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B.Tech. Programme in  
**ELECTRONICS AND  
COMMUNICATION ENGINEERING**

2019 Regulations

COURSE STRUCTURE AND SYLLABI OF I, II SEMESTERS



COLLEGE OF ENGINEERING  
(AUTONOMOUS)

**GAYATRI VIDYA PARISHAD COLLEGE OF ENGINEERING**  
(AUTONOMOUS)

MADHURAWADA, VISAKHAPATNAM

**AFFILIATED TO JNTU- KAKINADA**

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**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.***

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## B.TECH. - ELECTRONICS AND COMMUNICATION ENGINEERING ( I , II SEMESTERS )

<b>0 SEMESTER – INDUCTION TRAINING</b>					
<b>I SEMESTER</b>					
<b>course code</b>	<b>Title of the Course</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19BM1101	Calculus and Linear Algebra	3	1	0	4
19BP1101	Applied Physics	3	0	0	3
19CT1101	Problem Solving using C	3	1	0	4
19ME1102	Engineering Graphics	1	0	3	2.5
19ME1101	Basic Engineering Workshop	0	0	3	1.5
19BP1102	Applied Physics Lab	0	0	3	1.5
19CT1102	Problem Solving Lab using C	0	0	3	1.5
19BC11Z1	Environmental Science	3	0	0	0
<b>TOTAL</b>		<b>13</b>	<b>2</b>	<b>12</b>	<b>18</b>

<b>II SEMESTER</b>					
<b>course code</b>	<b>Title of the Course</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
19BM1102	ODE and Vector Calculus	3	1	0	4
19BC1101	Engineering Chemistry	3	0	0	3
19HE1101	Communicative English	3	0	0	3
19EC1101	Network Theory	3	0	0	3
19EE11D1	Principles of Electrical Engineering	3	0	0	3
19BC1102	Engineering Chemistry Lab	0	0	3	1.5
19HE1102	Communicative English Lab	0	0	3	1.5
19EC1102	Electronics Workshop	0	0	3	1.5
19EE11D3	Principles of Electrical Engineering Lab	0	0	3	1.5
<b>TOTAL</b>		<b>15</b>	<b>1</b>	<b>12</b>	<b>22</b>

## 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 eigenvalues and eigenvectors 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*", 44<sup>th</sup> edition, Khanna Publishers, 2017.

**References:**

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



## APPLIED PHYSICS

**Course Code: 19BP1101**

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

### Course Outcomes:

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

**CO1:** realize the principles of optics in designing optical devices

**CO2:** convert the knowledge of basic principles of dielectrics magnetism to design electrical and storage devices

**CO3:** apply electromagnetic wave propagation in different guided media

**CO4:** calculate conductivity of semiconductors

**CO5:** interpret the difference between normal conductor and superconductor, demonstrate the application of nanomaterials

### UNIT-I: WAVE OPTICS

**10 Lectures**

Interference of light-Principle of Superposition-Interference in thin films (reflected light)-Newton's Rings-Applications of Interference-Determination of Wavelength, Diffraction-Fraunhofer Diffraction-Single slit Diffraction -Diffraction Grating – Grating Spectrum -Polarization-Polarization by reflection, refraction and double refraction-Nicol's Prism-Half wave and Quarter wave plate- applications of Polarization.

Text Book 1:Sec.:8.2, 8.8.1, 8.8.2, 8.11.(1 - 4), 8.12.(1, 4), 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.8.1, 10.2, 10.6.1, 10.6.1.1, 10.6.2, 10.6.5, 11.5, 11.9.1, 11.9.2, 10.10.(i, ii)

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

1. apply the phenomena of interference in anti reflection coatings and filters (L3)
2. analyze the differences between interference and diffraction (L4)
3. illustrate the concept of polarization of light and its applications (L2)
4. classify the production and detection of different polarized light (L4)

### UNIT-II: DIELECTRICS AND MAGNETICS

**10 Lectures**

Introduction to Dielectrics-Electric polarization-Dielectric polarizability, Susceptibility and Dielectric constant- Types of polarizations, mathematical derivation for electronic polarizability -Frequency dependence of polarization-Lorentz(internal) field- Claussius -Mossotti equation-Applications of Dielectrics, Introduction to Magnetics-Magnetic dipole moment-Magnetization-Magnetic susceptibility and permeability- Origin of permanent magnetic moment -Classification of Magnetic materials-Weiss theory of ferromagnetism (qualitative)-Hysteresis-soft and hard magnetic materials-Ferrites-Magnetic device applications (transformer core and hard disc).

