B.Tech. Programme in
MECHANICAL ENGINEERING

2019 Regulations

COURSE STRUCTURE AND SYLLABI OF I, II SEMESTERS

GAYATRI VIDYA PARISHAD COLLEGE OF ENGINEERING
(AUTONOMOUS)

MADHURAWADA, VISAKHAPATNAM

AFFILIATED TO JNTU- KAKINADA

Vision

To evolve into and sustain as a Centre of Excellence in Technological Education and Research with a holistic approach.

Mission

To produce high quality engineering graduates with the requisite theoretical and practical knowledge and social awareness to be able to contribute effectively to the progress of the society through their chosen field of endeavor.

To undertake Research & Development, and extension activities in the fields of Science and Engineering in areas of relevance for immediate application as well as for strengthening or establishing fundamental knowledge.

B.TECH. -MECHANICAL ENGINEERING (I , II SEMESTERS)

0 SEMESTER – INDUCTION TRAINING					
I SEMESTER					
course code	**Title of the Course**	**L**	**T**	**P**	**C**
19BP1103	Engineering Physics	3	0	0	3
19BM1101	Calculus and Linear Algebra	3	1	0	4
19CT1101	Problem solving using C	3	1	0	4
19ME1101	Basic Engineering Workshop	0	0	3	1.5
19ME1102	Engineering Graphics	1	0	3	2.5
19CT1102	Problem solving lab using C	0	0	3	1.5
19BP1104	Engineering Physics Lab	0	0	3	1.5
19BC11Z1	Environmental Science	3	0	0	0
TOTAL		**13**	**2**	**12**	**18**

II SEMESTER					
course code	**Title of the Course**	**L**	**T**	**P**	**C**
19HE1101	Communicative English	3	0	0	3
19BM1102	ODE and Vector Calculus	3	1	0	4
19BC1103	Chemistry of Materials	3	0	0	3
19EE11D2	Basic Electrical and Electronics Engineering	3	0	0	3
19ME1103	Material Science and Engineering	2	0	0	2
19ME1104	Mechanical Engineering Workshop	0	0	3	1.5
19BC1104	Chemistry Lab	0	0	3	1.5
19EE11D4	Basic Electrical and Electronics Engineering lab	0	0	3	1.5
19HE1102	Communicative English Lab	0	0	3	1.5
19ME1105	Material Science and Engineering Lab	0	0	2	1
TOTAL		**14**	**1**	**14**	**22**

ENGINEERING PHYSICS

Course Code: 19BP1103

L	T	P	C
3	0	0	3

Course Outcomes:

At the end of the Course the student shall be able to

CO1: explain laws of mechanics to solve engineering problems
CO2: apply the principles of acoustics for noise cancellation
CO3: explain the relationship between elastic constants
CO4: classify different modes of heat transfer and thermal conductivity of different materials
CO5: identify the sensors for various engineering applications

UNIT-I: MECHANICS **12 Lectures**

Basic laws of vectors and scalars, conservative forces- F = - grad V, torque and angular momentum - Newton's laws in inertial and linear accelerating non-inertial frames of reference-rotating frame of reference with constant angular velocity-concept of pseudo forces (Centrifugal and Coriolis forces)-qualitative explanation of Foucault's pendulum-rigid body-angular velocity vector-moment of inertia tensor, ex: rod executing conical motion with fixed centre of mass- gravitation and Kepler's laws.

Text Book 1: Sec: 1.5 to 1.7, 5.11 (note 5.2), 7.5, 4.4, 2.10, Chapter 9 (example-9.11), 8.6, 8.6.1, Chapter-8 (example 8.14), Chapter 2 (example 2.10), 10.1;

Text Book 2: Sec: 15.2, 15.3, 15.3.1, 15.3.2.

Learning Outcomes:

The students will be able to

1. identify forces and moments in mechanical systems using scalar and vector techniques (L3)
2. interpret by equation of motion of a rigid rotating body(torque on a rigid body) (L3)
3. apply Newton's second law for inertial and non-inertial frame of reference (L3)
4. relate the effect of the Earth rotation to the formation and movement of winds such as typhoons and cyclones by using Foucault Pendulum (L2)
5. explain consideration of Earth rotation in designing and launching missiles (L2)

UNIT-II: ACOUSTICS AND ULTRASONICS **10 Lectures**

Classification of sound- Weber-Fechner law- decibel- Reverberation and reverberation time Sabine's formula- Derivation using growth and decay method-Absorption coefficient-

definition and its determination- factors affecting acoustics of buildings and their remedies (Shape of the auditorium, Reverberation time and seating arrangement). Introduction of ultrasonics-Production of ultrasonics by magnetostriction and piezoelectric methods-Acoustic grating- Applications-Non Destructive Testing using ultrasonics-Sonogram

Text Book 3: Sec:13.3, 13.4.4, 13.5, 13.9.1.1, 13.16, 13.17, 13.18, 13.13, 13.14, 13.20 (iv, vi, vii), 14.1, 14.4.2.1, 14.4.3.1, 14.8.2, 14.12.1

Learning Outcomes:

The students will be able to

1. explain how sound is propagated in buildings (L2)
2. analyze acoustic properties of typically used materials in buildings (L4)
3. recognize sound level descriptors and their use in architectural acoustics (L2)
4. identify the use of ultrasonics in different fields (L3)

UNIT-III: ELASTICITY 09 Lectures

Stress, Strain, Hooke's Law, Stress-Strain diagram, Generalized Hooke's law, different types of moduli and their relations, bending of beams, Bending Moment of a Beam; Depression of cantilever, Young's modulus by uniform bending.

Text Book 3: Sec: 2.3, 2.3.1, 2.3.2, 2.4, 2.5, 2.5. 1-3, 2.6, 2.7, 2.10, 2.10.1-3, 2.12, 2.12.1, 2.12.2, 2.12.5

Learning Outcomes:
The students will be able to

1. interpret stress and strain curve (L2)
2. develop the relationship between elastic constants (L2)
3. identify the yielding of materials with different loads (L3)

UNIT-IV: HEAT TRANSFER 09 Lectures

Transfer of heat- - Thermal conduction, convection and radiation and their Fundamental Laws (Newton's Law of Cooling, Stefan's-Boltzmann law and Wien's law)- Thermal expansion of solids and liquids-Heat Conduction in solids- Thermal Conductivity- Lee's method (bad conductor)-Heat conduction through compound media

Text Book 3: Sec: 16.1, 16.2, 16.3, 16.4.2, 16.5.2, 16.7

Learning Outcomes:
The students will be able to

1. identify the different modes of heat transfer (L3)
2. explain conduction process in solids (L2)
3. determine the thermal conductivity of metals and nonmetals (L3)

UNIT-V: SENSORS AND NANOMATERIALS 10 Lectures

Sensors:(qualitative description only): Classification of sensors, Strain and Pressure sensors- Piezoelectric, magnetostrictive sensors, Fibre optic methods of pressure sensing; Temperature sensor- Thermocouple, bimetallic strip, pyroelectric detectors, Hall-effect sensor, smoke and fire detectors. Basics of Nanomaterials – Top-down and bottom up approaches-Preparation-sol-gel & ball milling, Carbon nanotubes - Applications of Nano materials (better insulating materials, elimination of pollutants, high energy density batteries, nanomachines and nanodevices).

Text Book 4: Sec: 1.1, 1.2, 1.3, 4.2,4.4, 4.8, 7.11
Text Book 3: Sec: 49.3, 49.5.1(iii), 49.5.2 (iv), 49.9, 49.17(ii, v, viii xiv)

Learning Outcomes:

The students will be able to

1. identify different types of sensors and applications (L3)
2. explain the physics behind the working principles of sensors (L2)
3. select sensors for different types of applications (L3)
4. understand the basics and preparation methods of nanomaterials (L2)
5. identify the applications of nanomaterials in various fields (L3)

Text Books:

1. D. Kleppner and R. Kolenkow, *An Introduction to Mechanics*, 2nd Edition, Cambridge University Press, 2014.
2. M. K. Harbola, *Engineering Mechanics*, Fourth Edition, Cengage Learning India Pvt. Ltd, 2011.
3. M. N. Avadhanulu, P. G. Khirsagar, and T. V. S. Arun Murthy, *A textbook of Engineering Physics*, Revised edition (11e), S. Chand and Company Ltd., 2019.
4. I. R. Sinclair, *Sensor and Transducers*, 3rd Edition, Elsevier (Newnes), 2001.

