Rajiv Gandhi University of Knowledge Technologies – AP
(Established through AP ACT 18 of 2008)
Department of Electrical &Electronics Engineering

1st Year Course Syllabus for EEE Students for the Batch of 2020-24

Rajiv Gandhi University of Knowledge Technologies – AP
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Department of Electrical &Electronics Engineering

I SEMESTER

S.No	Course Code	Course Title	Course Category	Hours per week			Total Contact Hours	Credits
				L	T	P		
1	20MA1101	Differential Equations and Multivariable calculus	BSC	3	1	0	4	4
2	20PY1104	Engineering Physics	BSC	3	1	0	4	4
3	20PY1184	Engineering Physics Lab	BSC	0	0	3	3	1.5
4	20EE1101	Fundamentals of Electrical Engineering	PCC	3	1	0	4	4
5	20EE1182	Fundamentals of Electrical Engineering Lab	PCC	0	0	3	3	1.5
6	20CS1109	Programming and Data Structures	ESC	3	1	0	4	4
7	20CS1189	Programming and Data Structures Lab	ESC	0	0	3	3	1.5
8	20HS1102	Human Values	MC	2	0	0	2	0
Total				14	4	9	27	20.5
Induction Programme (Non-Credit)- Before the Commencement of 1st Semester								

Definition of Credit:

1 Hour Lecture(L) per week	1 credit
1 Hour Tutorial(T) per week	1 credit
3 Hours Practical(Lab)/week	1.5 credits

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Course code	Course Name	Course Category	L-T-P	Credits
20MA1101	Differential Equations and Multivariable calculus	BSC	3-1-0	4

Course Learning Objectives: The objective of this course is to
1. Discuss the Solutions of first order differential equations
2. Discuss theSolutions of higher order linear differential equations
3. Understand the converge of infinite series with different tests.
4. Learn power series representation of functions and its validity
5. Understand Continuity and differentiability of multi-variable functions and its applications to discuss maximum and minimum
6. Discuss the convergence Improper integrals and apply Leibnitz rule

Course Content:

Unit – I **(10 Contact hours)**

Differential equations of first order and first degree:
Basic concepts, Variable Separable method, homogeneous differential equations, Exact differential equations, Integrating factor, Differentiable equations Reducible to exact, Linear differential equations, Bernoulli differential equations.

Unit - II **(11 Contact hours)**

Linear differential equations of higher order:
Homogenous differentiable equations, Non-homogeneous linear equations of higher order with constant coefficients with RHS term of the type $e^{ax}, sinax, cosax,$ polynomials in $x, e^{ax}\,V(x), xV(x),$Methods of Undetermined Coefficients, Method of variation of parameters, Euler Cauchy equation.

Unit - III **(12 Contact hours)**

Sequences and Series
Definition of Sequences and convergence, Convergence of series, Comparison test, Ratio test, Root test, Absolute and Conditional convergence, Alternating series, Power series, Taylor's and Maclaurin's series.

Unit - IV **(12 Contact hours)**

Functions of several variables:
Limit, Continuity and Differentiability of functions of several variables, Partial derivatives and their geometrical interpretation, Differentials, Derivatives of Composite and Implicit functions,

Chain rule, Jacobians,Derivatives of higher order, Homogeneous functions, Euler's theorem, and Harmonic functions.

Unit - V

Applications of Functions of several Variable: (8 Contact hours)

Taylor's expansion of functions of several variables, Maxima and Minima of functions of several variables - Lagrange's method of multipliers.

Unit – VI (6 Contact hours)

Beta and Gamma Function:

Beta and Gamma functions - elementary properties, Relation between Beta and gamma functions, Evaluation of Definite integral usingBeta and Gamma functions, differentiation under integral sign, and differentiation of integrals with variable limits - Leibnitz rule.

Learning resources

Text book:

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

Reference Books:

1. TOM M. APOSTAL,*'Calculus, Volume II'*, Wiley-India,Second Edition,
2.R. K. JAIN AND S. R. K. IYENGAR,*'Advanced Engineering Mathematics'*, Narosa Publishers,3rd Edition.
3.B.S.GREWAL, '*Higher Engineering Mathematics'*, Khanna Publishers,42nd Edition.

Web resources:

1.NPTEL, IIT- Madras,08-June-2017, Introduction to ordinary differential equations URL: https://nptel.ac.in/courses/111106100/12
2. NPTEL, IIT- Kanpur,15-March-2016,Differential Calculus of Several Variables URL:https://nptel.ac.in/courses/111104092/11
3.NPTEL, IIT- Roorkee, 22-December-2017,Multivariable CalculusURL:https://nptel.ac.in/courses/111107108/
4.MatheMagician, 24–April-2017, Calculus - sequences and series,URL: https://www.youtube.com/playlist?list=PLJMXXdEk8kMAeBLj14HX0fhe_LypRc4aW
5.RGUKTCourse Content

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

CO 1	Solve first order differential equations.
CO 2	Solve higher order linear differential equations.
CO 3	Check the convergence of infinite series with different methods

CO 4	Discuss the power series representation of a function at various points.
CO 5	Explain limits and continuity, differentiability and partial derivatives of functions of multivariable and solve the extremum problems subjected to constraints.
CO 6	Apply Leibnitz rule and beta gamma functions to evaluate improper integrals.

For Theory courses only:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course code	Course name	Course Category	L-T-P	Credits
20PY1104	**Engineering Physics**	**BSC**	**3-1-0**	**4**

Course Learning Objectives:

1. To impart basic knowledge on the concept of vector and scalar fields as well its physical significance in all 3D coordinate systems. To integrate knowledge on vector calculus and its applications to transform 1, 2 and 3 dimensions.
2. To enhance the knowledge on waves & oscillation with an emphasis on different type of oscillations and its resonance conditions.
3. To purse the in-depth knowledge on Polarization with emphasis on Laurent's half-shade Polarimeter.
4. To inculcate the interest towards the concepts of Optical fibers along with its applications in electrical engineering
5. To enable the student in detailed knowledge on Crystallography, Free electron Theory, *Electrical Engineering Materials* and Superconductivity and their application.
6. To get knowledge about the band theory of solids by the assumption of movement of an electron in the periodic potential well only and hence distinguishes the materials classification, phenomena of Hall Effect exhibited by semiconductors and its applications.

Course Content:

UNIT - I: Mathematical Physics (10 Hours)
Coordinate system: Cartesian, cylindrical and spherical coordinate system transformations, Differential Calculus: Gradient, Divergence, Curl and their physical significance, Integral Calculus: Line, Surface, and Volume Integrals, Integral theorem: Gauss and stokes theorems, Curvilinear Coordinates

Unit II: Oscillations (8 Hours)
Oscillations**:** Simple Harmonic Oscillator (SHO), Damped Oscillations, Forced Oscillations, Amplitude and Velocity Resonance, Quality Factor, Coupled Oscillations &Normal modes, Coupled Pendulums & energy and Oscillation on N coupled modes.

UNIT-III: Polarization (8 Hours)
Polarization:Classification of Polarized light: Linear, Circular, Elliptical, Production& detection of polarized light, Brewster's law, Maluslaw,Retardationwave plates: Quarter & Half wave plates, Optical activity: Laurent Half shade Polarimeter.

UNIT-IV: **Fiber Optics(8 Hours)**

Optical fibres - classification (index & mode based) - principle and propagation of light in optical fibres - acceptance angle and numerical aperture - fibre optic communication system - active and passive sensors.

UNIT V: Electron Structure of solids and Electrical Materials (12 hours)

Introduction to Crystallography, Bravais Lattices, Miller Indices, defects, *Electrical Engineering Materials*: ceramic materials, insulating materials, magnetic materials – basics, properties and applications; ferrite, ferro-magnetic materials & components and their applications in electrical engineering, Photo-conductivity, theory of Superconductivity, types of superconductors and applications.