Text Book 1: Sec : 40.1, 40.2, 40.4, 40.5, 40.9, 40.13, 40.13.1, 40.15, 40.17, 40.18, 40.21(i, ii), 41.1, 41.2, 41.4, 41.8.1, 41.14.1, 41.14.2, 41.12, 41.16 (i, iia) and Table 41.1

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

1. explain the concept of dielectric constant and polarization in dielectric materials (L2)
2. interpret Lorentz field and Claussius- Mosotti relation (L2)
3. classify the magnetic materials based on susceptibility and their temperature dependence (L2)
4. explain the applications of dielectric and magnetic materials (L2)

### **UNIT-III: ELECTROMAGNETIC WAVES & FIBER OPTICS** **10 Lectures**

Divergence and Curl of Electric and Magnetic Fields -Maxwell's Equations- Electromagnetic wave propagation in free space- Poynting's Theorem. Introduction to Optical Fibers-Total Internal Reflection-Propagation of electromagnetic waves through optical fiber-Critical angle of propagation-Acceptance angle -Numerical Aperture-Classification of fibers based on Refractive index profile, modes-importance of V number-Medical Application (endoscopy) -Fiber optic Sensors- Block Diagram of Fiber optic Communication and its advantages.

Text Book 2: Sec: 11.4, 11.5

Text Book 1: Sec:6.13, 6.14, 7.4, 7.7, 47.1, 47.2, 47.3, 47.4, 47.4.1, 47.4.2, 47.6, 47.10 (i, ii), 47.11 (1, 2, 3), 47.13, 47.19.1, 47.22.(1a, 2), 47.20, 47.21

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

1. apply the Gauss Theorem for divergence and Stokes Theorem for curl (L3)
2. assess the electromagnetic wave propagation in free space and its power (L3)
3. explain the working principle of optical fibers and its classification based on refractive index profile and mode of propagation (L2)
4. identify the applications of optical fibers in medical, communication and other fields (L2)

### **UNIT-IV: SEMICONDUCTORS** **10 Lectures**

Classification of solids based on energy bands – Intrinsic semiconductors –Electrical conductivity- derivation of density of charge carriers (electron) -Fermi energy - extrinsic semiconductors - N-type & P-type - Density of charge carriers (Qualitative)- Dependence of Fermi energy on temperature and carrier concentration -Hall effect- Hall coefficient - Applications of Hall effect - Applications of Semiconductor.

Text Book 1:Sec: 36.7, 36.8, 37.3, 37.7, 37.8.1, 37.11, 37.15, 37.16.2, 37.17.1, 37.23, 37.24, 37.28.(1 - 4), 37.28.13

**Learning Outcomes:**

The students will be able to

1. classify the energy bands of semiconductors (L2)
2. outline the properties of n-type and p-type semiconductors (L2)
3. identify the type of semiconductor using Hall effect (L2)
4. list the applications of semiconductors in electronic manufacturing (L2)

## UNIT-V: SUPERCONDUCTORS AND NANOMATERIALS

10 Lectures

Superconductors-Properties: Zero resistance, Critical temperature, Critical magnetic field, Critical current density, Meissner effect- Type-I and type-II Superconductors -BCS Theory- Josephson effect (AC & DC)-High T Superconductors- Applications of superconductors: transformers and electrical machines, magLev trains, SQUID.