Reference Books:

1. S. P. Timoshenko and J. N. Goodier, *Theory of Elasticity*, Third Edition, Tata McGraw Hill, 2010.

CALCULUS AND LINEAR ALGEBRA

Course Code: 19BM1101

L	T	P	C
3	1	0	4

Course Outcomes:

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

CO1: test the convergence of an infinite series and express a function in terms of power series.

CO2: apply the techniques of multivariable differential calculus to determine extrema and series expansions of a function of several variables.

CO3: extend the concept of integration to higher dimensions and use it to solve problems in engineering.

CO4: solve a linear system of equations analytically and compute eigen values and eigen vectors of a square matrix.

CO5: diagonalize a matrix and identify the nature of a quadratic form.

UNIT- I: Sequences, Series and Mean value theorems **10 Lectures**

Sequence, infinite series, tests for convergence: comparison test, ratio test, root test. Rolle's theorem, Lagrange's and Cauchy's mean value theorem (without proof); expansions of functions: Taylor's and Maclaurin's series (without proof),
(Sections 4.3, 4.4, 9.1-9.6, 9.8, 9.9, 9.11 of the textbook)

Learning Outcomes:

At the end of this unit, the student will be able to

1. apply mean value theorems to find local extrema of a continuous function (L3)
2. discuss Taylor's and Maclaurin's series expansion of a function (L2)
3. determine the convergence of an infinite series (L3)

UNIT- II: Partial differentiation **10 Lectures**

Introduction to partial derivatives, total derivatives, change of variables, jacobians, Taylor's theorem for functions of two variables, maxima and minima of functions of two variables, Lagrange's method of undetermined multipliers.
(Sections 5.5, 5.6, 5.7, 5.9, 5.11, 5.12 of the textbook)

Learning Outcomes:
At the end of this unit, the student will be able to
1. calculate partial derivatives and use them to analyze a function (L3)
2. discuss the maxima and minima of a function of several variables (L2)
3. examine the dependency of functions using jacobian (L3)

UNIT- III: Multiple integrals **10 Lectures**
Double integrals, change of order of integration, double integration in polar coordinates, areas enclosed by plane curves, triple integrals and change of variables.
(Sections 7.1 - 7.5, 7.7 of the textbook)

Learning Outcomes:
At the end of this unit, the student will be able to
1. discuss multiple integral of a function of several variables (L2)
2. determine areas and volumes using multiple integrals (L3)
3. describe the concept of change of order of integration in double integrals (L2)

UNIT- IV: Matrix operations and solving systems of linear equations
10 Lectures
Rank of a matrix (echelon form and normal form), consistency of linear system of equations, eigen values and eigen vectors of a matrix, properties of eigen values.
(Sections 2.7, 2.10, 2.13, 2.14 of the textbook)

Learning Outcomes:
At the end of this unit, the student will be able to
1. express the rank of a matrix using elementary operations (L2)
2. discuss the consistency of systems of linear equations (L2)
3. determine eigen values and eigen vectors of a matrix (L3)

UNIT- V: Cayley-Hamilton theorem and Quadratic forms **10 Lectures**
Cayley-Hamilton theorem (without proof), finding inverse and power of a matrix by Cayley-Hamilton theorem, reduction to diagonal form, reduction of quadratic form to canonical form, nature of the quadratic form.
(Sections 2.15- 2.18 of the textbook)

Learning Outcomes:
At the end of this unit, the student will be able to
1. determine the inverse and power of a matrix using Cayley-Hamilton theorem (L3)
2. model an orthogonal matrix to obtain the diagonal form (L3)
3. discuss the nature of a quadratic form (L2)

Textbook:

B. S. Grewal, "*Higher Engineering Mathematics*", 44th edition, Khanna Publishers, 2017.

References:

1. Erwin Kreyszig, "*Advanced Engineering Mathematics*", 10th edition, John Wiley & Sons, 2011.
2. Greenberg M D, "*Advanced Engineering Mathematics*", 2nd edition, Pearson Education, Singapore, Indian Print, 2003.
3. Peter V. O'Neil, "*Advanced Engineering Mathematics*", 7th edition, Cengage Learning, 2011.

PROBLEM SOLVING USING C

Course Code: 19CT1101

L	T	P	C
3	1	0	4

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

CO1: analyze the problem and choose appropriate algorithm to solve it.

CO2: design modular programs involving input output operations, decision making and looping constructs by choosing the appropriate data types for writing programs in C language.

CO3: apply the concept of arrays and string handling in problem solving.

CO4: apply the concept of pointers for dynamic memory management.

CO5: design programs to store data in structures and files.

UNIT-I 10 Lectures

PROBLEM SOLVING: Introduction to computer based problem solving, Program design and implementation issues, Algorithms for problem solving: Simple problems based on number theory, Operations on ordered set of elements, Solving quadratic equations, Operations on matrices.

(Scope: Chapter 2 of text book 2)

Learning Outcomes: At the end of the module the student will be able to

1. identify the requirements to solve a problem (L2)
2. choose appropriate design to solve the problem (L3)
3. classify different programming environments (L2)
4. analyze and solve the problem with suitable algorithms (L4)

UNIT-II 10 Lectures

INTRODUCTION: An Overview of C, Basic Data types, Modifying the Basic Data Types, Identifier Names, Variables, Type Qualifiers, Constants, Operators, Expressions, Selection, Iteration and Jump Statements.

FUNCTIONS: Designing Structured Programs, Functions Basics, Standard Library Functions, User Defined Functions, Categories of Functions, Parameter Passing Techniques, Scope, Scope Rules, Storage Classes and Type Qualifiers, Recursion: Recursive Functions, Preprocessor Directives.

Learning Outcomes: At the end of the module the student will be able to

1. choose appropriate conditional and unconditional control statements in solving a problem. (L3)
2. demonstrate modular programming approach. (L3)

3. understand the scope and lifetime of a variable. (L2)
4. understand the concepts of preprocessor directives. (L2)
5. demonstrate usage of recursive functions. (L3)

UNIT-III **10 Lectures**

ARRAYS: Concepts, Using Arrays in C, Inter-Function Communication using Arrays, Array Applications, Two-Dimensional Arrays, Introduction to Multidimensional Arrays.

STRINGS – Concepts, C Strings, String Input / Output Functions, Arrays of Strings, String Manipulation Functions.

Learning Outcomes: At the end of the module the student will be able to
1. apply the basic concepts of arrays in solving problems. (L3)
2. demonstrate programs of various operations on arrays. (L3)
3. demonstrate programs that mimics string functions in solving problems.(L3)

UNIT-IV **10 Lectures**

POINTERS: Introduction, Pointer Arithmetic, Pointers for Inter-Function Communication, Pointers to Pointers, Arrays and Pointers- Array of Pointers, Pointer to Array, Pointers to void, Pointers to Functions, Command Line Arguments. Dynamic Memory Allocation Functions, Programming Applications.

Learning Outcomes: At the end of the module the student will be able to
1. apply the concepts of pointers with respect to arrays and functions. (L3)
2. demonstrate programs that run through command line arguments. (L3)
3. demonstrate the usage of dynamic memory allocation functions to solve problems. (L3)

UNIT-V **10 Lectures**

STRUCTURES, UNIONS AND ENUMERATED TYPES - Type Definition (typedef), Enumerated Types. Structure: Definition and Initialization of Structures, Accessing Structures, Nested Structures, Arrays of Structures, Structures and Functions, Pointers to Structures, Self Referential Structures, Unions.

FILES: Introduction to Files, Modes of File operations, Text and Binary Files, file I/O Operations

Learning Outcomes: At the end of the module the student will be able to
1. demonstrate programs that use user defined data types to write programs. (L3)
2. demonstrate the usage of pre-defined file I/O functions to perform operations on files. (L3)
3. demonstrate programs that solve real time problems using structures. (L3)

Text Books:

1. Ashok N Kamthane, Amit Ashok Kamthane, *Programming in C*, 3rd Edition, Pearson Publication 2015.
2. HarshaPriya, R. Ranjeet, *Programming and Problem Solving Through "C" Language*, New Edition, Fire Wall Media 2015. (For Unit 1)
3. Herbert Schildt, *The Complete Reference*, C 4th Edition, Tata McGraw-Hill 2000.