Unit IV: Semiconductor Physics (14 Hours)

Introduction to quantum mechanics: De Brogliematter waves, Uncertainty Principle, Wave function&it's probability interpretation, Postulates of quantum mechanics, Time independent Schrodinger Equation and its Applications, Particle in a box (1-D& 3-D)

Semiconductor Physics:Electron in periodic structures, Band theory of solids, effective mass, Density of states, Fermi levels. Intrinsic and extrinsic semiconductors, dependence of Fermi level on carrier-concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carriertransport: diffusion and drift, Hall effect- Hall sensors,Physics of p-n junction, Metal-semiconductor junction (Ohmic and Schottky)

Learning resources

Text book:

1. Dr. N. Subrahmanyam, Brijalal, Dr. M.N Avadhanulu" A Text Book of Optics" S chand Publication
2. Md. N. Khan & S. Panigrahi "Principals of Engineering Physics" Volume I, Volume II, Cambridge University Press
3. Hitendra K. Malik and A.K. Singh, '*Engineering Physics*'Tata McGraw Hill, 2nd Edition, 2017
4. Gaur and Gupta "*Engineering Physics*, Dhanpathrai Publications, 6th edition

Reference Books:

1. S.L. Kakani, SubhadraKakani '*Engineering Physics'*, CBS Publications, 2nd edition
2.Arunkumar *'Introduction to solid state physics'* HPI Publications, (30 January 2010)
3. Iswar Singh Tyagi *'Principles of quantum mechanics'* Pearson Publications; 1st edition (25 September 2012)
4. Donald Neamen *'Semiconductor devices'* McGraw Hill Education; 3ed edition (25 August 2006)

Web resources:

1. Prof V. Ravi Shakar, NPTEL-IIT Kanpur, '*Engineering Physics-II*'
URL: https://nptel.ac.in/courses/122104016/
2. Prof. D. K. Ghosh, NPTEL-IIT Bombay, '*Engineering Physics-II'*

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URL: https://nptel.ac.in/courses/122101002/
Course outcomes: At the end of the course,

CO 1	The student will have capacity to integrate knowledge on vector and scalar fields using mathematical del operators, and also solve the problems in integral calculus.
CO 2	Student will be able to differentiate all type of oscillations like Simple Harmonic, Forced, Damped & Coupled and also implications governed by Amplitude & Velocity Resonance
CO 3	Student will have capable to understand the lengths and breadths of Concept called Polarization as well as working of different retarding plates.
CO 4	Students will purse the knowledge about optical fibers and their applications.
CO 5	The student will be able to understand what are *Electrical Engineering Materials* and their applications in designing a circuit.
CO 6	Student will acquire the capacity to describe classification of solid state materials by the band theory of solids and semiconducting materials along with its significance.

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course code	Course name	Course Category	L-T-P	Credits
20PY1184	E1 Physics Lab	BSC	0-0-3	1.5

Course Learning Objectives:

1. Hall Effect: To determine the hall coefficient, carrier density and carrier mobility of a given semiconducting materials.
2. Frank Hertz: To verify the postulates of Bohr's theory and discrete (quantized) energy levels in atoms.
3. Photo electric Effect: To understand phenomenon of the photoelectric effect and determine the value of Plank's constant.
4. Energy gap of Semiconductor: Determine the energy gap of a given semiconducting material by four probe method.
5. Susceptibility of Para Magnetic Materials: To determine the susceptibility of a given paramagnetic by Gouy's method.
6. Magnetic hysteresis curve tracer: Determine the Coercivity, Saturation magnetization and Retentivity of a given Ferro magnetic material using a Hysteresis loop tracer.
7. Dielectric Constant measurement: Determine the Dielectric constant of a given dielectric material.
8. Viscosity of water Measurement: Determine the co-efficient of viscosity of given oil by falling sphere method.
9. Zener Diode experiment: Verification of I-V characteristics of Zener Diode and Determination break down voltage of Zener Diode.
10. Transition characteristic experiment: Determine different input and output parameters in common emitter configuration of both p-n-p and n-p-n Transistor.
11. Solar cell experiment: Determine the efficiency of a given Solar cell.

Experiments list

Exp-1: Hall Effect
Exp-2: Frank Hertz
Exp-3: Photo electric Effect
Exp-4: Energy gap of Semiconductor
Exp-5: Susceptibility of Para Magnetic Materials
Exp-6: Magnetic hysteresis curve tracer
Exp-7: Dielectric Constant measurement
Exp-8: Viscosity of water Measurement
Exp-9: Verification of I-V characteristics of Zener Junction Diode and Determination break down voltage of Zener Diode.

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Exp-10: ***p-n-p*** and ***n-p-n*** Transistor parameters in common emitter configuration
EXP-11: Calculating the efficiency of Solar cell

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

CO 1	Student will have capacity to measure hall coefficient of given semiconductor. Further, students can calculate carrier density and carrier mobility of a given semiconductor.
CO 2	Student will have capacity to describe discrete (Quantized) energy levels of atoms.
CO 3	Student will able to understand the photoelectric effect phenomena and then calculate Plank's constant value by using photoelectric equation.
CO 4	Student will have ability to describe the relation between conductivity and temperature in semiconductor materials and then calculate the energy gap of material.
CO 5	Student will have capable to calculate magnetic susceptibility of a given paramagnetic solution by Quinck's tube method.
CO 6	Student will able to differentiate between hard and soft ferromagnetic materials by observing B-H loops and then calculate M_s, M_r and H_c of a given ferromagnetic materials.
CO 7	Student will able to differentiate different type of dielectric mediums by calculate the dielectric constant.
CO 8	Student will have capable to calculate the co-efficient of viscosity of given oil by falling sphere method
CO 9	Student will able to understand (nonohmic) nature of I-V characteristic of Zener diode. And then calculate breakdown voltage.
CO 10	Student will able to calculate input resistance, output resistance, out the values of current and voltage gain parameters for given transistor. And also Identify the active, Saturation and cutoff regions of a given Transistors by drawing I-V characteristics.
CO11	Student will able to calculate the efficiency of solar cell.

Course Nature		**Practical**		
Assessment Method				
Assessment Tool	Experiments	Record	Viva-Voce/ Quiz/MCQ/Lab project	Total
Weightage (%)	25%	5%	10%	40%
End Semester Examination weightage (%)				60%

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Course code	Course name	Course Category	L-T-P	Credits
20EE1101	Fundamentals of Electrical Engineering	PCC	3L:1T:0P	4

Course Learning Objectives

1. To make understand the concept of electronic & electric components and fundamental laws associated with it along with circuit laws.
2. To make understand the concept of the DC circuits
3. To understand the single phase and three phase circuit analysis
4. To get knowledge about operating principle of measuring Instruments
5. To get familiar with electrical installations.

UNIT I: Fundamentals of Networks (6 hours)

R,L,C Parameters & Elements, Voltage and Current Sources, Independent and Dependent Sources, Kirchhoff's Laws, Network Reduction Techniques – Series, Parallel, Series Parallel, Star–to-Delta and Delta-to-Star Transformations.

UNIT II: Single phase A.C Circuits (8 hours)

Introduction to Alternating systems, Generation of an alternating e.m.f, calculation of R.M.S and Average values for both sinusoidal and non-sinusoidal currents and voltages. Representation of an alternating quantity by a phasor, Concept of Reactance, Impedance, Susceptance and Admittance, Phase and Phase difference. Simple series and parallel AC circuits and concept of resonance, Concept of Power Factor, Real and Reactive powers, Complex power in AC circuits.

UNIT III: Three Phase A.C. Circuit (8 hours)

Advantaged of three phase circuits, Phase Sequence- Star and Delta Connection-Relation between Line and Phase Voltages and Currents in Balanced Systems-Analysis of Balanced and unbalanced three phase circuits.

