

**Learning Outcomes based Curriculum Framework  
(LOCF)**

**For**

**B. Tech. First Year  
(All Streams)  
4 Year Regular  
Full-Time  
Graduate Programme**



**Faculty of Engineering and Technology  
Chaudhary Devi Lal University  
Sirsa-125055  
2021**

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### 1. Faculty of Engineering & Technology

The Faculty covers the professional and academic programmes/courses run in the university teaching department of computer science and engineering, university school of graduate studies, affiliated general degree colleges, institute of computer applications and engineering colleges. BTech and MTech programmes in major disciplines and MCA, MSc Data Science, BSc Data Science, BCA programmes are managed by the Faculty.

### 2. Learning Outcome based Curriculum Framework

The CBCS evolved into learning outcome based curriculum framework and provides an opportunity for the students to choose courses from the prescribed courses comprising core, elective/minor or skill-based courses. The courses can be evaluated following the grading system, which is considered to be better than the conventional marks system. Grading system provides uniformity in the evaluation and computation of the Cumulative Grade Point Average (CGPA) based on student's performance in examinations which enables the student to move across institutions of higher learning. The uniformity in evaluation system also enables the potential employers in assessing the performance of the candidates.

#### 2.1 Objectives of the programme

Programme objectives of B. Tech. in different disciplines will be different. Programme objectives shall be specified with the full 8-semester curriculum of individual stream of engineering.

#### 2.2 Programme Outcomes (POs)

<b>PO1</b>	<b>Engineering knowledge:</b> Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
<b>PO2</b>	<b>Problem analysis:</b> Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences
<b>PO3</b>	<b>Design/development of solutions:</b> Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
<b>PO4</b>	<b>Conduct investigations of complex problems:</b> Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
<b>PO5</b>	<b>Modern tool usage:</b> Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations
<b>PO6</b>	<b>The engineer and society:</b> Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent

	responsibilities relevant to the professional engineering practice
<b>PO7</b>	<b>Environment and sustainability:</b> Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
<b>PO8</b>	<b>Ethics:</b> Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
<b>PO9</b>	<b>Individual and team work:</b> Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
<b>PO10</b>	<b>Communication:</b> Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
<b>PO11</b>	<b>Project management and finance:</b> Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
<b>PO12</b>	<b>Life-long learning:</b> Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

### 2.3 Programme Specific Outcomes (PSOs)

Programme objectives of B. Tech. in different disciplines will be different. Programme objectives shall be specified with the full 8-semester curriculum of individual stream of engineering.

### 3. Programme Structure

B. Tech. (All major disciplines/branches) programme an eight-semester (4-year) graduate programme comprises of various types of courses, namely, Basic Science Courses (BSC), Programme Core Courses (PCC), Programme Elective Courses (PEC), Engineering Science Courses (ESC), Humanities, Social Sciences and Management Courses (HSMC), and Mandatory Courses (MC).

**Note 1:** All B.Tech. Programmes running in the University and in Affiliated Colleges/Institutes are divided into following two groups:

Group	Engineering disciplines
<b>A</b>	Electronics and Communication Engineering
	Electrical Engineering
	Mechanical Engineering
<b>B</b>	Computer Science and Engineering
	Computer Science and Engineering (Artificial Intelligence and Machine Learning)
	Artificial Intelligence and Machine learning
	Civil Engineering

**Note 2:** New branch/disciplines of Engg. & Tech. to be added to the Faculty of Engg. & Tech. may be placed in the relevant Groups A/B keeping in mind the balancing of human resource load.