Reference Books:

1. Brian W. Kernighan and Dennis M. Ritchie, *The C Programming Languag*e, 2nd Edition, Prentice-Hall, 2006.
2. Rajaraman V, *The Fundamentals of Computer*, 4thEdition , Prentice-Hall of India 2006.
3. Steve Oualline, *Practical C Programming*, 3rd Edition, O'Reilly Press 2006.
4. Jeri R. Hanly, Elliot B. Koffman, *Problem Solving and Program Design in C*,5th Edition, Pearson Education 2007.
5. Balagurusamy E, *Programming in ANSI C*, 4th Edition, Tata Mcgraw Hill. 82, 2008.
6. Gottfried, *Programming with C*, 3rd Edition , Tata Mcgraw Hill, 2010.
7. R G Dromey, *How to Solve it by Computer*, 1stEdition , Pearson Education 2006.

BASIC ENGINEERING WORKSHOP

Course Code: 19ME1101

L	T	P	C
0	0	3	1.5

Course Outcomes:

At the end of the Course the student will be able to

CO1: apply wood working skills in real world applications.

CO2: build different parts with metal sheets in real world applications.

CO3: apply fitting operations in various applications.

CO4: apply different types of basic electric circuit connections.

CO5: assemble and disassemble light engineering assemblies

LIST OF EXPERIMENTS

Wood Working:

Familiarity with different types of woods and tools used in wood working and making of the following joints

1. Half – Lap joint
2. Mortise and Tenon joint
3. Corner Dovetail joint or Bridle joint

Sheet Metal Working:

Familiarity with different types of tools used in sheet metal working, Development of following sheet metal jobs from GI sheets and soldering of the joints

4. Tapered tray
5. Conical funnel
6. Elbow pipe

Fitting:

Familiarity with different types of tools used in fitting and making of the following fitting joints

7. V-fit
8. Dovetail fit
9. Semi-circular fit

Electrical Wiring:

Familiarity with different types of basic electrical circuits and make the following connections

10. Parallel and series
11. Two-way switch
12. Tube light
13. Residential house wiring using fuse, switch, indicator, lamp and energy meter

Assembling/Disassembling Practice

14. Bicycle
15. Flush tank
16. Wall clock

Note: Any **TWELVE** of the above experiments to be conducted

ENGINEERING GRAPHICS

Course Code: 19ME1102

L	T	P	C
1	0	3	2.5

Course Outcomes:

At the end of the Course the student will be able to
CO1: illustrate various curves applied in engineering
CO2: show projections of lines and planes graphically.
CO3: show projections of solids and sections of solids graphically.
CO4: development of surfaces of regular solids using CAD packages.
CO5: use CAD packages to draw isometric and orthographic drawings.

List of Experiments:

LIST OF EXERCISES IN MANUAL DRAWING:

Introduction to engineering graphics and their significance – Conventions in drawing, lettering and BIS conventions.

1. Construction of Conic sections including the rectangular hyperbola- general method only.

2. Cycloid, epicycloids, hypocycloid, involute of the circle.

3. Projections of points in any quadrant.

4. Projections of lines inclined to one plane.

5. Projections of lines inclined to both planes.

6. Projections of planes inclined to one plane.

7. Projections of planes inclined to both the planes.

8. Projections of solids inclined to one plane.

9. Section planes and sectional view of right regular solids- prism, cylinder, pyramid and cone

LIST OF EXERCISES IN COMPUTER AIDED DRAFTING (will be considered for internal evaluation only)

Introduction to AutoCAD: Basic drawing and editing commands, Dimensioning principles and conventional representations.

10. Development of surfaces of right regular solids-prism, cylinder, pyramid, cone and their sectionalparts.
11. Orthographic Projections: Systems of projections, conventions and application to orthographicProjections.
12. Isometric Projections: Principles of isometric projection- Isometric scale; Isometric views: lines,planes, figures, simple and compound solids

Text Books:

1. N. D. Bhatt, *Engineering Drawing*, 53rd Edition, Charotar Publishers, 2016.
2. K. L. Narayana and P. Kannaiah, *Engineering Drawing*, 3rd Edition, Scitech Publishers, Chennai, 2012.

Reference Books:

1. Dhanajay A Jolhe, *Engineering Drawing*, 1st Edition, Tata McGraw-Hill, 2007.
2. Venugopal, *Engineering Drawing and Graphics*, 5rd Edition, New Age Publishers, 2004.
3. BasantAgarwal and C. M. Agarwal, *Engineering Drawing*, 2nd Edition Tata McGraw-Hill, 2013.

PROBLEM SOLVING LAB USING C

Course Code: 19CT1102

L	T	P	C
0	0	3	1.5

Course Outcomes:

At the end of the Course the student shall be able to:

CO1: Apply the concepts of variables, data types, operators and expressions.
CO2: Demonstrate the usage of Conditional and Unconditional statements.
CO3: Demonstrate the usage of functions and related functions with respect to arrays and strings.
CO4: Implement the concept of pointers and structures.
CO5: Demonstrate the usage of files and Command Line Arguments.

List of Programs:

Week 1 (Basic Programs)

1. C program to display hello world message.
2. C program to scan all data type variables as input and print it as output.
3. C program to perform arithmetic operations like +,-,*,/,% on two input variables.
4. C program to perform temperature conversions from Centigrade to Fahrenheit and vice versa.

Week 2 (Programs on Operators)

1. C program to scan an input and perform pre and post increment operation on it and display the result.
2. C program to perform all bit wise operations.
3. C program to extract the last two digits of a given integer n, where the number of digits should be greater than 2.
4. C program to display the greatest of three numbers using conditional operator.
5. C program to swap two numbers without using third variable.

Week 3 (Programs on Conditional Statements)

1. C program to check whether a given input integer is in between two values x and y.
2. C program to check whether a given character is a vowel or a consonant or a digit or a special symbol.
3. C program to display the nature and roots of a quadratic equation.
4. C program to perform arithmetic operations using switch statement.
5. C program to convert upper case character to lower case and vice versa.

Week 4 (Programs on Loop Statements)

1. C program to print odd numbers between specified ranges.
2. C program to display the factors of a given number and check whether it is a prime or not.
3. C program to display the sum of individual digits of a given integer raised to the power of n. Also check whether the given integer is Armstrong or not.
4. C Program to demonstrate the usage of unconditional control statements.
5. C program to display the following pattern.

5 4 3 2 1
4 3 2 1
3 2 1
2 1
1

Week 5 (Programs on Functions)

1. C program to demonstrate the various categories of functions with respect to return type and number of arguments.
2. C program to find the LCM of two numbers using functions.
3. Create a header file which contains the following prototype:
   i. int factorial (int) ; // non-recursive function
   ii. intfactorial_rec(int); //Recursive function
   iii. int prime (int) ;

   Use the above functions in a C program by including the above header file.
4. C program to display Pascal's triangle using functions.

Week 6 (Programs on Arrays)

1. C program to read n integer values into an array and display them
2. C program to count and display the number of positive, negative, even and odd numbers in a given array of integers and also display their sum.
3. C program to find the smallest and largest numbers in an array of integers.
4. C program to perform addition, multiplication, transpose of given matrices using functions.
5. C program to check whether a given integer exists in a list of numbers and print its index value if it is present, otherwise print "No".

Week 7 (Programs on Strings)

1. C program to convert upper case character to lower case and vice versa in a given string.
2. C program to delete all vowels in a given string and display the remaining string.
3. C program to check whether a given string is palindrome or not.
4. C program that reads two integers as strings and display their sum.

Week 8 (Programs on Strings)

1. C program to demonstrate the usage of at least 10 predefined string handling functions.
2. C program that implements the following user defined string handling functions
   i. To find the length of the given string
   ii. To copy the contents of one string to another
   iii. To reverse the contents of a string
   iv. To compare two strings
   v. To concatenate two strings

Week 9 (Programs on Pointers and Dynamic Memory Allocation)

1. C program to demonstrate the usage of pointers.
2. C program that uses dynamic memory allocation functions to add n elements and display their average.
3. C program that performs pointer arithmetic.
4. C program that implements call by reference.

Week 10 (Programs on Pointers)

1. C program to demonstrate the following
   i. Pointers to Pointers
   ii. Array of Pointers
   iii. Pointer to Array
   iv. Pointers to Functions

Week 11 (Programs on Structures)

1. C program to access and display the members of the structure.
2. C program that demonstrates different ways to access the structure elements using pointers.

Week 12 (Programs on Files)

1. C program to read the contents of a file and display on to output screen.
2. C program to copy the contents of one file to another.
3. C program to count and display the number of characters, words and lines in a file.
4. C program to print last n characters of a file by reading file name and n value from command line.