UNIT IV: Magnetic Circuits (10 hours)

Introduction to magnetic circuits, Different laws for calculating magnetic field: Biot-Savart law, Ampere's circuital law, application of ampere's circuital law in magnetic circuits. Concept of magneto motive force and magnetic fields strength, Permeability, Reluctance, B-H characteristics, 'Ohm's law for a magnetic circuit, dot convention, Analysis of series and parallel magnetic circuits.

UNIT V: Fundamentals of Measuring Instruments (8 hours)

Analog indicating instruments: permanent magnet moving coil meter, moving iron meter, electrodynamometer, Digital meters, wattmeter and energy meter. Measurement of Active and Reactive Power in Balanced Three Phase Systems- Two Wattmeter Method of Measurement of Three Phase Power, Measurement of energy in single phase and three phase circuits.

UNIT VI: Electrical Installations (5 hours)

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

Course Outcomes At the end of the course: The student will be able to

CO 1	Use ohm's laws, Kirchhoff‘s laws on passive elements
CO 2	Analyse circuits made up of linear lumped elements. Specifically, analyse circuits containing resistors and independent sources.
CO 3	Analyse the Single phase AC circuits
CO 4	Analyse the Three phase AC circuits
CO 5	Understand the principle of operation of Measuring Instruments
CO 6	Understand the basics of Electrical Installations

Learning Resources:

Text Books:

1. E. Hughes, “Electrical and Electronic Technology”, tength edition, 2008.
2. V.N Mittal and Arvind Mittal, “Basic Electrical Engineering”, second edition, 2008

Reference Books:

1. C. K. Alexander and M. N. O. Sadiku, “Electric Circuits”, McGraw Hill Education, 2004.
2. W. H. Hayt and J. E. Kemmerly, “Engineering Circuit Analysis”, McGraw Hill Education, 2013.
3. D P Kothari and IJ Nagrath, “Basic Electrical Engineering", third edition, Tata McGraw Hill 2010.

Web resources:

1. Prof. Avishek Chatterjee, NPTEL-IIT Kharagpur, ‘*Electrical Measurements and Electronic Instruments*’. URL: https://nptel.ac.in/courses/108/105/108105153/
2. Prof. Debapriya Das, NPTEL- IIT Kharagpur, ‘Fundamentals of Electrical Engineering’. URL: https://nptel.ac.in/courses/108/105/108105112/

3. Prof. Dr. NagendraKrishnapura, NPTEL-IIT Madras, *'Basic Electrical Circuits'*. URL: https://nptel.ac.in/noc/courses/noc14/SEM2/noc14-ec01/

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course code	Course name	Course Category	L-T-P	Credits
20EE1182	Fundamentals of Electrical Engineering Lab	PCC	0L:0T:3P	1.5 credits

Course Learning Objectives:

1. To make understand the concept of electronic & electric components and fundamental laws associated with it along with circuit laws.
2. To make understand the concept of the DC circuits
3. To understand the single phase and three phase circuit analysis
4. To get knowledge about operating principle of measuring Instruments
5. To get familiar with electrical installations.

List of Experiments:

1. **Introduction to Laboratory:** Basic safety precautions, Introduction to use of measuring Instruments- voltmeter, Ammeter, multi-meter, oscilloscope, Resistors, Inductors, Capacitors
2. Verification of Ohm's law
3. Verification of KVL and KCL
4. Steady state behaviour of R-L-C series circuit
5. Calculation and Verification of impedance and current of RL, RC series circuits
6. Measurement of Active and Reactive power in a balanced three phase circuit.
7. Measurement of Active and Reactive power in an unbalanced three phase circuit.
8. Measurement of energy in a single phase ac circuit

Any two of the following need to be done in software platform

1. Verification of KVL and KCL
2. Steady state A.C. Analysis
3. Analysis of 3 phase circuit

Course Outcomes At the end of the course: The student will be able to

CO 1	Use ohm's laws, Kirchhoff's laws on passive elements
CO 2	Analyse circuits made up of linear lumped elements. Specifically, analyse circuits containing resistors and independent sources
CO 3	Analyse the Single phase AC circuits

CO 4	Analyse the Three phase AC circuits
CO 5	Understand the principle of operation of Measuring Instruments
CO 6	Understand the basics of Electrical Installations

Course Nature		**Practical**		
Assessment Method				
Assessment Tool	Experiments	Record	Viva-Voce/ Quiz/MCQ/Lab project	Total
Marks	25	5	10	40
End Semester Examination weightage Marks				60

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Course code	Course name	Course Category	L-T-P	Credits
20CS1109	**Programming and Data Structures**	**ESC**	**3L: 1T: 0P**	**4**

Course Learning Objectives

1. To deduce adequate knowledge in programming language and problem-solving techniques.
2. To develop programming skills using the fundamentals of C Language.
3. To recognize the effective usage of arrays, structures, functions, pointers.
4. To implement the memory management concepts.
5. To illustrate the usage of pointers and dynamic memory allocation.
6. Explore Data Structures and its applications.

Unit- I: Introduction **(5 hours)**

Computer Hardware, Bits and Bytes, History of Programming Languages, Character Set, Variables and Identifiers, Built-in Data Types. Operators and Expressions, Constants and Literals, Simple Assignment Statement, Basic Input/output Statement, Simple 'C' Program, Conditional Statements and Loops.

Unit – II: Arrays **(6 hours)**

One Dimensional Arrays, Array Manipulation, Searching, Insertion, Deletion of An Element from An Array; Finding the Largest/Smallest Element in An Array; Two Dimensional Arrays, Addition/Multiplication of Two Matrices, Transpose of square Matrix, Inverse of Matrix, Character Arrays, Multi-dimensional arrays.

Unit – III: Functions **(8 hours)**

Function Declaration, Function Definition, Function Call, Call by Value, Call by Reference, Recursion, String Fundamentals, String Handling Functions.

Unit - IV: Structure & Union **(8 hours)**

Structure Variables, Initialization, Structure Assignment, Nested Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions.

Unit - V: Pointers **(8 hours)**

Pointer Type Declaration, Pointer Assignment, Pointer Initialization, Pointer Arithmetic, Functions and Pointers, Arrays and Pointers, Pointer to Pointers, Dangling Memory, Dynamic Memory Allocations, Storage Classes.

Unit – VI: Data Structures **(10 hours)**

Linked List, Doubly Linked Lists, Stack, Stack Implementation Using Arrays, Stack Implementation Using Linked List, Queues, tree traversals.

Learning Resources:

Text book:

1. ReemaThareja, *'Data Structures using C'*, Oxford Higher Education,2nd Edition.

Reference Books:

1. W. Kernighan, Dennis M. Ritchie, *'C Programming Language',* Prentice Hall India Learning Private Limited, 2nd Edition.
2. Balagurusamy, *'Programming in ANSI C',*McGraw Hill Education India Private Limited; 7th Edition.
3. YashavantKanetkar, *'Let us C',* BPB Publications,14th Edition

Web resources:

1. Prof SatyadevNandakumar, NPTEL-IIT Kanpur, *'Introduction to Programming in C'*, URL: https://nptel.ac.in/syllabus/106104128/
2. Dr P PChakraborty, NPTEL-IIT Kharagpur, *'Programming and Data Structures'* URL: https://nptel.ac.in/courses/106105085/4
3. URL: https://www.tutorialspoint.com/cprogramming/

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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

CO 1	Illustrate the flowchart and design an algorithm for a given problem and to develop one C program using Operators.
CO 2	Develop conditional and iterative statements to write C Programs.
CO 3	Describe C Programs that use the arrays and its usage.
CO 4	Exercise user defined functions to solve real time problems.

CO 5	Describe C Programs using pointers and to allocate memory using dynamic memory management functions.
CO 6	Explore different data structures and understand.