**Table 1(a): B.Tech. First Scheme Credit Scheme for Group - A**

Semester	Basic Sciences' Courses BSC		Engineering Sciences' Courses ESC		Humanities, Social Sciences, Management Courses HSMC		Mandatory Courses		Grand Total Credit
	No. of Courses	Total Credits	No. of Courses	Total Credits	No. of Courses	Total Credits	No. of Courses	Total Credits	
I	02	10	02	10	01	03	01	-	23
II	02	10	02	08	-	-	02	-	18

**Table 1(b): B.Tech. First Scheme Credit Scheme for Group - B**

Semester	Basic Sciences' Courses BSC		Engineering Sciences' Courses ESC		Humanities, Social Sciences, Management Courses HSMC		Mandatory Courses		Grand Total Credits
	No. of Courses	Total Credits	No. of Courses	Total Credits	No. of Courses	Total Credits	No. of Courses	Total Credits	
I	02	10	02	08	-	-	01	-	18
II	02	10	02	10	01	03	02	-	23

**Table 2(a): Detailed break-up of Courses' Type (Semester wise) Group - A**

Semester	Basic Sciences' Courses BSC	Engineering Sciences' Courses ESC	Humanities, Social Sciences, Management Courses HSMC	Mandatory Courses MC	Grand Total Credits
I	BSC/1 BSC/3 BSC/5	ESC/1 ESC/4	HSMC/1	MC/1	23
II	BSC/2 BSC/4	ESC/2 ESC/3	-	MC/2	18

**Table 2(b): Detailed break-up of Courses' Type (Semester wise) Group -B**

Semester	Basic Sciences' Courses BSC	Engineering Sciences' Courses ESC	Humanities, Social Sciences, Management Courses HSMC	Mandatory Courses MC	Grand Total Credits
I	BSC/2 BSC/3	ESC/2 ESC/3	-	MC/1	18
II	BSC/1 BSC/4 BSC/6	ESC/1 ESC/4	HSMC/1	MC/3	23

**Table 3(a): Courses' codes, titles, and credits (Group-A)**

Course Code	Course Title	Workload/Credit			
	Semester I	Theory	Tutorial	Practical	Total

BSC/1-T BSC/1(i)-T BSC/1(iv)-T	Physics: Introduction to Electromagnetic Theory (Mech. Engg.) Oscillations, Waves and Optics (Elec. Engg., Eltx. & Comm. Engg.)	3/3	1/1	-	4/4
BSC/3-T BSC/5-T	Mathematics-I Mathematics-I (for CSE/IT/AI&ML)	3/3	1/1	-	4/4
ESC/1-T	Basic Electrical Engineering	3/3	1/1	-	4/4
ESC/4-T	Workshop/Manufacturing Practices	3/3	-	-	3/3
HSMC/1-T	English	2/2	-	-	2/2
BSC/1-P BSC/1(i)-P BSC/1(iv)-P	Physics Lab: Introduction to Electromagnetic Theory (Mech. Engg.) Oscillations, Waves and Optics (Elec. Engg., Eltx. & Comm. Engg.)	-	-	4/2	4/2
ESC/1-P	Basic Electrical Engineering Lab	-	-	2/1	2/1
ESC/4-P	Workshop/Manufacturing Practices Lab	-	-	4/2	4/2
HSMC/1-P	English Lab	-	-	2/1	2/1
MC/1	Induction Training	-	-	-	-
<b>Total</b>		<b>14/14</b>	<b>3/3</b>	<b>12/6</b>	<b>29/23</b>
<b>Semester II</b>		Theory	Tutorial	Practical	Total
BSC/2-T	Chemistry	3/3	1/1	-	4/4
BSC/4-T	Mathematics-II	3/3	1/1	-	4/4
ESC/2-T	Engineering Graphics and Design	1/1	-	-	1/1
ESC/3-T	Programming for Problem Solving	3/3	-	-	3/3
MC/2-T	Environmental Science	3/-	-	-	3/-
BSC/2-P	Chemistry Lab	-	-	4/2	4/2
ESC/2-P	Engineering Graphics and Design Lab	-	-	4/2	4/2
ESC/3-P	Programming for Problem Solving Lab	-	-	4/2	4/2
<b>Total</b>		<b>13/10</b>	<b>2/2</b>	<b>12/6</b>	<b>27/18</b>