Programs to be covered beyond syllabus:

1. C program to find the factorial of a given number using recursive and non recursive functions.
2. C program to display the first n terms of the Fibonacci sequence.
   Example: If n= 5 it has to print 0 1 1 2 3

3. Write a general-purpose function to convert any given year into its roman equivalent. The following table shows the roman equivalents of decimal numbers:

Decimal	Roman
1	I
5	V
10	X
50	L
100	C
500	D
1000	M

Example:
Roman equivalent of 1988 is MDCCCCLXXXVIII
Roman equivalent of 1525 is MDXXV

4. C program to display upper and lower triangles of a given matrix.
5. C program to add the sum of row wise elements, column wise elements and diagonal elements of a given square matrix and display the result.
6. C program to check whether the matrix is symmetric or not.
7. Given a positive integer (<= 1000000), find the minimum number of bits required to represent it as a binary number.
8. C program to perform left rotation of the array.
9. C program to implement binary search
10. C program to sort a given list of values using bubble sort.
11. C program to find the LCM of array of integers
12. C program to find the two's complement of a given binary input.
13. C program to replace all the vowels in a given string with a given character
14. C program to perform arithmetic operations using command line arguments
15. C program that writes the contents to a file and reads the contents from a file using structures.

Text Books:

1. Ashok N Kamthane, Amit Ashok Kamthane, *Programming in C*, 3rd Edition, Pearson Publication 2015.
2. HarshaPriya, R. Ranjeet, *Programming and Problem Solving Through "C" Language*, New Edition, Fire Wall Media 2015.
3. Herbert Schildt, *The Complete Reference*, C 4th Edition, Tata McGraw-Hill 2000.

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2. Rajaraman V, *The Fundamentals of Computer*, 4th Edition , Prentice-Hall of India 2006.
3. Steve Oualline, *Practical C Programming*, 3rd Edition, O'Reilly Press 2006.
4. Jeri R. Hanly, Elliot B. Koffman, *Problem Solving and Program Design in C*, 5th Edition , Pearson Education 2007.
5. Balagurusamy E, *Programming in ANSI C*, 4th Edition, Tata Mcgraw Hill. 82, 2008.
6. Gottfried, *Programming with C*, 3rd Edition , Tata Mcgraw Hill, 2010.
7. R G Dromey, *How to Solve it by Computer*, 1st Edition , Pearson Education 2006.

ENGINEERING PHYSICS LAB

Course Code: 19BP1104

L	T	P	C
0	0	3	1.5

At the end of the Course the student shall be able to:

CO1: identify the mechanical behaviour of the materials
CO2: analyze the dielectric behaviour of a material
CO3: interpolate some of the physical parameters based on optical phenomena
CO4: estimate the strength of magnetic field and asses the losses in magnetization
CO5: demonstrate the mechanical parameters using sensors

List of Experiments

1. Determination of Rigidity modulus of a material of a wire - Torsional Pendulum.
2. Determination of ultrasonic wave velocity in liquid using interferometer.
3. Determination of Acceleration due to Gravity and Radius of Gyration - Compound Pendulum.
4. Study of magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus
5. Study the variation of B versus H by magnetizing the magnetic material (B-H curve).
6. Determination of wavelength of Laser by diffraction grating.
7. Determination of particle size oflycopodium powder using LASER.
8. Determination of dielectric constant by charging and discharging method.
9. Determination of Strain variation using strain gauge sensor.
10. Determination of Moment of Inertia of a FlyWheel.
11. Determine the thermal conductivity of a bad conductor by Lee's disc method.
12. Determination of the elastic constants of the material of a flat spiral spring.
13. Double pipe heat exchanger experiment.
14. Heat Transfer by Natural Convection.
15. Verify Newton's Law of Cooling of different materials and different liquids.

*Note: Any **TWELVE** of the above experiments to be conducted*

ENVIRONMENTAL SCIENCE

Course Code: 19BC11Z1

L	T	P	C
3	0	0	0

Course Outcomes: At the end of the Course the student shall be able to

CO1: gain a higher level of personal involvement and interest in understanding and solving environmental problems.
CO2: recognize the interconnectedness of human dependence on the various ecosystems
CO3: demonstrate knowledge relating to the biological systems involved in the major global environmental problems of the 21st century
CO4: influence the society in water management and environmental acts.
CO5: discuss the management of environmental hazards, disasters and sustainable development practices.

UNIT – I: **10 Lectures**

MULTIDISCIPLINARY NATURE OF ENVIRONMENTAL STUDIES

Definition, Scope and Importance – Need for Public Awareness.

Natural resources : Renewable and non-renewable resources – Natural resources and associated problems – Forest resources – Use and over – exploitation, deforestation, case studies – 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, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. – Energy resources:

Learning outcomes

After the completion of the Unit, students will be able to

1. articulate the basic structure, functions, and processes of key social systems affecting the environment.(L2)
2. use of water resources (L3)
3. articulate basic understanding of the effects of modern agriculture on the environment.(L3)
4. explain how various paradigms or world views and their implicit and explicit assumptions and values shape the viewer’s perception of environmental problems and solutions.(L2)

UNIT – II: 10 Lectures

ECOSYSTEMS, BIODIVERSITY AND ITS CONSERVATION

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 the following ecosystem:

a. Forest ecosystem.
b. Grassland ecosystem
c. Desert ecosystem
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

Biodiversity and its conservation: Definition: genetic, species and ecosystem diversity – Bio-geographical classification of India – Value of biodiversity: consumptive use, Productive use, social, ethical, aesthetic and option values – Biodiversity at global, National and local levels – India as a mega-diversity nation – Hot-sports of biodiversity – Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – Endangered and endemic species of India – Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Learning outcomes

After the completion of the Unit, students will be able to

1. get a clear picture of the structure and functions of ecosystems.(L1)
2. explain why renewable and non-renewable energy resources are important.(L2)
3. get awareness about land degradation, soil erosion & desertification.(L2)
4. gain a rigorous foundation in various scientific disciplines as they apply to environmental science, such as ecology, evolutionary biology, hydrology, and human behavior.(L3)

UNIT – III: 10 Lectures

ENVIRONMENTAL POLLUTION AND SOLID WASTE MANAGEMENT

Environmental pollution: Definition, Cause, effects and control measures of :

a. Air Pollution.
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution
g. Nuclear hazards

Solid waste management: Causes**,** effects and control measures of urban and industrial wastes – Role of an individual in prevention of pollution – Pollution case studies – Disaster management: floods, earthquake, cyclone and landslides.

Learning outcomes

After the completion of the Unit, students will be able to

1. demonstrate knowledge and understanding of theories in the field of Biodiversity and systematics in the broad sense.(L1)
2. conduct basic conservation biology research.(L2)
3. explain endangered and endemic species of India.(L2)
4. identify the threats to biodiversity (L2)

UNIT – IV: 10 Lectures

SOCIAL ISSUES AND THE ENVIRONMENT

Social issues and the environment: From Unsustainable to Sustainable development – Urban problems related to energy – Water conservation, rain water harvesting, watershed management – Resettlement and rehabilitation of people; its problems and concerns. Case studies – Environmental ethics: Issues and possible solutions – Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies – Wasteland reclamation. – Consumerism and waste products. – Environment 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.

Learning outcomes:

After the completion of the Unit, students will be able to

1. illustrate Cause, effects and control measures of air pollution.(L3)
2. describe soil, noise & water pollution.(L2)
3. explain the enforcement of Environmental legislation(L2)
4. demonstrate solid waste management.(L3)

UNIT – V: 10 Lectures

HUMAN POPULATION AND THE ENVIRONMENT

Human population and the environment: Population growth, variation among nations. Population explosion – Family Welfare Programmed. – Environment and human health – Human Rights – Value Education – HIV/AIDS – Women and Child Welfare – Role of information Technology in Environment and human health – Case studies.

Field work: Visit to a local area to document environmental assets River/forest grassland/hill/mountain – Visit to a local polluted site-Urban/Rural/Industrial/Agricultural Study of common plants, insects, and birds – river, hill slopes, etc..

Learning outcomes

After the completion of the Unit,students will be able to

1. Describe watershed management and environmental ethics.(L2)
2. explain the reasons for global warming(L2)
3. explain principles and impact of disasters on environment.(L2)
4. demonstrate disaster management cycle in India(L3)

Text Books

1. AnubhaKaushik,.Kaushik C.P, *Environmental Studies*, 3rd edition, New age international publishers, 2011.

Reference Books

1. Bharucha. E., *Textbook of Environmental Studies for Undergraduate Courses*, University Press, 2005.
2. Rajagopalan. R., *Environmental Studies*, Oxford University Press, 2005.
3. AnjiReddy. M., *Textbook of Environmental Sciences and Technology*, BS Publications, 2010.