Course code	Course name	Course Category	L-T-P	Credits
20CS1189	**Programming and Data Structures Lab**	**ESC**	**0L: 0T: 3P**	**1.5**

Course Learning Objective:

1. Understand the basic concept of C Programming and Data Structures, its different modules that include conditional and looping expressions, Arrays, Strings, Functions, Structures, Files, Stacks and Queues.
2. Acquire knowledge about the basic concept of writing a program.
3. Purpose of programming language and its application in problem solving.

List of Experiments

Exercise-1: Introduction to C, Conditional Statements and Loops

1. C Program to calculate the sum of Natural numbers.
2. C Program to generate a multiplication table of a given number.
3. C Program to display Fibonacci sequence (Up to given number).
4. C Program to Check whether a given number is prime or not.
5. C Program to make a simple Calculator using switch case.
6. C Program to check whether a number is palindrome or not.
7. C Program to display factors of a given number.
8. C Program to print Pyramids, Triangles and various patters using loops.

Exercise-2: Arrays and Sorting

1. C Program to find the second largest Element of an Array.
2. C Program to add two matrices using multi-dimensional arrays.
3. C Program to multiply two matrices using multi-dimensional arrays.
4. C Program to find transpose of a matrix.
5. C Program to Sort Elements of an Array using Bubble sort.
6. Using Insertion Sort, Selection Sort.
7. Using Counting Sort, Bucket Sort 8. Check whether two strings are anagram of each other or not.

Exercise 3: Functions and Recursion

1. C Program to check whether a given number is prime or not using a user-defined function.
2. C Program to swap two integer values using call by value and call by reference.
3. C Program to find the factorial of a given number using recursion.
4. C Program to calculate length of string without using strlen() function.
5. C Program to print all permutations of a string (abc, acb, bac, bca, cab, cba).
6. C Program to sort elements in Lexicographical order (Dictionary order) using in built string functions.
7. Sorting using Merge Sort.
8. Sorting using Quick Sort.

Exercise-4: Structures and Unions

1. C Program using structures to read and display the information about a student.
2. C Program to read, display, add and subtract two complex numbers.
3. C Program to read and display the information of a student using nested structure
4. C Program, using an array of pointers to a structure, to read and display the data of students.
5. C Program to demonstrate arrays of Union variables.
6. C Program using structures to maintain a book library (Book is a structure) which has following operations print various types of books along with their count, author details, search a book by author name or book name or publisher.

Exercise-5: Pointers and File Handling

1. C Program to demonstrate, handling of pointers in C.
2. C Program to access array elements using pointers.
3. C Program to find the sum of n numbers with arrays and pointers.
4. C Program to swap two numbers using pointers and function
5. C Program to find sum of n elements entered by user. To perform this, allocate memory dynamically using malloc() function.
6. C Program to read and write a file.
7. C Program to count number of lines and words.
8. Write a c program to copy data from one file to another file.

Exercise-6: Introduction to Data Structures

1. Write a program to create a linked list and perform insertions and deletions of all cases. Write functions to sort and finally delete the entire list at once.

2. Write a program to create a doubly linked list and perform insertions and deletions in all cases.
3. Write a program to perform push, pop and peek operations on a stack.
4. Write a program to implement a linked stack.
5. Write a program to implement a linked queue.
6. Write a program to implement binary search tree insertion.
7. Write a program to implement binary search tree traversals (pre-order, post-order, in-order).

Course outcome: After the completion of this Laboratory course, the student will be able to

CO 1	Apply and practice logical ability to solve the problems
CO 2	Understand C programming development environment, compiling, debugging, executing a program using the development environment
CO 3	Analyzing the complexity of problems, modularize the problems into small modules and then convert them into programs
CO 4	Understand and apply the in-built functions and customized functions for solving the problems
CO 5	Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems
CO 6	Understand and apply the structures and unions concept and solving problems on the same
CO 7	Understand the basic concepts of stacks, queues and applying the same for basic problems

Course Nature		**Practical**		
Assessment Method				
Assessment Tool	Experiments	Record	Viva-Voce/ Quiz/MCQ/Lab project	Total
Marks	25	5	10	40
End Semester Examination weightage Marks				60

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Course code	Course name	Course Category	L-T-P	Credits
20HS1102	Human Value	MC	2: 0: 0	0

VALUE 'SKILLS'.

Course Learning Objectives:

1. To help the students appreciate the essential complementarity between 'VALUES' and 'SKILLS'.
2. to ensure sustained happiness and prosperity which are the core aspirations of all human beings.
3. To facilitate the development of a Holistic perspective among students, in their profession and happiness.
4. Correct understanding of the human reality and the rest of Existance. Such a holistic perspective forms the basis of Value based living in a natural way.
5. To highlight plausible implications of such a Holistic understanding in terms of ethical human conduct, trustful and mutually satisfying human behavior.
6. It mutually enriches interaction with Nature.

Course Contents:

UnitI: (5 hours)

Need, basic Guidelines, Content and Process for Value Education: Understanding the need, basic guidelines, content and process for Value Education. Self-Exploration - what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation - as the mechanism for self-exploration.

Unit II: (5 hours)

Continuous Happiness and Prosperity - A look at basic Human Aspirations. Right understanding, Relationship and Physical Facilities - the basic requirements for fulfilment of aspirations of every human being with their correct priority. Understanding Happiness and Prosperity correctly - A critical appraisal of the current scenario. Method to fulfil the above human aspirations: understanding and living in harmony at various levels.

Unit III: (5 hours)

Understanding Harmony in the Human Being - Harmony in Myself! : Understanding human being as a co-existence of the sentient 'I' and the material 'Body'. Understanding the needs of Self ('I') and 'Body' - Sukh and Suvidha. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). Understanding the harmony of I with the Body: Sanyam and Swasthya; correct appraisal of Physical needs, meaning of Prosperity in detail. Programs to ensure Sanyam and Swasthya.

Unit IV: **(6 hours)**

Understanding Harmony in the Family and Society - Harmony in Human - Human Relationship: Understanding harmony in the Family the basic unit of human interaction. Understanding values in human - human relationship; meaning of Nyaya and program for its fulfilment to ensure Ubhay-tripti; Trust (Vishwas) and Respect (Samman) as the foundational values of relationship. Understanding the meaning of Vishwas; Difference between intention and competence. Understanding the meaning of Samman, Difference between respect and differentiation; the other salient values in relationship. Understanding the harmony in the society (society being an extension of family): Samadhan, Samridhi, Abhay, Sah-astiva as comprehensive Human Goals. Visualizing a universal harmonious order in society - Undivided Society (AkhandSamaj), Universal Order (Sarvabhaum Vyawastha) - from family to world family!

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Unit V: **(5 hours)**

Understanding Harmony in the nature and Existence - Whole existence as Co-existence: Understanding the harmony in the Nature. Interconnectedness and mutual fulfilment among the four orders of nature - recyclability and self-regulation in nature. Understanding Existence as Co-existence (Sah-astiva) of mutually interacting units in all-pervasive space. Holistic perception of harmony at all levels of existence.

Unit VI: **(4 hours)**

Implications of the above Holistic Understanding of Harmony on Professional Ethics: Natural acceptance of human values, Definitiveness of Ethical Human Conduct, Basic for Humanistic Education, Humanistic Constitution and Humanistic Universal Order. Competence in professional ethics:

Learning Resources

Text books:

1. R. R. Gaur, R Sangal, G P Bagaria, 2009, A Foundation Course in Human Values and Professional Ethics.
2. Prof. K. V. Subba Raju, 2013, Success Secrets for Engineering Students, Smart Student Publications, 3rd Edition.