**Table 3(b): Courses' codes, titles, and credits (Group-B)**

Course Code	Course Title	Workload/Credit			
		Theory	Tutorial	Practical	Total
<b>Semester I</b>		Theory	Tutorial	Practical	Total
BSC/2-T	Chemistry	3/3	1/1	-	4/4
BSC/4-T	Mathematics-II	3/3	1/1	-	4/4
ESC/2-T	Engineering Graphics and Design	1/1	-	-	1/1
ESC/3-T	Programming for Problem Solving	3/3	-	-	3/3
BSC/2-P	Chemistry Lab	-	-	4/2	4/2
ESC/2-P	Engineering Graphics and Design Lab	-	-	4/2	4/2
ESC/3-P	Programming for Problem Solving Lab	-	-	4/2	4/2
MC/1	Induction Training	-	-	-	-
<b>Total</b>		<b>13/10</b>	<b>2/2</b>	<b>12/6</b>	<b>24/18</b>
<b>Semester II</b>		Theory	Tutorial	Practical	Total
BSC/1-T BSC/1(ii)-T BSC/1(v)-T	Physics: Introduction to Mechanics-Civil Engg. Semiconductor Physics- CSE/IT/AI & ML/ CSE (AI/ML)	3/3	1/1	-	4/4

BSC/4-T	Mathematics-II	3/3	1/1	-	4/4
BSC/6-T	Mathematics-II (for CSE/IT/AI/ML)				
ESC/1-T	Basic Electrical Engineering	3/3	1/1	-	4/4
ESC/4-T	Workshop/Manufacturing Practices	3/3	-	-	3/3
HSMC/1-T	English	2/2	-	-	2/2
MC/3-T	Indian Constitution	3/-	-	-	3/-
BSC/1-P	Physics Lab:	-	-	4/2	4/2
BSC/1(ii)-P	Introduction to Mechanics-Civil Engg.				
BSC/1(v)-P	Semiconductor Physics- CSE/IT/AI & ML/ CSE (AI/ML)				
ESC/1-P	Basic Electrical Engineering Lab	-	-	2/1	2/1
ESC/4-P	Workshop/Manufacturing Practices Lab	-	-	4/2	4/2
HSMC/1-P	English Lab	-	-	2/1	2/1
Total		<b>17/14</b>	<b>3/3</b>	<b>12/6</b>	<b>32/23</b>

**Note 3:** The following mandatory non-credit courses taught in 2<sup>nd</sup> semester to group A disciplines will be taught to group B disciplines in 3<sup>rd</sup> semester, and vice versa.

Mandatory non-credit courses to be taught during 3 <sup>rd</sup> semester	
Environmental Sciences	Group B
Indian Constitution	Group A

**Note 4:** Each discipline of Engineering & Technology has opted one of the following seven options in Physics Course most suitable to their students/disciplines (Table 4). However, keeping the logistics in mind, the College/Institute may opt a different Physics Course for different disciplines.

#	Course name
(i)	Introduction to Electromagnetic Theory
(ii)	Introduction to Mechanics
(iii)	Optics, Fibre Optics, Magnetism, and Nuclear Physics
(iv)	Oscillations, Waves and Optics
(v)	Semiconductor Physics
(vi)	Waves Optics, Quantum Mechanics and Solids
(vii)	Introduction to Quantum Physics

**Table 4.** Discipline-wise Physics Course options

Discipline	Option
Mechanical Engineering	Introduction to Electromagnetic Theory
Electrical Engineering	Oscillation, Waves and Optics
Electronics and Communication Engineering	Oscillation, Waves and Optics
Civil Engineering	Introduction to Mechanics
Computer Science and Engineering, Information Technology, Computer Science and Engineering (AI and ML) Artificial Intelligence and Machine Learning	Semiconductor Physics

**Note 5: Induction Programme (MC/1)**

It is mandatory to conduct an induction programme for newly admitted students right at the beginning of the first semester. The objective of the induction programme is to create a bond between the institution and the newly admitted students.