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 1:Sec : 42.2, 42.4.1, 42.4.3, 42.4.4, 42.4.5, 42.4.6, 42.6, 42.7, 42.8, 42.10 (ii, vii, viii), 49.3, 49.5.1(iii), 49.5.2 (iv), 49.9, 49.17(ii, v, vii, xiv)

### Learning Outcomes:

The students will be able to

1. explain electrical resistivity of solids with temperature (L2)
2. classify superconductors based on Meissner effect (L2)
3. explain BCS theory, Josephson effect and high  $T_c$  materials (L2)
4. understand the basics and preparation methods of nanomaterials (L2)
5. identify the applications of nanomaterials in various fields (L3)

### Text Books:

1. 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.
2. H. K. Malik and A. K. Singh, *Engineering Physics*, 2<sup>nd</sup> Edition, McGraw Hill Education Pvt Ltd., 2018.

### Reference Books:

1. D. J.Griffiths, *Introduction to Electrodynamics*, 4<sup>th</sup> Edition, Pearson Education, 2014.
2. G. Keiser, *Optical Fiber Communications*, 4<sup>th</sup> Edition, Tata McGrawHill, 2008.
3. C. Kittel, *Introduction to Solid State Physics*, Wiley Publications, 2011.
4. S. M. Sze, *Semiconductor devices-Physics and Technology*, Wiley Publications, 2008.
5. T. Pradeep, *A Textbook of NanoScience and NanoTechnology*, Tata McGrawHill, 2013.

## PROBLEM SOLVING USING C

**Course Code: 19CT1101**

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

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

## 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 sectiona lparts.
11. Orthographic Projections: Systems of projections, conventions and application to orthographic Projections.
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*, 53<sup>rd</sup> Edition, Charotar Publishers, 2016.
2. K. L. Narayana and P. Kannaiah, *Engineering Drawing*, 3<sup>rd</sup> Edition, Scitech Publishers, Chennai, 2012.

**Reference Books:**

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



## 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

## APPLIED PHYSICS LAB

**Course Code: 19BP1102**

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

**CO1:** interpolate some of the physical parameters based on optical phenomena

**CO2:** analyze the dielectric behaviour of a material

**CO3:** identify the characteristics of semiconducting materials

**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 wavelength of a source-Diffraction Grating-Minimum Deviation method
2. Newton's rings – Radius of Curvature of Plano - Convex Lens.
3. Determination of particle size of flycopodium powder using LASER diffraction.
4. Study of magnetic field along the axis of a current carrying coil – Stewart and Gee's apparatus.
5. Determination of Energy Band gap of a Semiconductor p - n junction.
6. Determination of wavelength of LASER by using grating.
7. Determination of dielectric constant by charging and discharging method.
8. Determination of resistivity of semiconductor by Four probe method.
9. Study the variation of B versus H by magnetizing the magnetic material ( B-H curve).
10. Determination of Strain variation using strain Gauge sensor.
11. Hall effect
12. To determine the energy band of semiconductor by Four probe method.
13. To determine the energy gap of a semiconductor.
14. Measurement of resistance with varying temperature.

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

## 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. `int factorial_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 ( $\leq 1000000$ ), 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*, 3<sup>rd</sup> 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.

**Reference Books:**

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



## 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-spots 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. Anubha Kaushik, .Kaushik C.P, *Environmental Studies*, 3<sup>rd</sup> 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**

## 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*", 44<sup>th</sup> edition, Khanna publishers, 2017.

**References:**

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



## ENGINEERING CHEMISTRY

**Course Code: 19BC1101**

L	T	P	C
3	0	0	3

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

**CO1:** recall the principles; explain the working and design of energy storage devices.

**CO2:** compare different types of cells and explain the merits of fuel cells.

**CO3:** list various sources of renewable energy and applications of solar energy

**CO4:** classify the polymers and can apply to specific purposes

**CO5:** distinguish between nano clusters & nano wires, Molecular Machines & Switches

### Unit- I

**10 Lectures**

#### **ELECTROCHEMICAL ENERGY SYSTEMS- I**

Introduction-Electrode potential, origin and measurement, Nernst Equation for a single electrode; Types of Reference Electrodes -Hydrogen and Calomel electrode; Electrochemical Cell, Galvanic Cell vs Electrolytic Cell, Electrochemical conventions, EMF of a cell; Concentration Cells; Types of Ion Selective Electrodes - glass membrane electrode-pH measurement, polymer membrane electrodes (nafion).