II SEMESTER

COMMUNICATIVE ENGLISH

Course Code: 19HE1101

L	T	P	C
3	0	0	3

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

CO1: acquire skills of understanding and inferred meaning of words
CO2: transfer information from one form to another in texts and authentic materials
CO3: write paragraphs and summarized with clarity, cohesiveness and precision
CO4: produce well organized notes, essays, letters, emails & précis.
CO5: formulate sentences using proper grammatical structures and correct word forms

UNIT-I **08 Lectures**

Lessons:

1. **What's your job –** from Cambridge Objective PET (Unit – 3)
2. **Wheels and wings –** from Cambridge Objective PET (Unit –5)

Reading: Skimming to get the main idea of a text; scanning to look for specific pieces of information.

Reading for Writing: Beginnings and endings of paragraphs - introducing the topic, summarizing the main idea and/or providing a transition to the next paragraph.

Grammar: Nouns - countable and uncountable, pronouns, verb-tenses - present simple, present continuous, state verbs; prepositions of time, basic sentence structures; simple question form - wh-questions.

Vocabulary: Technical vocabulary from across technical branches (20) GRE Vocabulary (20) (Antonyms and Synonyms, Word applications) Verbal reasoning and sequencing of words, prefixes & suffixes.

Learning Outcomes: At the end of the module, the student will be able to

1. employ suitable strategies for skimming & scanning to get the general idea of a text and specific information (L3)
2. recognize paragraph structure with beginnings/endings (L3)
3. form sentences using proper grammatical structures and correct word forms (L3)

UNIT-II **10 Lectures**

Lessons:

1. **Around town –** from Cambridge Objective PET (Unit – 7)
2. **How do you feel –** from Cambridge Objective PET (Unit – 9)
3. **I look forward to hearing from you –** from Cambridge Objective PET (Unit – 10)

Reading: Identifying sequence of ideas; recognizing verbal techniques that help to link the ideas in a paragraph together.

Writing: Paragraph writing (specific topics) using suitable cohesive devices; mechanics of writing - punctuation, capital letters and Précis.

Grammar: Prepositions of place & movement, comparative adjectives, commands; Tenses –perfect & past simple; use of articles and zero article.

Vocabulary: Technical vocabulary from across technical branches (20 words), GRE Vocabulary Analogies (20 words) (Antonyms and Synonyms, Word applications) and confusables.

Learning Outcomes: At the end of the module, the student will be able to

1. understand the use of cohesive devices for better reading comprehension (L2)
2. write well structured paragraphs on specific topics (L3)
3. make necessary grammatical corrections in sentences & in short passages (L3)

UNIT-III **12 Lectures**

Lessons:

1. **Risk! –** from Cambridge Objective PET (Unit – 15)
2. **Free time –** from Cambridge Objective PET (Unit – 16)
3. **Next week's episode –** from Cambridge Objective PET (Unit – 17)
4. **Shooting a film -** from Cambridge Objective PET (Unit – 18)

Reading: Reading a text in detail by making basic inferences - recognizing and interpreting specific context clues; strategies to use text clues for comprehension.

Writing: Summarizing - identifying main idea/s and rephrasing what is read; avoiding redundancies and repetitions and email.

Grammar: Tenses–forms of future tense and forms of past continuous, past perfect & past perfect continuous; subject-verb agreement; modal verbs and conjunctions.

Vocabulary: Technical vocabulary from across technical branches (20 words), GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications) Association, sequencing of words and idioms & phrases.

Learning Outcomes: At the end of the module, the student will be able to

1. infer meanings of unfamiliar words using contextual clues (L3)
2. write summaries based on global comprehension of reading/listening texts (L3)
3. form sentences using proper grammatical structures and correct word forms (L3)

UNIT-IV **10 Lectures**

Lessons:

1. **Happy families –** from Cambridge Objective PET (Unit – 19)
2. **Best friends? –** from Cambridge Objective PET (Unit – 23)
3. **I have got an idea –** from Cambridge Objective PET (Unit – 24)

Reading: Studying the use of graphic elements in texts to convey information, reveal trends/patterns/relationships, communicate processes or display complicated data.

Writing: Information transfer; describe, compare, contrast, identify significance/trends based on information provided in figures/charts/graphs/tables.

Grammar: Adjectives and adverbs; degrees of comparison; direct and indirect speech.

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications), one-word substitutes.

Learning Outcomes: At the end of the module, the student will be able to

1. produce a coherent paragraph interpreting a figure/graph/chart/table (L4)
2. use language appropriate for description and interpretation of graphical elements (L4)
3. use correct forms of adjectives, adverbs, one-word substitutes and a range of reporting
4. verbs in speech and in writing (L3)

UNIT-V **10 Lectures**

Lessons:

1. **Shop till you drop –** from Cambridge Objective PET (Unit – 25)
2. **Travellers' tales –** from Cambridge Objective PET (Unit – 27)
3. **What would you do? –** from Cambridge Objective PET (Unit – 28)

Reading: Reading for comprehension - Intensive and Extensive reading techniques.

Writing: Writing well-structured essays and letters.

Grammar: Conditional sentences; editing short texts – identifying and correcting common errors in grammar and usage (articles, prepositions, tenses, subject-verb agreement)

Vocabulary: Technical vocabulary from across technical branches (20 words) GRE Vocabulary (20 words) (Antonyms and Synonyms, Word applications).

Learning Outcomes: At the end of the module, the student will be able to

1. produce well-organized essays and letters (L3)
2. edit short texts by correcting common errors (L4)
3. form sentences using proper grammatical structures and correct word forms (L3)

Textbook: Hashemi, Louise & Thomas, Barbara. Cambridge Objective PET – Student's Book 2nd Ed., Cambridge University Press, 2018.

Suggested Reading:

1. Carson, Rachel. Silent Spring. Boston Houghton Mifflin, 2002.
2. *The Individual and Society***.** 1st Edition, Pearson Publications, , 2010

Reference Books

1. Bailey, Stephen. Academic writing: A handbook for international students. Routledge, 2014.
2. Rogers. Louis &Wilkin Jennifer. Skillful Level 2 Reading & Writing Student's Book Pack (B1), Macmillan Educational, 2013.
3. Hewings, Martin .Cambridge Academic English (B2). CUP, 2012.
4. Narayanaswami, V. R. Strengthen Your Writing. Orient BlackSwan, 2005.

Sample Web Resources

Grammar/Listening/Writing

- 1-language.com
- http://www.5minuteenglish.com/
- https://www.englishpractice.com/

Grammar/Vocabulary

- English Language Learning Online
- http://www.bbc.co.uk/learningenglish/
- http://www.better-english.com/
- http://www.nonstopenglish.com/
- https://www.vocabulary.com/
- BBC Vocabulary Games
- Free Rice Vocabulary Game

Reading

- https://www.usingenglish.com/comprehension/
- https://www.englishclub.com/reading/short-stories.htm
- https://www.english-online.at/

All Skills

- https://www.englishclub.com/
- http://www.world-english.org/
- http://learnenglish.britishcouncil.org/

Online Dictionaries

- Cambridge dictionary online
- MacMillan dictionary
- Oxford learner's dictionaries

ORDINARY DIFFERENTIAL EQUATIONS AND VECTOR CALCULUS

Course Code: 19BM1102

L	T	P	C
3	1	0	4

Course Outcomes:

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

CO1: solve first order differential equations arising in various engineering fields

CO2:solve linear differential equations of higher order and use the knowledge to study certain problems in engineering.

CO3: compute improper integrals using beta and gamma functions and determine best fit curve for a tabulated data.

CO4: perform the technique of Laplace transform to solve engineering problems.

CO5: extend calculus to vector functions and interpret vector integral theorems.

UNIT I: First order differential equations and applications 10 Lectures

Linear and Bernoulli differential equations, exact differential equations, equations reducible to exact equations, orthogonal trajectories, simple electric circuits, Newton's law of cooling. (Sections 11.9 - 11.12, 12.3, 12.5, 12.6 of the textbook)

Learning Outcomes:

At the end of this unit, the student will be able to

1. solve first order differential equations using various techniques (L3)
2. model certain engineering problems (L3)
3. discuss the method of finding orthogonal trajectories of a function (L2)

UNIT II: Higher order Linear differential equations 10 Lectures

Linear differential equations of higher order with constant coefficients, complete solution, operator D, rules for finding the complementary function, inverse operator, rules for finding the particular integral, method of variation of parameters, Cauchy's linear equation, L-C-R circuit problems.