The new students enter an institution with diverse backgrounds and expectations. It is important to help them adjust to the new environment. To meet this purpose, there will be three week-long induction programme before the normal classes start. The induction program shall provide students the opportunity to settle down and be comfortable in the new environment. The new students will come to know their seniors, faculty members, department and university. The student would be engaged in the following activities.

1. Familiarization with the Department and the University
2. Physical activities like morning walks, cycling or playing one or the other games.
3. Creative arts like painting, music and dancing etc.
4. Talks and lectures by eminent people, and group discussion on universal Human values
5. Literary activities like reading writing or debating

The schedule for organizing the induction programme shall be prepared every year at university level. Students will be engaged in diverse activities at the level of Department. Depending on the interest, every student must opt for one of the activities during all the semesters. For this purpose, the following clubs shall be established in the Department.

1. Sports Club
2. Green Club
3. Culture, Literature and Film Club
4. Social Service Club
5. Technology Innovation Club

Each student will spend 3 to 5 hours for these activities per week.

# Theory Courses



<b>Course code</b>	<b>BSC/1(i)-T</b>		
<b>Category</b>	<b>Basic Science Course</b>		
<b>Course title</b>	<b>Physics: Introduction to Electromagnetic Theory</b>		
<b>Scheme and Credits</b>	<b>L</b>	<b>T</b>	<b>Credits</b>
	<b>3</b>	<b>1</b>	<b>4</b>
<b>Course Assessment Methods</b>	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination ( 70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> <li>☐ A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</li> </ul>		

**Pre-requisites** High-school education

- Course objectives**
- ☐ Analyzing Electromagnetism in different mediums
  - ☐ Developing and designing various engineering applications involving Electromagnetic fields.
  - ☐ Providing good knowledge on magnetic materials.
  - ☐ Apprising the students with Maxwell's equations and their significance.
  - ☐ Studying propagation of EM waves in different mediums.

#### **Course Outcomes**

**By the end of the course students will be able to:**

- CO1. describe physics of electromagnetic theory.
- CO2. Analyze / demonstrate the different forms of Maxwell equations in different mediums.
- CO3. apply Maxwell equations as per their course or practical application requirements.
- CO4. Differentiate between the materials based on its magnetic properties.
- CO5. defend critically and to use appropriate concepts in problems or situations involving the fundamental principles of physics in electronics devices.
- CO6. create, think and participate deeply, creatively and analytically in emerging area of engineering and technology.

#### **Course Contents:**

##### **UNIT – I**

#### **Electrostatics in vacuum and linear dielectric medium**

Calculation of electric field and electrostatic potential for a charge distribution; Divergence and curl of electrostatic field; Laplace's and Poisson's equations, Boundary conditions of electric field and electrostatic potential; energy of a charge distribution and its expression.

Electrostatic field and potential of a dipole. Bound charges due to electric polarization; Electric displacement; Method of Images, boundary conditions on displacement, Problems: Point charge at the center of dielectric sphere, Charge in front of dielectric slab.

##### **UNIT - II**

### Magnetostatics

Bio-Savart law, Divergence and curl of static magnetic field; vector potential and calculating it for a given magnetic field using Stokes' theorem; the equation for the vector potential and its solution for given current densities.

Magnetostatics in a linear magnetic medium: Magnetization and associated bound currents; auxiliary magnetic field; Boundary conditions on  $\mathbf{B}$  and  $\mathbf{H}$ . Solving for magnetic field due to simple magnets like a bar magnet; magnetic susceptibility and ferromagnetic, paramagnetic and diamagnetic materials. Magnetic field in presence of magnetic materials (Qualitative only)

### UNIT - III

#### Faraday's law and Maxwell's equations

Faraday's law; equivalence of Faraday's law and motional EMF; Lenz's law; Electromagnetic induction and its applications; Differential form of Faraday's law; energy stored in a magnetic field, Continuity equation for current densities; Modified equation for the curl of magnetic field; displacement current and magnetic field arising from time-dependent electric field; Maxwell's equation in vacuum and non-conducting medium; Energy in an electromagnetic field; Flow of energy and Poynting vector (Qualitative only), Momentum in EM field (Qualitative only)

### UNIT - IV

#### Electromagnetic waves and Transmission lines

The wave equation; Plane electromagnetic waves in vacuum, their transverse nature and polarization; relation between electric and magnetic fields of an electromagnetic wave; energy carried by electromagnetic waves and examples. Momentum carried by electromagnetic waves and resultant pressure.