Reference books

1. Ivan IIIich, 1974, Energy & Equity, The Trinity Press, Worcester, and HarperCollins, USA
2. E. F. Schumancher, 1973, Small is Beautiful: a study of economics as if people mattered. Blond & Briggs, Britain.
3. A Nagraj, 1998 JeevanVidyaekParichay, Divya Path Sansthan, Amarkantak.
4. Sussan George, 1976, How the Other Half Dies, Penguin Press, Reprinted 1986, 1991.
5. P. L. Dhar, R. R. Gaur, 1990, Science and Humanism, Commonwealth Publishers.
   A. N. Tripathy, 2003, Human Values, New Age International Publishers.
6. SubhasPalekar, 2000, How to practice Natural Farming, Pracheen(Vaidik) KrishiTantraShodh, Amravati.
7. Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth - Club of Rome's report, Universe Books.
8. E G Seebauer& Robert L.Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press.
9. M Govindrajan, S Natrajan& V. S Senthilkumar, Engineering Ethics (including Humna Values), Eastern Economy Edition, Prentice Hall of India Ltd.

Relevant CDs, Movies, Documentaries & Other Literature:

1. Value Education website, http://www.uptu.ac.in
2. Story of Stuff, http://www.storyofstuff.com
3. AI Gore, An Inconvenient Truth, Paramount Classics, USA
4. Charle Chaplin, Modern Times, United Artists, USA
5. IIT Delhi, Modern Technology - the Untold Story

Web resources

Prof. A.K. Sharma, '*Professional Ethics*' https://nptel.ac.in/courses/109104068/30

Course Outcomes

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

CO1	The students will understand the importance of Values and Ethics in their personal lives and professional careers.
CO2	The students will learn the rights and responsibilities as an employee, team member and a global citizen
CO3	Student will develop judgmental capability for right and wrong
CO4	This will provide a systematic following of professional career
CO5	It will create better working enviourment

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II SEMESTER

S. No	Course Code	Course Title	Course Category	Hours per week			Total Contact Hours	Credits
				L	T	P		
1	20EE1201	Electromagnetic Fields	ESC	3	0	0	3	3
3	20MA1201	Mathematical Methods	BSC	3	1	0	4	4
4	20EC1201	Basic Electronics	ESC	3	1	0	4	4
5	20EC1281	Basic Electronics Lab	ESC	0	0	3	3	1.5
6	20EE1202	Electrical Machines-I	PCC	3	1	0	4	4
	20EE1283	Electrical Machines-I Lab	PCC	0	0	3	3	1.5
7	20EG1281	English Language Communication Skills Lab-I	HSS	1	0	3	4	2.5
8	20CE1114	Engineering Graphics and Computer Drafting	ESC	1	0	2	3	2
9	20HS2101	Constitution of India	MC	2	0	0	2	0
Total				16	3	11	30	22.5

Definition of Credit:

1 Hour Lecture(L) per week	1 credit
1 Hour Tutorial(T) per week	1 credit
3 Hours Practical(Lab)/week	1.5 credits

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Course code	Course name	Course Category	L-T-P	Credits
20EE1201	**Electromagnetic Fields**	**ESC**	**3L:0T:0P**	**3 credits**

Course Learning Objective

1. To compute electric and magnetic fields for symmetrical charge and current configuration and force between charges and currents
2. To calculate the capacitance and inductance of common conductor configuration and the energy stored
3. To analyse time varying fields and compute the energy stored in electromagnetic fields
4. To understanding the electro-mechanical Energy conversion from the concepts of field-energy and co-energy

UNIT I: Electrostatics-I (08 hours)

Coulomb's law, Electrical filed intensity, electric flux density, electric field due to point, line, sheet, spherical charge distributions, Gauss' law and its applications, Divergence and curl of electrostatic field,Energy expended in moving a charge in an electric field, electric potential, potential due to point, line,spherical charge distributions, potential gradient.

UNIT II: Electrostatics-II (08 hours)

Poisson's and Laplace' equations, Uniqueness theorem,Electric dipole, Dipole moment, potential and electric filed due to an electric dipole, Torque on an Electric dipole in an electric field, resistance, capacitance, Dielectrics, Energy in electrostatic field, boundaryconditions.

UNIT III: Magneto static Fields (08 hours)

Biot-Savart's law, magnetic flux density, magnetic field intensity, magnetic field due to straight wire, surface, solenoid, toroid carrying steady current Ampere's Law and its applications, Divergenceand curl of Magnetic field, Comparison of magneto statics and electrostatics, Magnetic scalar and vectorpotentials.

UNIT IV: Magnetic Forces, Materials and Devices (06 hours)

Forces due to Magnetic Fields, Magnetic torque and movement, a magnetic dipole, magnetic materials, Hall effect, energy in magneto static fields, boundaryconditions inductance, self and mutual inductance of solenoid, toroidal and other simpleconfigurations, conductors, forces on magnetic materials.

UNIT V: Time varying fields (07 hours)

Equation of continuity, Faraday's law, Lenz's law, transformer emf and motional emf, inconsistency of Ampere's law, displacement current, Maxwell's equations, electromagnetic wave, Poyntingtheorem, energy in electro-magnetic fields.

UNIT VI: Magnetically Coupled Circuits&Electromechanical Energy Conversion (08 hours)

Review of basic concepts,magnetizing inductance, modelling linear and nonlinear magnetic circuits.Principles of energy flow, concept offield energy and co-energy, Derivation of torque expression for various machines using the principles ofenergy flow and the principle of coenergy.

Learning Resources:

Text Books:

1. William H.Hayt Jr. & John A.Buck: Engg. Electromagnetics, TMH 8th Edition, 2012.
2. David J.Griffiths: Introduction to Electrodynamics, PHI 4thEdition, 2013.
3. Matthew Sadiku: Elements of Electromagnetics, Oxford University Press, 2007

Reference Books:

1. Nathan Ida: Engg. Electromagnetics, Springer 2nd Edition, 2005
2. A.E Fitzgerald, C. Kingsely and S.Umans: Electrical Machines by, MGH, 5th Edition.

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

CO 1	Compute electric and magnetic fields for symmetrical charge and current configuration and force between charges and currents
CO 2	Calculate the capacitance and inductance of common conductor configuration and the energy stored
CO 3	Analyze time varying fields and compute the energy stored in electromagnetic fields
CO 4	Understanding the electro-mechanical Energy conversion from the concepts of field-energy and coenergy

Course Nature	**Theory**

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Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

Course code	**Course Name**	**Course Category**	**L-T-P**	**Credits**
20MA1201	**Mathematical Methods**	**BSC**	**3-1-0**	**4**

Course Learning Objectives: The objective of this course is to

1. Introduce vector spaces and linear transformation.
2.Discuss Eigen values and Eigen vectors of a matrix and various properties.
3.Setup double and triple integrals to find volume and surface area.
4. Discuss directional derivatives and application of Green's, Stokes and Gauss theorems.
5. Discuss numerical methods to find the roots of transcendental equations and Interpolation.
6. Evaluate integrals by using numerical methods and solving IVP.

Course Content:

Unit – I: Linear Algebra: (12 hours)

Vector Spaces, Linear Combinations of Vectors, Linear dependence and Independence, Basis and Dimension, Linear Transformations, Matrix Representations of Linear transformation.

Unit – II: Eigen values and Eigen vectors: (8 hours)

Solving system of Homogeneous and Non-Homogeneous equations by using Gauss elimination method. Characteristic roots and Characteristic Vectors of a matrix - Cayley-Hamilton Theorem (without proof);Finding inverse and power of a matrix by Cayley-Hamilton Theorem.

Unit-III: Multiple integrals: (10 hours)

Double and triple integrals, computations of surface and volumes, Jacobeans of transformations, change of variables in double integrals, Change of Order of double integrals, integrals dependant on parameters - applications.

Unit–IV: Vector calculus: (12 hours)

Scalar and vector fields, level surfaces, directional derivative, Gradient, Curl, Divergence, Laplacian, line, surface integrals and Volume integrals,Green, Gauss and Stokes theorems(without Proof) and problems.