#### **Learning outcomes:**

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

1. illustrate the construction of concentration cells. (L2)
2. explain the significance of electrode potentials.(L2)
3. compare different types of cells and batteries. (L2)
4. classify ion selective electrodes. (L2)

### Unit-II

**10 Lectures**

#### **ELECTROCHEMICAL ENERGY SYSTEMS - II**

Batteries- primary cells- Dry/Leclanche cell, Alkaline cells (Zn-HgO cell, Zn-AgO cell) Secondary cells– Lead acid battery, Ni-Cd battery, Lithium-ion battery, metal air battery; Fuel cells- Introduction, merits of fuel cells, hydrogen - oxygen fuel cell- Alkaline fuel cell, phosphoric acid fuel cell, propane and oxygen fuel cell .

#### **Learning outcomes:**

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

1. classify different types of batteries. (L2)
2. explain the concepts involved in the construction of lithium cells. (L2)
3. compare the merits of different fuel cells. (L2)
4. apply redox principles for construction of batteries and fuel cells. (L3)

**Unit- III****10 Lectures****ENERGY SOURCES AND APPLICATIONS**

Introduction- fossil and renewable energy; Sources of renewable energy, Solar energy- Silicon Photovoltaic cells - manufacture by chemical vapour deposition method and applications; Band theory of solids, Doping of Silicon- p and n type semiconductors; p-n junction.

**Learning outcomes**

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

1. list different renewable sources of energy. (L1)
2. explain how photovoltaic cells convert light into energy. (L2)
3. compare p and n type semiconductors. (L2)
4. illustrate the construction of PV cell. (L2)

**Unit-IV****10 Lectures****POLYMER CHEMISTRY**

Introduction to polymers - functionality of monomers, chain growth and step growth polymerization, coordination polymerization, copolymerization (stereo specific polymerization).

**Plastics** - Thermoplastic and Thermosetting, preparation, properties and applications of – Bakelite, urea-formaldehyde polymer, Nylon-66.

**Elastomers**-preparation, properties and applications of Buna-S, Buna-N.

**Conducting polymers** – Preparation, properties and applications of polyacetylene, polyaniline, polypyrroles.

**Learning Outcomes:**

At the end of this Unit, the students will be able to

1. explain different types of polymers and their applications (L2)
2. explain the preparation, properties and applications of Bakelite, Nylon-66, and carbon fibres (L2)
3. describe the mechanism of conduction in conducting polymers (L2)
4. discuss Buna-S and Buna-N elastomers and their applications (L2)

**Unit – V****10 Lectures****NANOMATERIALS AND MOLECULAR MACHINES**

**Nanomaterials:** Introduction to nanomaterials - nanoparticles, nanoclusters, fullerenes, carbon nanotubes (CNT) and nanowires; Synthesis of nanomaterials - Sol-gel method, Reverse micellar method; Variation of colour of gold nanoparticles – quantum confinement – qualitative picture based on band diagram; Applications of nanomaterials in wastewater treatment, lubricants and engines.

**Molecular machines**-Introduction, types.

**Learning outcomes:**

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

1. classify nano materials. (L2)
2. explain the synthesis and characterization methods of nano materials. (L2)
3. apply the concepts of artificial molecular machines (L3)
4. use nano materials in wastewater treatment other applications (L3)

**Text Books**

1. P.C. Jain and M. Jain, *Engineering Chemistry*, 15<sup>th</sup> edition, DhanapatRai& Sons, Delhi , 2014.
2. B.S Murthy and P. Shankar, *A Text Book of NanoScience and NanoTechnology*, University Press , 2013.