Reflection and transmission of EM waves from a non-conducting medium, vacuum interface for normal incidence.

#### Suggested Text Books

1. David Griffiths, Introduction to Electrodynamics, Pearson Publisher
2. Resnick and Halliday, Physics, Wiley Publisher
3. W. Saslow, Electricity, magnetism and light, Elsevier Publisher

#### CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	2	1	-	-	-	-	-	-	-	-	-	-
CO2.	2	1	-	-	-	-	-	-	-	-	-	-
CO3.	2	1	-	-	-	-	-	-	-	-	-	-
CO4.	2	1	-	-	-	-	-	-	-	-	-	-
CO5.	2	1	-	-	-	-	-	-	-	-	-	-
CO6.	2	1	-	-	-	-	-	-	-	-	-	-
3 –High 2-Medium 1-Low												

Course code	BSC/1(ii)-T		
Category	Basic Science Course		
Course title	Physics: Introduction to Mechanics		
Scheme and Credits	L	T	Credits
	3	1	4
Course Assessment Methods	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination ( 70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> <li>☐ A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</li> </ul>		

**Pre-requisites:** High-school education

**Course Objectives**

- ☐ Developing basic understanding vector mechanics,
- ☐ Studying various frame of references.
- ☐ Gaining knowledge about Harmonic motion,
- ☐ Studying rigid body mechanics along with frictional forces

**Course Outcomes:**

**By the end of the course students will be able to:**

- CO1. describe different mechanisms, degree of freedom and kinematic synthesis of mechanism analysis. Students will be able to understand and analyse the various problems encountered in physical world from Newtonian mechanics.
- CO2. demonstrate basic scientific principles, theories and laws as well as an awareness of the changing nature of science.
- CO3. apply, formulate and solve engineering problems.
- CO4. compare various results based on degree of approximations are utilized in even mechanical problems as well.
- CO5. defend critically and to use appropriate concepts in problems or situations involving the fundamental principles of physics in electronics devices.
- CO6. create, think and participate deeply, creatively, and analytically in emerging area of engineering and technology.

**Course Contents:**

### UNIT I

#### Vector Mechanics of Particles

Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Newton's laws and its completeness in describing particle motion; Form invariance of Newton's Second Law; Problems including constraints and friction; Extension to cylindrical and spherical coordinates. Potential energy function;  $F = -\text{Grad } V$ , equi-potential surfaces and meaning of gradient.

## UNIT II

### Mechanics of Particles in Motion and Harmonic Motion

Conservative and non-conservative forces, curl of a force field; Central forces; Conservation of Angular Momentum; Energy equation and energy diagrams; Elliptical, parabolic and hyperbolic orbits; Application: Satellite maneuvers;

Non-inertial frames of reference; Rotating coordinate system: Five-term acceleration formula. Centripetal and Coriolis accelerations; Applications: Weather systems;

Harmonic oscillator; Damped harmonic motion – over-damped, critically damped and lightly-damped oscillators; Forced oscillations and resonance.

## UNIT III

### Rigid Body Mechanics

Definition and motion of a rigid body in the plane; Rotation in the plane; Kinematics in a coordinate system rotating and translating in the plane; Angular momentum about a point of a rigid body in planar motion; Euler's laws of motion, their independence from Newton's laws, and their necessity in describing rigid body motion;

Introduction to three-dimensional rigid body motion — only need to highlight the distinction from two-dimensional motion in terms of (a) Angular velocity vector, and its rate of change and (b) Moment of inertia tensor; Three-dimensional motion of a rigid body wherein all points move in a coplanar manner: e.g. Rod executing conical motion with center of mass fixed — to show that formulation in 2D fails.