(Sections 13.1 - 13.7, 13.8(i), 13.9(i), 14.5(ii) of the textbook)

Learning Outcomes:

At the end of this unit, the student will be able to

1. identify the solution of a linear differential equation of higher order (L1)
2. use the method of variation of parameters to find particular solution of second order differential equations (L3)
3. solve a higher order differential equation by analyzing a physical situation (L3)

UNIT III: Special functions and Curve fitting 10 Lectures

Beta and gamma functions, relation between beta and gamma functions. Introduction to method of least squares, fitting a straight line, power curve, exponential curve and parabola. (Sections 7.14 - 7.16,24.1, 24.5, 24.6 of the textbook)

Learning Outcomes:

At the end of this unit, the student will be able to

1. discuss improper integrals by using beta and gamma functions (L2)
2. demonstrate the least squares method (L3)
3. describe several types of curves for a tabulated data (L2)

UNIT IV: Laplace Transforms 10 Lectures

Definition of Laplace transform, existence conditions, properties of Laplace transform, periodic functions, transforms of derivatives, transforms of integrals, multiplication by t, division by t, evaluation of integrals by Laplace transforms, inverse Laplace transforms, convolution theorem (without proof), unit step function, unit impulse function, applications to ordinary differential equations.
(Sections 21.1-21.5, 21.7-21.15, 21.17, 21.18 of the textbook)

Learning Outcomes:

At the end of this unit, the student will be able to

1. apply Laplace and inverse Laplace transforms to various functions (L3)
2. discuss improper integrals using Laplace transforms (L2)
3. solve an ordinary differential equation through Laplace transforms (L3)

UNIT V: Vector Calculus 10 Lectures

Scalar and vector point functions, gradient, directional derivative, divergence and curl, Line integral - circulation, work done, surface integral-flux, volume integral, Green's theorem in the plane, Stoke's theorem and the Divergence theorem (without proof).
(Sections 8.4-8.7, 8.11- 8.16 of the textbook)

Learning Outcomes:

At the end of this unit, the student will be able to

1. demonstrate the concepts of Gradient, Divergence and Curl (L3)
2. discuss the work done in moving a particle along a path (L2)
3. apply vector integral theorems to multiple integrals (L3)

Textbook:

B. S. Grewal, "*Higher Engineering Mathematics*", 44th edition, Khanna publishers, 2017.

References:

1. Erwin Kreyszig, "*Advanced Engineering Mathematics*", 10th edition, John Wiley & Sons, 2011.

2. Greenberg M D, "*Advanced Engineering Mathematics*", 2nd Edition, Pearson Education, Singapore, Indian Print, 2003.
3. Peter V. O'Neil, "*Advanced Engineering Mathematics*", 7th Edition, Cengage Learning, 2011.

CHEMISTRY OF MATERIALS

Course Code: 19BC1103

L	T	P	C
3	0	0	3

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

CO1: recall the principles; explain the working and design of energy storage devices.
CO2: extend the principles involved in corrosion to predict and prevent corrosion in real life system.
CO3: analyze and determine the water quality and prescribe the remedial measures for domestic aswell as industrial usage.
CO4: classify the polymers and can apply to specific purposes
CO5: analyzethe importance of nano and smart materials**.**

UNIT- I

ENERGY SOURCES, SYSTEMS AND APPLICATIONS 10 Lectures

Electrode potential, determination of single electrode potential-Nernst equation; Reference electrodes - Weston Cadmium Cell, hydrogen and calomel electrodes; Electrochemical series and its applications; Primary cell - dry or Leclanche cell; Secondary cell - lead acid storage cell, nickel-cadmium cell, lithium ion batteries; Fuel cell, hydrogen-oxygen fuel cell (AFC); Solar energy- photovoltaic cell and applications.

Learning outcomes:

After the completion of the Unit I, the student will be able to

1. define electrode potential. (L1)
2. explain Nernst's equation. (L2)
3. identify primary and secondary cells (L2)
4. use the applications of solar energy. (L3)

UNIT- II 10 Lectures

CORROSION ENGINEERING

Corrosion: Definition, theories of corrosion-dry corrosion and electrochemical corrosion; factors affecting corrosion- nature of the metal and nature of the environment.

Corrosion controlling methods: Sacrificial anodic and Impressed current cathodic protection; Inhibitors -anodic and cathodic inhibitors; Metallic coatings-anodic coatings, cathodic coating, galvanizing and tinning; Organic coatings-paints and varnishes (constituents and their functions).

Learning outcomes:

After the completion of the Unit II, the student will be able to

1. explain theories of corrosion. (L2)
2. classify different corrosion methods. (L2)

3. choose different organic coatings. (L2)
4. apply the principles of corrosion control. (L3)

UNIT- III

WATER TECHNOLOGY **10 Lectures**

Introduction –Hard and Soft water, Estimation of hardness by EDTA Method; Boiler troubles - scaling and sludge-priming and foaming; specifications for drinking water - Bureau of Indian Standards (BIS) and World Health Organization (WHO) standards; Industrial water treatment – zeolite and ion-exchange processes; desalination of brackish water - reverse osmosis (RO) and electrodialysis.

Learning outcomes:

After the completion of the Unit III, the student will be able to

1. differentiate between temporary and permanent hardness of water. (L1)
2. explain the principles of reverse osmosis and electrodialysis. (L2)
3. compare the quality of drinking water with BIS and WHO standards. (L2)
4. illustrate problems associated with hard water. (L2)
5. demonstrate the Industrial water treatment processes.(L2)

UNIT- IV **10 Lectures**

ENGINEERING MATERIALS AND POLYMERS

Steel – Types of Steel, chemical composition – applications of alloy steels

Cement: Portland cement, constituents, Manufacture of Portland Cement, chemistry of setting and hardening of cement (hydration, hydrolysis, equations).

Polymers: Introduction, differences between thermoplastic and thermosetting resins, Preparation, properties and uses of polystyrene, Polyphosphazenes

Learning outcomes:

After the completion of the Unit IV, the student will be able to

1. classify the types of steel. (L2)
2. illustrate the chemical reactions involved in the manufacturing of cement. (L2)
3. identify preparation and properties of inorganic polymers. (L3)
4. distinguish between thermoplastic and thermosetting resins. (L4)

UNIT- V **10 Lectures**

NANO AND SMART MATERIALS

Nano Materials: Introduction to Nanomaterials - nanoparticles, nanoclusters, fullerenes, carbon nanotubes (CNT) and nanowires; Sol-gel synthesis of nanomaterials: Reverse micellar method; Applications of nanomaterials in wastewater treatment, lubricants and engines.

Smart Materials: Introduction – Types of smart materials-self healing materials-shape memory alloys and Uses of smart materials.

Learning outcomes:

After the completion of the Unit V, the student will be able to

1. classifynanomaterials. (L2)
2. explain the synthesis and characterization methods of nano materials. (L2)
3. identify different types of smart materials. (L1)

Text Books

1. P.C. Jain and M. Jain, *Engineering Chemistry*, 15th edition, Dhanapat Rai & Sons, 2014.
2. B.S Murthy and P. Shankar, *A Text Book of Nano Science and Nano Technology*, University Press, 2013.

Reference Books

1. SashiChawla, *A Textbook of Engineering Chemistry*, DhanapathRai and sons, 2003.
2. B.K. Sharma, *Engineering Chemistry*, Krishna Prakasham, 2014.
3. S.S. Dara, *A Textbook of Engineering Chemistry*, S.Chand& Co, 2010.
4. V. Raghavan, *A Material Science and Engineering*, Prentice-Hall India Ltd, 2004.

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Course Code: 19EE11D2

L	T	P	C
3	0	0	3

Course Outcomes: At the end of the Course the student shall be able to

CO1: Analyze the behavior of an electrical circuit.

CO2: Measure the performance quantities such as losses, efficiency of DC machines

CO3: Measure the performance quantities such as losses, efficiency of AC machines

CO4: Understand the importance and application of p-n junction diode

CO5: Evaluate the configurations and applications of Op-Amps.

UNIT-I **10 Lectures**

BASIC LAWS AND THEOREMS

Ohm's law, Kirchoff's Laws, series and parallel circuits, source transformations, delta-wye conversion. Mesh analysis, nodal analysis. Linearity and superposition theorem, Thevenin's theorem, Norton's theorem, maximum power transfer theorem with basic problems.