**Reference Books**

1. O.G.Palanna, *Engineering Chemistry*, Tata McGraw Hill Education Pvt Ltd, 2009.
2. SashiChawla, *A Textbook of Engineering Chemistry*, DhanapathRai and sons, 2003.
3. S.S. Dara, *A Textbook of Engineering Chemistry*, S.Chand& Co , 2010

## 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

- understand the use of cohesive devices for better reading comprehension (L2)
- write well structured paragraphs on specific topics (L3)
- 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

- infer meanings of unfamiliar words using contextual clues (L3)
- write summaries based on global comprehension of reading/listening texts (L3)
- 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

- produce a coherent paragraph interpreting a figure/graph/chart/table (L4)
- use language appropriate for description and interpretation of graphical elements (L4)
- use correct forms of adjectives, adverbs, one-word substitutes and a range of reporting 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

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

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

### Suggested Reading:

1. Carson, Rachel. *Silent Spring*. Boston Houghton Mifflin, 2002.
2. *The Individual and Society*. 1<sup>st</sup> 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://1-language.com)
- <http://www.5minuteenglish.com/>
- <https://www.englishpractice.com/>

#### Grammar/Vocabulary

- [English Language Learning Online](http://www.englishlanguagelearningonline.com/)
- <http://www.bbc.co.uk/learningenglish/>
- <http://www.better-english.com/>
- <http://www.nonstopenglish.com/>
- <https://www.vocabulary.com/>
- [BBC Vocabulary Games](http://www.bbc.co.uk/learningenglish/games/vocabulary/)
- [Free Rice Vocabulary Game](http://www.free-ice.com/)

#### 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](http://www.cambridge.org/online-dictionary)
- [MacMillan dictionary](http://www.macmillan.com/dictionary)
- [Oxford learner's dictionaries](http://www.oxfordlearnersdictionaries.com/)

## NETWORK THEORY

**Course Code: 19EC1101**

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

Prerequisites: Calculus and Linear Algebra, ODE

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

**CO1:** apply network theorems, for solving electrical circuits

**CO2:** classify appropriate technique for solving the electrical circuits under different conditions with ac sources

**CO3:** describe two port parameters and network functions used to build two port networks

**CO4:** outline basic concepts of network topology

**CO5:** explain the concepts of filters

### UNIT-I

**10 Lectures**

#### Network Theorems

Ohm's law, KCL, KVL, Node and Mesh Analysis, Superposition theorem, Thevenin & Norton theorems, Maximum power transfer theorem, Reciprocity theorem, Dual networks.

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

1. apply network theorems for electrical circuits analysis (L3)
2. determine maximum power transfer to the load (L3)
3. solve electric circuits using mesh and nodal analysis techniques (L3)

### UNIT-II

**12 Lectures**

#### Analysis of AC circuits

Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, Laplace transform evaluation of initial conditions. Sinusoidal and phasor, phasor relationship for circuit elements, Solving Series and parallel RL, RC, RLC circuits, initial and final conditions in network elements, forced and free response, time constants, transient and steady state response.

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

1. understand behavior of circuit elements under switching conditions (L2)
2. illustrate initial and final conditions in RL, RC and RLC circuits (L4)
3. analyze transient & steady state response of RL, RC & RLC circuits in time and frequency domains (L4)



**UNIT-III****10 Lectures****Two Port Networks**

Network functions of one and two ports, Poles and Zeros, Networks of different kinds, Two Port Networks, impedance parameters, admittance parameters, transmission parameters, hybrid and inverse hybrid parameters, relationship between parameters, interconnection of two port networks.

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

1. understand two port network parameters such as  $z$ ,  $y$ , ABCD and  $h$  parameters for given electrical network (L2)
2. analyze different two port network parameters (L4)
3. outline various driving point & transfer functions of two port network (L4)

**UNIT-IV****10 Lectures****Network Topology**

Linear Graphs in Electrical Networks, Basic definitions, Incidence, Loop and cut-set matrices, Fundamental Loop and Fundamental Cut-set Matrices, Graph theoretic version of KCL and KVL, Loop Impedance and Node Admittance Matrices, Duality in Electrical Networks.

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

1. understand concepts of network topology (L2)
2. illustrate Fundamentals of Cut-Set Matrices (L3)
3. analyze Duality in Electrical Networks (L4)

**UNIT-V****08 Lectures****Filters**

Filter fundamentals, series and parallel resonance, Lowpass and Highpass filter, Band pass and band stop filters.