Unit – V: Root finding Methods and Interpolation: (10 hours)

Roots of polynomial and transcendental equations – bisection method, Regula-falsi method and Newton-Raphson method,Finite differences, Newton's forward and backward interpolation formulae.

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Unit – VI:Numerical integration and numerical solution of IVP: (8 hours)
Trapezoidal rule, Simpson's $1/3^{rd}$ rule and $3/8^{th}$rule for numerical integration, Solution of IVP by Euler and Runga-Kutta method.

Learning resources

Text book:
1. ERWIN KREYSZIG**, '***Advanced Engineering Mathematics'*, Wiley-India,9^{th} Edition.

Reference Books:
1.R. K. JainandS. R. K. Iyengar**,** '*Advanced Engineering Mathematics',* Narosa Publishing House, New Delhi,3rd Edition.
2**.** B.S.Grewal, '*A Text Book of Higher Engineering Mathematics'*, Khanna Publishers, 43rd Edition.
3. Gilbert Strang, 'Linear Algebra and its Applications', CENGAGE Learning 4th Edition.
Web resources:
1.https://onlinecourses.nptel.ac.in/noc20_ma54/preview
2. https://onlinecourses.nptel.ac.in/noc21_ma11/preview
3. RGUKT content
Course outcomes: At the end of the course, the student will be able to

CO 1	Write Matrix representation for transformations.
CO 2	Find Eigen values and Eigen vector for a Matrix.
CO 3	Setup and evaluating double and triple integrals.
CO 4	Apply Green's Stokes and Gauss Divergence Theorems.
CO 5	Approximate the roots of polynomial and transcendental equations.
CO 6	Approximate the Integral value by numerical methods and solve IVP using numerical methods.

For Theory courses only:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course code	Course Name	Course Category	L-T-P	Credits
20EC1201	Basic Electronics	ESC	3L:1T:0P	4

Course Learning Objectives

1. To make the students understand the fundamentals of Electronic Devices and Circuits.
2. To design simple Electronic circuits understanding the concept of design specification and design requirements.

Unit-I: Introduction (06 hours)

Intrinsic and Extrinsic semiconductors, Fermi Level in Intrinsic and Extrinsic semiconductors. Mobility and conductivity, Diffusion currents and drift currents, Injected minority carrier charge, contact potential, currents in forward and reverse biased junction.

Unit-II: Diodes (08 hours)

The open circuited p-n Junction, Current components in a p-n diode, Volt-Ampere characteristics (Forward Bias and Reverse Bias and temperature dependence of the V/I characteristic, Diode Resistance (Static and Dynamic), Diode as a circuit element diode models, Load line concept, Small signal analysis of diode, Transition capacitance and Diffusion capacitance, Junction diode switching times; Zener diodes, Zener breakdown and Avalanche breakdown, Zener voltage regulator and its limitations.

Unit-III: PN Diode Applications (10 hours)

Half Wave, Full wave and Bridge rectifiers (their operation, performance calculations), with Filters (RC, LC, RLC), Ripple factor calculations, Clippers (two level) Transfer characteristics, clampers; Diode as a switch; Diode as a analog gate, Voltage Multipliers (Doubler and Tripler).

Unit-IV: BJT Characteristics (06 hours)

BJT construction, Transistor Junction formation (Collector-Base, Base-Emitter Junctions), Current components; Modes of Transistor operations; Early Effect, BJT input and output characteristics in different configurations, BJT as an inverter.

Unit-V: Transistor Biasing and Stabilization-BJT (09 hours)

Biasing techniques-different types of biasing , Transistor as an amplifier, Thermal runaway, heat sinks, Thermal stabilization, Operating point stabilization against temperature and device variations, Stability factors, Bias stabilization and compensation techniques.

Unit-VI: MOSFETs (6 hours)

MOS capacitor, MOSFET construction, Types of MOSFET (Enhancement type and Depletion type), derivation of current equation, Regions of operation, second order effects (Channel-length modulation, body effect), MOSFET characteristics and operating point including load line analysis, MOSFET as a switch (inverter). Biasing of a MOSFET.

Learning resources:

Text book:

1. Jacob Milliman, Christos C. Halkias, and Satyabratajit, *'Electronic Devices and Circuits'* McGraw Hill, 3rd Edition,2012.
2. David A.Bell, *'Electronic Devices and Circuits'*, Oxford University Press, 5th edition, 2008.

Reference Books:

Ben G.StreetMan, Sanjay Kumar Benerjee, *'Solid State Electronic Devices'*,6th edition.

Web Resources:

1. Prof K Radhakrishna Rao, NPTEL-IIT Madras, *'Electronics for Analog Signal Processing-I'*. URL: https://nptel.ac.in/courses/117106087/
2. Dr. Mahesh B Patil, NPTEL-IIT Bombay, *'Basic Electronics'*. URL: https://nptel.ac.in/courses/108101091/
3. Dr. ChitralekhaMahanta,NPTEL - IIT Guwahati, *'Basic Electronics'*, URL: https://nptel.ac.in/courses/117103063/

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

CO 1	Apply the knowledge of basic semiconductor physics and understand the working principles
CO 2	Analyse the characteristics of various electronic devices like diodes, transistor etc.
CO 3	Classify and analyse the various circuit configurations of transistor and MOSFETs

CO 4	Designing circuits for different applications using diodes
CO 5	Analyse the concept of stability and biasing of transistors
CO 6	Troubleshooting circuits which utilizes diodes, transistors

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course code	Course Name	Course Category	L-T-P	Credits
20EC1281	**Basic Electronics Lab**	**ESC**	**0L: 0T: 3P**	**1.5 credits**

Course Learning Objective

To get a hands-on experience on the concepts present in Basic Electronics Theory course and thereby developing practical knowledge in analysis of electronic circuits using Diodes, BJTs and MOSFETs

List of Experiments

1. Introduction to Lab Components and Electronic instruments (For first Two weeks).
2. Characteristics of PN junction Diode, Zener Diode.
3. Design of voltage regulators using Zener Diodes.
4. Design of Half wave Rectifier, Full wave, Bridge wave rectifier with and without LC, RC filters.
5. Design and analysis of Clippers and Clampers.
6. Design and analysis of Voltage Multipliers.
7. Design and analysis of Analog gate and Digital gates.
8. Characteristics of Common Base, Common Emitter, Common collector configurations of BJTs.
9. Stability analysis and biasing of BJT Circuits.
10. Transfer characteristics of MOSFETs.

Note: It is suggested to perform an experiment on any one of the Software Tools before the experiment is performed on hardware.

Course Nature		**Practical**		
Assessment Method				
Assessment Tool	Experiments	Record	Viva-Voce/ Quiz/MCQ/Lab project	Total
Marks	25	5	10	40
End Semester Examination weightage Marks				60

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Course outcome: After the completion of this Laboratory course, the student will be able to

CO 1	Experimental verification of transfer characteristics of diodes and transistors
CO 2	Design voltage regulators using diodes
CO 3	Design multilevel clippers and clampers using diodes
CO 4	Design and troubleshooting circuits which utilizes diodes
CO 5	Experimental analysis of different configurations of transistor circuits
CO 6	Design of BJT circuits considering stability and biasing practically
CO 7	Implementing and analysing a practical prototype of Diode/BJT application

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Course code	Course Name	Course Category	L-T-P	Credits
20EE1203	Electrical Machines-I	PCC	3L: 1T: 0P	4 credits

Course Learning Objectives

1. To illustrate the theory of electromechanical energy conversion.
2. To demonstrate the working principle of different types of dc machines and transformers..
3. To analyse the losses in dc machines by conducting various tests.
4. To outline the principle of operation, construction and testing of single phase and three phase transformers.

