSE DESIGNED BY: Department of Electrical & Electronics Engineering

	Program outcomes	Po1	Po2	Po3	Po4	Po5	Po6	Po7	Po8	Po9	Po10	Po11	Po12
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								

CATEGORY	General Humanities	Basic sciences	Engineering sciences and Technical	Professional subjects
				√

Mode of Evaluation	Quiz, Assignment, Seminar, Written Examination

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	VLSI DESIGN	3	0	0	3
Teaching	Total contact hours - 48				
Prerequisite (s)					

UNIT –I

Introduction

Introduction to IC technology – The IC era – MOS and related VLSI technology – Basic MOS transistors – Enhancement and depletion modes of transistor action – IC production process – MOS and CMOS fabrication process – BiCMOS technology – Comparison b/w CMOS and bipolar technologies.

UNIT – II

Basic electrical properties of MOS and BiCMOS circuits

I_{ds}–V_{ds} relationships – Aspects of MOS transistor threshold voltage – MOS Trans–conductance and output conductance – MOS Transistor – Figure of merit – The pMOS transistor – The nMOS inverter – Determination of pull– up to pull–down ratio for nMOS inverter driven by another nMOS inverterfor an nMOS inverter driven through one or more pass Transistors – Alternative forms of pull up – The CMOS Inverter MOS transistor Circuit model – Bi–CMOS Inverters.

UNIT – III

MOS and BiCMOS circuit design processes

MOS layers – Stick diagrams – Design rules and layout – General observation on the design rules, 2µm double metal, double poly – CMOS/BiCMOS rules, 1.2µm Double metal, Double poly CMOS rules – Layout diagrams of NAND and NOR gates and CMOS inverter – Symbolic Diagrams – Translation to Mask Form.

Basic circuit concepts

Sheet resistance – Sheet resistance concept applied to MOS transistor and inverters – Area capacitance of layers – Standard unit of capacitance – Some area capacitance calculations – The delay unit – Inverter delays – Driving large capacitive loads – Propagations Delays – Wiring Capacitance – Fan–in and Fan–out characteristics – Choice of layers – Transistor switches – Realization of gates using nMOS, pMOS and CMOS technologies.

UNIT – IV

Scaling of MOS circuit

Scaling models and scaling factors – Scaling factors for device parameters – Limitations of scaling – Limits due to sub threshold currents – Limits on logic level and supply voltage due to noise – Limits due to current density – Some architectural Issues – Introduction to switch logic and gate logic.

UNIT – V

Digital design using HDL

Digital system design process – VLSI Circuit Design Process – Hardware simulation – Hardware Synthesis – History of VHDL – VHDL requirements– Levels of abstraction – Elements of VHDL – Packages – Libraries and bindings – Objects and classes – Variable assignments – Sequential statements – Usage of subprograms – Comparison of VHDL and verilog HDL.

VHDL Modelling

Simulation – Logic Synthesis – Inside a logic synthesizer – Constraints – Technology libraries – VHDL and logic synthesis – Functional gate – Level verification – Place and route – Post layout timing simulation – Static timing– Major net list formats for design representation – VHDL synthesis – Programming approach.

Course Objective: The student will be introduced to

1. Use mathematical methods and circuit analysis models in analysis of CMOS digital electronics circuits, including logic components and their interconnects
2. Learn the various fabrication steps of IC and come across basic electrical properties of MOSFET.
3. Apply CMOS technology-specific layout rules in the placement and routing of transistors and interconnect and to verify the functionality, timing, power and parasitic effects.
4. The concepts and techniques of modern integrated circuit design and testing (CMOS VLSI).
5. Design static CMOS combinational and sequential logic at the transistor level, including mask layout.

Text Books:

1. Essentials of VLSI Circuits and Systems–Kamran Eshraghian, Douglas and A.Pucknell and SholehEshraghian, Prentice–Hall of India Private Limited, 2005 Edition.
2. VLSI Design–K. LalKishor and V.S.V.Prabhakar, I.K. International Publishing House Private Limited, 2009 First Edition.
3. VLSI Design–A.Shanthi and A.Kavitha, New Age International Private Limited, 2006 First Edition.

VLSI DESIGN													
COURSE DESIGNED BY: Department of Electrical & Electronics Engineering													
	Program outcomes	Po1	Po2	Po 3	Po 4	Po 5	Po 6	Po 7	Po 8	Po 9	Po1 0	Po1 1	Po1 2
Course outcomes	Co1		√								√		
	Co2			√								√	
	Co3			√									
	Co4				√								
	Co5	√											
CATEGORY		General Humanities		Basic sciences		Engineering sciences and Technical			Professional subjects				
									√				
Mode of Evaluation		Quiz, Assignment, Seminar, Written Examination											

Regulation	GR - 17 (B.Tech.)	L	T	P	C
Course/ Code	PROJECT	0	0	3	9
Teaching					
Prerequisite (s)					