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

1. understand Filter fundamentals (L2)
2. explain cut off frequency, pass band and stop band of a filter (L2)
3. differentiate low pass and high pass filters (L2)

**Text Books:**

C. K. Alexander and M. N. O. Sadiku, *Electric Circuits*, McGraw Hill Education, 2004.

**References:**

1. D. Roy Choudhury, *Networks and Systems*, New Age International Publications, 1998.

2. M. E. Van Valkenburg, *Network Analysis*, Prentice Hall, 2006.
3. W. H. Hayt and J. E. Kemmerly, *Engineering Circuit Analysis*, McGraw Hill Education, 2013.
4. D. K. Cheng, *Field and Wave Electromagnetics*, Addison-Wesley, 1989
5. Ravish Singh, *Network Analysis & Synthesis*, McGraw Hill Education, 2013

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## PRINCIPLES OF ELECTRICAL ENGINEERING

**Course Code: 19EE11D1**

**L T P C**

**3 0 0 3**

**Prerequisites:** Physics

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

**CO1:** Apply concepts of KVL/KCL and network theorems in solving DC circuits

**CO2:** Analyze steady state behavior of single phase and three phase AC electrical circuits

**CO3:** Illustrate working principles of induction motor, dc motor and synchronous generator.

**CO4:** Identify type of electrical machine based on their construction.

**CO5:** Describe working principles of protection devices used in electrical circuits.

### UNIT-I

**10 Lectures**

#### DC CIRCUITS

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

**Learning Outcomes:** Students should be able to

1. recall Kirchoff Voltage and Current laws (L1)
2. analyze simple electric circuits with dc excitation (L4)
3. apply network theorems to simple circuits with independent sources (L3)
4. analyze first order RL & RC circuits in time domain (L4)

### UNIT-II

**10 Lectures**

#### AC CIRCUITS

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

**Learning Outcomes:**

1. Analyze single phase AC circuits consisting of series and parallel RL, RC, RLC combinations (L4)
2. Determine conditions for resonance in the series and parallel circuits (L5)
3. Interpret voltages and currents in three-phase star - delta connections (L2)
4. Solve simple balanced three-phase ac systems (L3)

**UNIT-III****10 Lectures****TRANSFORMERS**

Magnetic materials, BH characteristics, Mutual coupled circuits, Dot Convention in coupled circuits, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency, Auto-transformer and three –phase transformers connections

**Learning Outcomes:** Students should be able to

1. understand magnetic materials and their characteristics (L2)
2. compare ideal and practical transformers (L2)
3. determine losses, efficiency, and voltage regulation of a transformer under specific operating conditions (L5)
4. identify the connections of a three phase transformer (L3)

**UNIT-IV****10 Lectures****ELECTRICAL MACHINES**

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

**Learning Outcomes:** Students should be able to

1. illustrate effects of magnetic induction on moving parts (L2)
2. explain construction & working of induction motor, DC motor & synchronous generator (L2)
3. determine motor losses and efficiency (L5)

**UNIT-V****10 Lectures****COMPONENTS OF LT SWITCHGEAR**

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

**Learning Outcomes:** Students should be able to

1. understand working principles of LT Switchgear components (L2)
2. perform elementary calculations for energy consumption (L3)
3. perform elementary calculations for power factor improvement and battery backup (L3)

**Text Books:**

1. D. P. Kothari and I. J. Nagrath, *Basic Electrical Engineering*, Tata McGraw Hill, 3<sup>rd</sup> Edition, 2010. (Unit – I, II, III, IV)
2. D. C. Kulshreshtha, *Basic Electrical Engineering*, Revised First Edition, McGraw Hill, 2017 (Unit-V)

**References:**

1. L. S. Bobrow, *Fundamentals of Electrical Engineering*, Oxford University Press, 2011.
2. E. Hughes, *Electrical and Electronics Technology*, Pearson, 2010.
3. V. D. Toro, *Electrical Engineering Fundamentals*, Prentice Hall India, 2<sup>nd</sup> Edition 1989.