Learning outcomes: At the end of this unit, the student will be able to

1. apply Ohms and Kirchhoff’s Laws (L3)
2. analyze theorems such as Linearity & superposition theorem, Thevenin's& Norton's theorem and maximum power transfer theorem. (L4)
3. determine the current, voltage and power in a given electrical circuit (L3)

UNIT-II **10 Lectures**

DC MACHINES

Constructional features induced EMF and torque expressions with simple problems, different types of excitation, performance characteristics of different types of dc machines, 3-point starter, losses and efficiency, efficiency by direct loading with basic problems

Learning Outcomes: At the end of this unit, the student will be able to

1. understand the constructional features of DC machines. (L2)
2. analyze EMF, torque and performance characteristics of DC machines. (L4)
3. estimate losses and efficiency of electrical machines. (L3)

UNIT-III **10 Lectures**

AC MACHINES

Transformers: Constructional details, EMF equation, voltage regulation, losses and efficiency, open/short- circuit tests and determination of efficiency with basic problems.

Three Phase Induction Motors: Construction, working principle, Torque and Torque-Slip characteristics, efficiency with basic problems.

Synchronous Motor: Construction, EMF Equation, working principle.

Learning Outcomes: At the end of this unit, the student will be able to

1. outline the constructional details and principle of transformers. (L2)
2. analyze the efficiency and voltage regulation of a transformer. (L4)
3. explain the principle of three phase induction motor and synchronous motor. (L2)

UNIT-IV **10 Lectures**

SEMICONDUCTOR DEVICES

p-n Junction diode - Basic operating principle, current-voltage characteristics, rectifier circuits (half-wave, full-wave, rectifier with filter capacitor), Zener diode as Voltage Regulator; Metal oxide semiconductor field effect transistors (MOSFET): Operation of NMOS and PMOS FETs, MOSFET as an amplifier and switch

Learning Outcomes: At the end of this unit, the student will be able to

1. analyze the device structure, operation and characteristics of a p-n junction diode. (L4)
2. apply p-n diodes for various applications. (L3)
3. explain the construction, operation and applications of MOSFETs (L2)

UNIT-V **10 Lectures**

OPERATIONAL AMPLIFIERS

The Ideal Op Amp, The Inverting Configuration, The closed loop gain, Effect of Finite open-loop gain, The Non Inverting Configuration, The closed loop gain, Characteristics of Non Inverting Configuration, Effect of finite open loop gain, the voltage follower, Difference amplifiers, A Single Op-amp difference amplifier.

Learning Outcomes: At the end of this unit, the student will be able to

1. illustrate the operation of Op Amps. (L2)
2. explain different modes of operation of Op Amps. (L2)
3. make use of Op Amp in different applications. (L2)

TEXT BOOKS:

1. V. K. Mehta, Rohit Mehta, *Principle of electrical Engineering and electronics*, 3rd edition, S. Chand Publishing, New Delhi, 2016.(Unit-1, 2 and 3)
2. Adel S. Sedra and Kenneth C. Smith, *Microelectronic Circuits*, 6th edition, Oxford University Press, 2014. (Unit-4 & 5)

REFERENCES:

1. S.K. Bhattacharya, *Basic Electrical and Electronics Engineering*, Pearson Education, 2011.
2. Dharma Raj Cheruku, B T Krishna, *Electronic Devices and Circuits*, 2/e, Pearson Education, 2008.
3. R.K. Rajput, *Basic Electrical and Electronics Engineering*, University Science Press, New Delhi, 2012.

MATERIAL SCIENCE AND ENGINEERING

Course Code: 19ME1103

L	T	P	C
2	0	0	2

Course Outcomes:

At the end of the Course the student will be able to

CO1: explain binary phase diagrams.

CO2: apply heat treatment to different applications.

CO3:.select steels and cast irons for a given application.

CO4:.select nonferrous metals and alloys in engineering.

CO5: choose composites for various applications and assess the properties of nano-scale materialsand their applications.

UNIT-I **07 Lectures**

Structure of Metals: metallic crystal structures: BCC, FCC and HCP, crystallization, crystal imperfections: point, line, interstitial and volume defects; plastic deformation: slip and twinning

Constitution of Alloys: substitutional and interstitial solid solutions- binary phase diagrams:

isomorphous system, eutectic, peritectic, eutectoid and peritectoid reactions

Learning outcomes:

At the end of this unit the student will be able to

1. formulate the density of metal from lattice parameters (L6)
2. differentiate various kinds of crystal imperfections (L4)
3. interpret phase diagrams (L3)

UNIT-II **07 Lectures**

Iron-Iron Carbide Diagram: Iron-Iron Carbide diagram and microstructural aspects of ferrite, cementite, pearlite, austenite and ledeburite, Plain carbon steels and their applications

Heat Treatment of Steels: annealing, normalizing, hardening and tempering; TTT diagrams, austempering, martempering, case hardening methods

Learning outcomes:

At the end of this unit the student will be able to

1. interpret Fe-Fe_3C phase diagram (L2)
2. describe the composition, microstructure, properties and applications of plain carbon steels (L2)
3. select appropriate heat treatment process to improve desired properties of steels (L5)

UNIT-III **06 Lectures**

Alloy Steels: Effect of alloying elements on Iron-Iron carbide diagram, Hadfield manganese steel, stainless steels, tool steels, HSS.

Cast irons: Micro structure, properties and applications of white cast iron, malleable cast iron, grey cast iron, nodular cast iron and alloy cast irons.

Learning outcomes:

At the end of this unit the student will be able to

1. classify various types of alloy steels along with their properties and applications. (L4)
2. outline various types of cast irons along with their properties and applications. (L4)
3. compare the relative merits of steels and cast irons (L5)

UNIT-IV **06 Lectures**

Non-ferrous Metals and Alloys: Composition, microstructure, properties and applications of copper base, aluminum base and titanium base alloys

Polymeric Materials: Structure and properties of polymeric materials and their applications

Learning outcomes:

At the end of this unit the student will be able to

1. describe the composition, microstructure, properties and applications of copper based, aluminum based and titanium based alloys (L2)
2. differentiate between thermoplastics and thermosets (L4)
3. describe the applications of plastics (L2)

UNIT-V **06 Lectures**

Ceramic Materials: Ceramics, abrasive materials, Nano- materials-definition, properties and applications for the above.

Composite Materials: Particle reinforced materials, fiber reinforced materials, metal ceramic and polymeric matrix composites and C-C composites.

Learning outcomes:

At the end of this unit the student will be able to

1. explain ceramic, abrasive and nano materials (L2)
2. differentiate various types of composite materials (L4)
3. describe the applications of ceramic, abrasive, nano and composite materials (L2)

Text Books:

1. S. H. Avner, *Introduction to Physical Metallurgy*, 2nd Edition, Tata McGraw- Hill, 2017. (Units I-IV)

2. Kalpakjian S and Schmid S. R, *Manufacturing Engineering and Technology (SI Edition)*, PearsonPublishers, 2018. (Unit V)

Reference Books:

1. Kodgire VD and Kodgire SV, *Material Science and Metallurgy for Engineers*, Everest Publishing House, 2018.
2. Y. Lakhtin, *Engineering Physical Metallurgy*, University Press of the Pacific, 2005.
3. L.H.VanVlack, *Elements of Material Science and Engineering*, 5th Edition, Pearson Education, 2008.

MECHANICAL ENGINEERING WORKSHOP

Course Code: 19ME1104	**L**	**T**	**P**	**C**
	0	**0**	**3**	**1.5**

Course Outcomes:

After completion of this lab student will be able to
CO1: develop molds using sand casting
CO2: apply basic knowledge to make different weld joints
CO3: demonstrate assemble and disassemble of machine components
CO4: apply basic knowledge to make plastic components
CO5: build different domestic utility products

Foundry Practice:

1. Preparation of a green sand mold using single piece pattern
2. Preparation of a green sand mold using split piece pattern with core
3. Preparation of sand mold using CO_2 process

Welding Practice:

4. Butt joint arc welding
5. T joint using arc welding.
6. Lap joint using gas welding
7. Butt joints using gas welding

Assembling/Disassembling Practice:

8. Clutch and carburetor
9. Two wheeler engine
10. Gearbox of a four wheeler (with reversing gear)

Manufacture of a Plastic Component

11. Use of injection molding machine
12. FRP composite using hand layup method
13. Use of blow molding machine

Design and manufacture any two domestic utility products with any material

14. Making of stirrer to stir curd to buttermilk
15. Making of a wooden hanger stand
16. Making of stool/ Candle stand

CHEMISTRY LAB

Course Code: 19BC1104

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course the student shall be able to

CO 1: determinethe metal content indifferent samples.
CO 2: determine the strength of acids and water quality parameters.
CO 3: explainthe functioning of the instruments such as pH metry, Conductometry and Potentiometry.
CO 4: determine the physical properties like surface tension , viscosity and flash- fire points of oils.
CO 5: synthesizenano materials and biodiesel.