Course content

UNIT - I:Electromechanical Energy Conversion & General terms pertaining to Rotating Machines: (7 hours)

Principle, Singly Excited Magnetic System and Doubly Excited Magnetic system. Physical concept of torque production; Electromagnetic torque and Reluctance torque. Electrical & Mechanical degree, Pole pitch, Coil, Generated EMF in full pitched coil, Generated EMF in a short pitched coil, EMF polygon, Distribution factor, Pitch factor. MMF produced by Distributed Windings, MMF of a coil, MMF of single phase distributed Winding, MMF waveform of Commutator machines.

UNIT - II DC Generators (8 hours)

Working principle, construction and methods of excitation. Armature Winding: Introduction of simplex lap and wave windings. DC generators: EMF equation – methods of excitation – separately and self-excited – shunt, series, compound - armature reaction – effects of armature reaction - demagnetizing & cross magnetizing ampere-turns – compensating windings – inter poles - commutation – methods to improve commutation - voltage build-up – no load characteristics – load characteristics – losses and efficiency - power flow diagram –parallel operation – applications of DC generators.

UNIT- III DC Motors (8 hours)

Principle of operation – back EMF – classification – torque equation – losses and efficiency – power flow diagram- performance characteristics of shunt, series and compound motors – starting of DC motors – necessity and types of starters – design of starters – speed control – methods of speed control – solid state speed control (block diagram) – testing – Swinburne's test

– Hopkinson's test – separation of losses – retardation test – field test of dc motors – application of DC motor.

UNIT- IV Single phase transformers (8 hours)

Transformers: Principle, construction and operation of single phase transformers, phasor diagram, equivalent circuit, voltage regulation, losses and efficiency, Testing- Open & short circuit tests, Polarity test, Sumpner's test, Separation of hysteresis and eddy current losses, Autotransformers - Construction, Principle, Applications and Comparison with two winding transformer.

UNIT-V Three phase transformer (8 hours)

Three phase Transformer: Construction, various types of connection and their comparative features, 3-phase transformer connections - Δ-Δ, Y-Y, Δ-Y, Y-Δ, V-V – vector groupings Yy0, Dd0, Yd1, Yd11, Dy1, Dy11, Scott connection – three winding transformer – tertiary winding – per unit impedance, Parallel operation of single phase and three phase transformers

UNIT-VI Tap changing transformers (6 hours)

Tap changing Transformers - No load and on load tap changing of transformers, cooling methods of transformers. Excitation phenomenon in transformers, Harmonics in single phase and three phase transformers.

Learning Resources

Text Books

1. Nagrath I J and Kothari D P, Electric Machines, TMH Publishers, 4th Edition, 2004
2. P. S Bimbhra-Electrical Machines-Khanna Publishers,2002

Reference Books

1. A.E Fitzgerald, Charles Kingsley, Stephen D Umans Electrical Machines–TMH Publishers, 6th Edition, 2003.
2. J.B. Gupta: Theory &Performance of Electrical Machines SK Kataria& Sons, 4th Edition, 2006.
3. George Mcphersion ,"An Introduction to Electrical Machines and Transformers", John Wiley & Sons, NY,2007
4. Irving L. and Kosow, Electric Machinery and Transformers, 2nd edition 2008,Prentice-Hall of India

Web Resources

1. Prof. TK Bhattacharya, IIT Kharagpur, 'Electrical Machines-I', URL: https://nptel.ac.in/courses/108/105/108105155/

2. Prof. G. Bhuvaneswari, IIT Delhi, 'Electrical Machines', URL: https://nptel.ac.in/courses/108/102/108102146/
3. Prof. D Kastha, IIT Kharagpur, 'Electrical Machines-I', URL: https://nptel.ac.in/courses/108/105/108105017/

Course outcomes

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

CO 1	Understand working principle, performance, control and applications of DC Machines and Transformer.
CO 2	Carry out test and conduct performance experiments on DC machine and Transformer.
CO 3	Formulate and solve DC machine and Transformer related problems.
CO 4	Understand the application of special transformer.

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course code	Course Name	Course Category	L-T-P	Credits
20EE1283	Electrical Machines-I Lab	PCC	0L: 0T: 3P	1.5 credits

Course Learning Objective

To get a hands-on experience on the concepts present in Electrical Machines-I course and thereby developing practical knowledge in analysis of DC Machines and Transformers.

List of Experiments

1. Determination of open circuit characteristic of D.C. machine
2. Determination of Load characteristics of D.C. generators
3. Speed control of D.C. motors using Armature control and Field control Methods
4. Brake test on D.C. Shunt motor
5. Swinburne's Test on DC Machine
6. Retardation test on D.C. machines to determine the Moment of Inertia
7. Field's test on two identical D.C. Series machines
8. Hopkinson test on two identical D.C. machines
9. O.C. and S.C. tests on single phase transformer
10. Load test on single phase transformer
11. Sumpner's test on two single phase transformers
12. Scott connection of single phase transformers
13. Separation of no load losses of a single phase transformer

Note: It is suggested to perform an experiment on any one of the Software Tools before the experiment is performed on hardware.

Course outcome: After the completion of this Laboratory course, the student will be able to

CO 1	Select apparatus based on the ratings of DC Machines and Transformers.
CO 2	Determine equivalent circuit parameters and performance of transformers
CO 3	Evaluate the performance of DC machines and transformers by direct and indirect loading methods.
CO 4	Select braking and speed control methods of DC machines

Open Source Software: - LTSpice for circuit simulation, - KiCAD for CAD application

Web-based tools for design:

1. http://www.fairchildsemi.com/support/design-tools/power-supply-webdesigner/
http://www.ti.com/lsds/ti/analog/webench/overview.page

Circuit Lab:-https://www.circuitlab.com/editor/

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Course Nature		**Practical**		
Assessment Method				
Assessment Tool	Experiments	Record	Viva-Voce/ Quiz/MCQ/Lab project	Total
Marks	25	5	10	40
End Semester Examination weightage Marks				60

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Course code	Course Name	Course Category	L-T-P	Credits
20CE1114	Engineering Graphics	ESC	1L: 0T: 2P	2

Course Learning Objective

1. To know about the emergence of Engineering Graphics as a refined communication tool and to be aware of International and national standards of practice for uniform presentation of drawings.
2. To adopt the projection of three dimensional object orthogonally on a set of vertical and horizontal planes and obtain the views of the frontal and the top surfaces.
3. To describe the position of a point and position of the line with respect to all the planes of projection and obtain its views.
4. To learn orthographic projections of various simple plane surfaces in simple and inclined positions.
5. To know about orthographic projections of right and regular solids in simple positions, when their axes are perpendicular to one reference plane and parallel to the other.
6. To learn about types of cutting planes and to obtain views of simple solids.
7. To learn about different methodologies to be used for obtaining the two dimensional layout of the lateral surfaces of uncut solids.
8. To learn about computer aided drafting techniques and to be familiarize with one of the most powerful software 'AutoCAD'.

Unit-I: Introduction to Engineering Drawing **(7 hours)**

Introduction to Engineering drawing – Tools and Standards, Geometric Constructions, Scales, Conics and Special Curves - ellipse, parabola, hyperbola, cycloids, involutes.

Unit-II: Orthographic projections **(6 hours)**

Introduction to Orthographic Projections, Projections of Points, Projection of Lines.

Unit-III: Projection of Solids **(8 hours)**

Projection of Planes, Projections of Solids cube, prism, pyramid, cylinder, cone and sphere.

Unit-IV: Section of solids **(8 hours)**

Sections of Solids - cube, prism, pyramid, cylinder, cone and sphere. Development of Surfaces – Parallel line method and Radial line method.

Unit-V: Introduction to AutoCAD **(8 hours)**

Computer Aided Design – Introduction to AutoCAD, Coordinate System (UCS) and their Commands, Basic Commands of Drawing and Editing, Dimensioning and Text.