## ENGINEERING CHEMISTRY LAB

**Course Code: 19BC1102**

L	T	P	C
0	0	3	1.5

**Prerequisites:** Fundamentals of Chemistry

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

**CO1:** determine the metal ions by titrimetry

**CO2:** determine the strength of acids, bases and water quality parameters

**CO3:** explain the functioning of the instruments such as pH meters, Conductometer and Potentiometer.

**CO4:** determine the physical properties like surface tension and viscosity

**CO5:** prepare polymeric resins and nanoparticles

### LIST OF EXPERIMENTS

1. Determination of Zinc by potassium Ferrocyanide.
2. Determination of Total hardness of a groundwater sample
3. Determination of copper in brass
4. Determination of active chlorine content in Bleaching powder
5. Determination of sodium carbonate and sodium bicarbonate in a mixture
6. Determination of chromium (VI) by hypo
7. Determination of sulphuric acid in lead-acid storage cell.
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 citric acid in a citrus fruit by conductometric method.
11. Determination of viscosity of a liquid.
12. Determination of surface tension of a liquid.
13. Preparation of gold nanoparticles.
14. Construction of Galvanic cell.
15. Determination of Fe(III) by spectrophotometry.
16. Preparation of Nylon polymer.

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

### **Text Books**

N.K Bhasin and Sudha Rani, *Laboratory Manual on Engineering Chemistry* 3<sup>rd</sup> edition, Dhanpat Rai Publishing Company, 2007.

### **Reference Books**

A.I.Vogel, "A Text book of quantitative chemical analysis", 6<sup>th</sup> edition, Pearson Education Pvt. Ltd., 2002

## 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 to imagine 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 2<sup>nd</sup> 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*. 10<sup>th</sup> 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](#)

## ELECTRONICS WORKSHOP

Course Code: 19EC1102

L	T	P	C
0	0	3	1.5

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

**CO1:** describe about electronic components, measuring and testing instruments.

**CO2:** apply practical experience on wiring and soldering practice on electronic circuits.

**CO3:** illustrate about the battery charging circuits.

**CO4:** demonstrate installation of open source software and EDA Tools.

**CO5:** outline various sensors and actuators.

### List of Experiments:

1. Study of datasheets for various electronic components.
2. Study of resistor colour codes, identification of active and passive electronic components.
3. Study of multimeter, CRO and DSO.
4. Testing of Electronic Components.
5. Assembling and Testing of simple electronic circuits on breadboards.
6. Study of Function Generator and Regulated power supply.
7. Soldering of Electronic components on PCBs.
8. Study of Different types of batteries.
9. Study of Battery Charging circuit.
10. Installation of open source Operating System.
11. Installation and demonstration of Linux based Office Tools.
12. Demonstration of EDA Tools.
13. Study of Sensors & Actuators.
14. Mini Hobby project.

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

## PRINCIPLES OF ELECTRICAL ENGINEERING LAB

**Course Code: 19EE11D3**

**L T P C**

**0 0 3 1.5**

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

**CO1:** explain the operation and use of various laboratory equipments

**CO2:** verify Network Theorems both theoretically and practically

**CO3:** obtain performance characteristics for AC Circuits and AC machines

**CO4:** obtain performance characteristics for DC machines

**CO5:** understand the components of LT Switchgear

### List of Experiments:

1. Study and use of measuring instruments – voltmeter, ammeter, multi-meter, oscilloscope. Real-life resistors, capacitors and inductors.
2. Verification of Thevenin's and Norton Theorems.
3. Time Response of series RL and RC Circuits
4. Transient response of Series RLC Circuit
5. Form Factor calculation of Nonsinusoidal input
6. Series Resonance
7. Load test on single phase Transformer
8. Determine the performance characteristics of a Shunt Motor.
9. Speed control of DC Shunt Motor.
10. Determine the load characteristics of a Shunt Generator.
11. Determine the load characteristics of a Single Phase Induction Motor.
12. Study and use of the LT switchgear.

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

13. OCC Characteristics of Synchronous Generator
14. Determine the performance characteristics of a Series Motor.
15. Measurement of voltage, current and phase using three phase transformer connections.
16. Determine the performance characteristics of a Compound Motor.

### References:

1. D. P. Kothari and I. J. Nagrath, *Basic Electrical Engineering*, Tata McGraw Hill, 3<sup>rd</sup> Edition 2010.
2. D. C. Kulshreshtha, *Basic Electrical Engineering*, Revised First Edition, McGraw Hill, 2017.