LIST OF EXPERIMENTS

1. Determination of Total hardness of a groundwater sample.
2. Determination of active chlorine content in Bleaching powder.
3. Determination of iron in an iron ore sample
4. Determination of copper in a copper ore
5. Estimation of calcium in portland cement
6. Determination of Sulphuric acid in lead-acid storage cell.
7. Determination of chromium (VI) by hypo.
8. Determination of strength of an acid by pH metric method.
9. Determination of Fe (II) in Mohr's salt by potentiometric method.
10. Determination of strength of an acid by conductometric method
11. Determination of viscosity of a liquid
12. Determination of surface tension of a liquid
13. Determination of Flash and Fire points of a lubricant
14. Preparation of Biodiesel from vegetable oil
15. Preparation of gold nanoparticles
16. Determination of Fe(III) in cement by spectrophotometry.

Text Books

1. N.K Bhasin and Sudha Rani, *Laboratory Manual on Engineering Chemistry*, 3rd edition, DhanpatRai Publishing Company , 2007.

Reference Books

1. A.I.Vogel, "*A Text book of quantitative chemical analysis*", 6th edition, Pearson Education Pvt. Ltd., 2002

BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LAB

Course Code: 19EE11D4

L	T	P	C
0	0	3	1.5

Course Outcomes: At the end of the Course the student shall be able to

CO1: analyze the DC Theorems

CO2: obtain the performance characteristics of DC machines and AC Machines

CO3: obtain the characteristics of Diode and LED

CO4: apply the devices such as Diode, MOSFET, OPAMP as a Rectifier, Amplifier and inverter Gate

CO5: **s**imulate Diode, Transistor, MOSFET , OPAMP circuits using suitable software

List of Experiments:

1. Verification of Kirchhoff's Laws.
2. Verification of Superposition Theorem.
3. Verification of Thevenin's Theorem.
4. Speed Control of DC shunt motor.
5. OC and SC Tests on a single phase transformer.
6. Brake Test on DC shunt motor.
7. Current Voltage Characteristics of a p-n Junction Diode/LED.
8. Diode Rectifier Circuit- Half wave rectifier
9. Diode Rectifier circuit- Full wave bridge rectifier
10. Voltage Regulation with Zener Diodes.
11. Observe output waveform of Inverting amplifier with Op-Amps
12. Observe output waveform of Non-inverting Amplifier with Op-amps.

In addition to the above experiments, at least any one or two of the experiments from the following list are required to be performed

13. Open Circuit characteristics of separately excited DC generator.
14. Design of a MOSFET amplifier.
15. Operate MOSFET as inverter/NOR gate.
16. Simulation experiments using PSPICE

    (a) Diode and Transistor Circuit Analysis.

    (b) MOSFET Amplifier design.

17. Inverting and Noninverting Amplifier Design with Op-amps.
18. Swinburn's test on DC Shunt Machine.

References:

1. D. P. Kothari and I. J. Nagrath, *Basic Electrical Engineering*, Tata McGraw Hill, 2010.
2. D. C. Kulshreshtha, *Basic Electrical Engineering*, McGraw Hill, 2009.
3. Adel S. Sedra and Kenneth C. Smith, *Microelectronic Circuits*, 6th edition, Oxford University Press, 2014.

COMMUNICATIVE ENGLISH LAB

Course Code: 19HE1102

L	T	P	C
0	0	3	1.5

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

CO1: summarize formal, semi-formal and informal speeches by native speakers
CO2: use appropriate dialogues in formal and informal contexts
CO3: demonstrate oral skills in group discussions and debates
CO4: use stress and intonation in connected speech in tune with IELTS, & TOEFL
CO5: demonstrate formal oral presentation and PPT skills

List of Activities

1. **Listening for formal introductions/self introductions** –students should listen to videos on formal self introductions and learn to introduce themselves; they also practise grammar and vocabulary exercises on computers.

2. **Listening to TED talks and answering short questions** - Identifying the topic, the context and specific pieces of information by listening to short audio texts and answering a series of questions; they also practise grammar and vocabulary exercises on computers.

3. **Listening to inspiring speeches** - Answering a series of questions about main idea and supporting ideas after listening to audio texts; they also practise grammar and vocabulary exercises on computers.

4. **Role Play** – students need toimagine a situation, assume different roles and enact them in pairs.

5. **Group Discussions on specific topics** – students have to form into groups and learn about DOs and Don'ts of GD and discuss on specific topics.

6. **Introduction to the Sounds of English: Vowels** – students should listen to the vowel sounds on computers and familiar themselves with them.

7. **Introduction to the Sounds of English: Consonants** – students are required to listen to the consonant sounds on computers and familiar themselves with them.

8. **Narrating short stories –** students have to write a short story and narrate it individually or in pairs; they also practise grammar and vocabulary exercises on computers.

9. **Narrating one's experiences -** students should recall some unforgettable experiences individually or in pairs; they also practise grammar and vocabulary exercises on computers.

10. **Pronunciation: Word stress** – students have to listen to the videos by native and non-native speakers and articulate words following appropriate rules of word stress.

11. **Pronunciation: Sentence stress** - students listen to the videos by native and non-native speakers and articulate words following appropriate rules of sentence stress.

12. **Debates –** students participate in debates after watching model debates; they also practise grammar and vocabulary exercises on computers.

13. **Oral presentations –** students prepare for presentations on the lives of remarkable engineers and perform individually; they also practise grammar and vocabulary exercises on computers.

14. **PPT presentations –** students make Power Point Presentations and present them in teams

15. **Listening for rhythm –** students listen to speeches by native speakers, familiarize themselves with rhythm; they also practise grammar and vocabulary exercises on computers.

16. **Listening for intonation -** students listen to speeches by native speakers familiarize themselves with intonation; they also practise grammar and vocabulary exercises on computers.

Textbook:

Hashemi, Louise & Thomas, Barbara.Cambridge Objective PET – Student's Book 2nd Ed., Cambridge University Press, 2018.

Reference Books:

1. Chase, Becky Tarver. *Pathways: Listening, Speaking and Critical Thinking.* Heinley ELT; 2nd Edition, 2018.
2. Hancock, Mark. English Pronunciation in Use. 10th Ed, CUP. 2003.
3. James, Ioan. Remarkable Engineers. Cambridge University Press, 2010.

Sample Web references:

Listening

- https://learningenglish.voanews.com/z/3613
- http://www.englishmedialab.com/listening.html

Speaking

- https://www.talkenglish.com/
- BBC Learning English – Pronunciation tips
- Merriam-Webster – Perfect pronunciation Exercises

All Skills

- https://www.englishclub.com/
- http://www.world-english.org/
- http://learnenglish.britishcouncil.org/

Online Dictionaries

- Cambridge dictionary online
- MacMillan dictionary
- Oxford learner's dictionaries

MATERIAL SCIENCE AND ENGINEERING LAB

Course Code: 19ME1105	**L**	**T**	**P**	**C**
	0	**0**	**2**	**1**

Course Outcomes:

At the end of the Course the student will be able to

CO1: identify various microstructures of steels and cast irons.

CO2: illustrate grains and grain boundaries.

CO3: evaluate hardness of treated and untreated steels.

CO4: summarize the importance of hardening of steels.

CO5: evaluate the properties of ceramic, polymeric and nano-materials

LIST OF EXPERIMENTS

1. Study of microstructure of pure metals – Iron, copper and aluminum.
2. Study of microstructure of low carbon steel, mild steel and high carbon steel.
3. Study of microstructure of cast irons.
4. Study of microstructure of non-ferrous alloys – aluminum, copper, titanium, nickel and theiralloys.
5. Study hardenability of steels by Jominy End Quench Test.
6. Study of microstructure of heat treated steels.
7. Find hardness of various untreated and treated steels.
8. Study of microstructure of ceramics, polymeric materials.
9. Study of microstructure of super alloy and nano-materials.
10. Find the hardness of ceramics, super alloys, nano-materials and polymeric materials