Unit-VI: Computer Graphics **(8 hours)**

Drawing practice with AutoCAD – Creating 2D Drawings of Objects from Isometric views, Creating Isometric views from Orthographic views and Introductions to 3D drawings.

Learning Resources:

Textbooks:

Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), *'Engineering Drawing'*, Charotar Publishing House.

Reference books:

1. Shah, M.B. &Rana B.C. (2008), *'Engineering Drawing and Computer Graphics'*, Pearson Education.
2. Agrawal B. & Agrawal C. M. (2012), *'Engineering Graphics'*, TMH Publication.

Web resources:

1. Prof AnupamSaxena, NPTEL-IIT Kanpur, 'Engineering Drawing'.
   URL: https://nptel.ac.in/courses/112104172/
2. Prof AnupamSaxena, NPTEL-IIT Kanpur, 'Computer Aided Engineering Design'.
   URL:https://nptel.ac.in/syllabus/112104031/

Course outcome: After the completion of this course, the student will be able to

CO 1	Aware of International and national standards of practice.
CO 2	Familiar with obtaining the views of the frontal and the top surfaces of an object.
CO 3	Aware of orthographic projections of right and regular solids in simple positions, when their axes are perpendicular to one reference plane and parallel to the other.
CO 4	Know about computer aided drafting techniques and will be familiar with one of the most powerful software ‘AutoCAD’.

Rajiv Gandhi University of Knowledge Technologies – AP
(Established through AP ACT 18 of 2008)

Department of Electrical &Electronics Engineering

Course code	Course Name	Course Category	L-T-P	Credits
20HS2101	Indian Constitution	MC	2-0-0	0

Course Learning Objectives:

1. The basic objective of the course is to provide knowledge about institutions
2. It help to understand the processes to governing the society in a systematic way.
3. It helps to establish social Justice, Liberty, Equity and Fraternity.
4. The course will introduce the idea of political system in general
5. It provides idea about working process of constitutional institutions.
6. To create awareness about the functioning of the judicial system in India.

Course Contents:

UNIT I: **(5 hours)**

Introduction-Constitution' meaning of the term, Indian constitution sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and duties, Directive Principles of State Policy.

UNIT II: **(5 hours)**

Union Government and its Administration-Structure of the Indian Union: Federalism, centre-state relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Loksabha, Rajyasabha.

UNIT III: **(5 hours)**

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

UNIT IV: **(3 hours)**

State Government and its Administration- Governor: Role and position, CM and Council of ministers, state secretariat: Organization, structure and functions.

UNIT V: **(7 hours)**

Local Administration-District's Administration head: Role and importance, Municipalities: Introduction, Mayor and role of Elected Representatives, CEO of Municipal Corporation, Panchayati raj: Introduction, PRI: ZillaPanchayat, Elected officials and their roles, CEO ZillaPanchayat: Position and role, Block level: Organizational Hierarchy (different departments), Village level: Role of elected and appointed officials, Importance of grass root democracy.

UNIT VI: **(5 hours)**

Union Judiciary-Establishment and constitution of Supreme court, Appointment of Judges, Establishment of State High court, Establishment of common High court for 2 or more states, WRITS, PIL(Public Interest Litigation).

Learning resources

Text book:

1. Durga Das Basu,*Constitutions of India*, 23rd ed, LexisNexis Publication.

Reference Books:

1.'Indian Polity' by Laxmikanth
2.'Indian Administration' by SubhashKashyap
4.'Indian Administration' by Avasti and Avasti
5.'Government and Politics of India' by W.H.Mrrison Jones
6.'Constitution of India' by J.C.Johari

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

CO 1	The students will understand their fundamental rules and duties.
CO 2	The students will learn the political system and the system of elections in India.
CO 3	It is to provide the students the institutions and processes to govern themselves in the manner they prefer.
CO 4	Students can also be able to utilize the laws and facilities provided by constution
CO 5	It will provide over all idea about our legal system.
CO 6	It will enable students more strong in terms of law and practice in day to day life.

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Department of Electrical &Electronics Engineering

Course code	Course Name	Course Category	L-T-P	Credits
EG 1281	English Language Communication Skills Lab-1	HSS	1 – 0 – 3	2.5

Course objectives:

1. To facilitate computer-aided multi-media instruction enabling individualized and independent language learning
2. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
3. To provide opportunities for practice in using English in day to day situations
4. To improve the fluency in spoken English and neutralize mother tongue influence
5. To train students to use language appropriately for debate, group discussion and public speaking

UNIT-I: **(06 Contact Hours)**

Theory: An Ideal Family by Katherine Mansfield

Spoken Skills: Situational Dialogues – Role-play – Expressions in various situations – Self Introduction – Introducing others – Greetings – Apologies – Requests – Giving directions

UNIT-II: **(06 Contact Hours)**

Theory: Energy -Alternative sources of Energy

Panel Debate on "On-grid & off-grid support to public participation in the production of solar energy in India", Reading the Wikipedia content on "The Green New Deal". Reflective session on the prospects of "The Green New Deal in India"

Writing Skills: Letter Writing (Formal & Informal) and Hands on Session on Letter Writing

UNIT-III: **(06 Contact Hours)**

Theory: Transport - Problems & solutions

Group Discussion on "The Future of Bullet Trains in India"

PPT on "The Dedicated Freight Corridors & the Future of Indian Economy" – Introductionto Speech

Spoken Skills: Sounds – Vowels, Consonants and Diphthongs – Pronunciation Exercises (Basic Level)

UNIT-IV: **(06 Contact Hours)**

Theory: Technology - Evaluating technology

PPTon "3R: Reduce, Recycle, Reuse" - Solo Debate on "Can Block Chain Technology Mitigate the Issue of Cyber Crimes and Hacking?"

Presentation Skills: JAM –Description of Pictures, Photographs, Process, Talking about wishes, Information Transfer

UNIT-V: **(06 Contact Hours)**

Theory: Environment - Ecology versus Development

Listening Skills: ListeningActivity on YouTube video on "Greening the Deserts" - Students' seminar on "Waste to Wealth: Examples from around the Globe".

UNIT-VI: **(06 Contact Hours)**

Theory: Industry - Selling products

Reading Skills: Reading the material on "4Ps: Product, Price, Place, and Promotion" Role play on "How to sell your product and services"

References:

1. Non – Detailed Text Book: Panorama – A Course on Reading published by Oxford University Press, India
2. English for engineers and technologists by Orient Black Swan
3. A Textbook of English Phonetics for Indian Students 2nd Ed T. Balasubramanian. (Macmillan), 2012.
4. Speaking English Effectively, 2nd Edition Krishna Mohan & NP Singh, 2011. (Macmillan).
5. A Hand book for English Laboratories, E.Suresh Kumar, P.Sreehari, Foundation Books,2011
6. English Pronunciation in Use. Intermediate & Advanced, Hancock, M. 2009. CUP
7. Basics of Communication in English, Soundararaj, Francis. 2012.. *New Delhi: Macmillan*
8. English Pronouncing Dictionary, Daniel Jones Current Edition with CD.Cambridge, 17th edition, 2011.

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

CO 1	Understand the issues affecting the economy and environment in India and across the globe
CO 2	Develop the instinct for problem solution
CO 3	Develop the ability to collect materials on various socio-economic-technological issues and prepare PPT for presentation
CO 4	Improving listening skills
CO 5	Inculcate speaking as a behaviour by repeated practice and exposure

Assessment Method:

Course Nature: THEORY + LABORATORY

Internal Assessment (40 Marks)		**External Assessment**(60 Marks)	
Record Writing	– 10 Marks	Reading Comprehension	– 15 Marks
Attendance	– 10 Marks	Writing	– 30 Marks
Continuous Assessment (Listening – 10 Marks + Oral Presentations – 10 Marks)		Speaking (Viva-Voce)	– 15 Marks