## UNIT IV

### Statics of Solids

Free body diagrams with examples on modeling of typical supports and joints; Condition for equilibrium in three- and two- dimensions; Friction: limiting and non-limiting cases; Force displacement relationship; Geometric compatibility for small deformations; Illustrations through simple problems on axially loaded members like trusses.

### Suggested Text Books

1. Engineering Mechanics, 2<sup>nd</sup> ed. — MK Harbola, Cengage Learning India publisher
2. Introduction to Mechanics — MK Verma, CRC Press
3. An Introduction to Mechanics — D Kleppner & R Kolenkow, University Printing House,
4. Cambridge
5. Principles of Mechanics — JL Synge & BA Griffiths, McGraw-Hill

### CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	2	1	-	-	-	-	-	-	-	-	-	-
CO2.	2	1	-	-	-	-	-	-	-	-	-	-
CO3.	2	1	-	-	-	-	-	-	-	-	-	-
CO4.	3	1	-	-	-	-	-	-	-	-	-	-
CO5.	2	1	-	-	-	-	-	-	-	-	-	-
CO6.	2	1	-	-	-	-	-	-	-	-	-	-
3 –High 2-Medium 1-Low												

Course code	BSC/1(iii)-T			
Category	Basic Science Course			
Course title	Physics: Optics, Fiber Optics, Magnetism and Nuclear Physics			
Scheme and Credits	L	T	Credits	
	3	1	4	
Course Assessment Methods	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination ( 70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> <li>☐ A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</li> </ul>			

**Pre-requisites:** High-school education

**Course Objectives:**

- ☐ Understanding of optics and its applications,
- ☐ Studying light propagation through optical fibers.
- ☐ Apprising about different laws of electricity and magnetism
- ☐ Gaining knowledge on magnetic materials.
- ☐ Acquiring knowledge about Nuclear Physics

**Course Outcomes:**

Students will be familiar with

- CO1. Bragg's Law
- CO2. Principles, types of lasers and its applications
- CO3. Various terms related to properties of materials viz. permeability, polarization, etc.
- CO4. Magnetic and dielectric properties of materials
- CO5. Nuclear Phenomena and their applications

**Course Contents:**

### UNIT – I

#### Optics

Diffraction: Introduction to interference and example; concept of diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at single slit, double slit, and multiple slits; diffraction grating, characteristics of diffraction grating and its applications.

Polarization: Introduction, polarization by reflection, polarization by double refraction, scattering of light, circular and elliptical polarization, optical activity.

## UNIT – II

### Fiber Optics and Lasers

Fiber Optics: Introduction, optical fiber as a dielectric wave guide: total internal reflection, numerical aperture and various fiber parameters, losses associated with optical fibers, step and graded index fibers, application of optical fibers.

**Lasers:** Introduction to interaction of radiation with matter, principles and working of laser: population inversion, pumping, various modes, threshold population inversion, three level Laser, types of laser: Ruby, He-Ne, semiconductor, Diode, gas; applications of lasers.

## UNIT – III

### Electromagnetism and Magnetic Properties of Materials

Laws of electrostatics, electric current and the continuity equation, laws of magnetism. Ampere's Faraday's laws. Maxwell's equations. Polarization, permeability and dielectric constant, polar and non-polar dielectrics, applications of dielectrics. Magnetization, permeability and susceptibility, classification of magnetic materials, ferromagnetism, magnetic domains and hysteresis, applications.

## UNIT – IV

### Nuclear Physics

Nuclear Physics: Neutron cross-section, Nuclear fission, Moderators reactors, Reactor critically, nuclear fusion. Interaction of radiation with matter. Basic concepts: radiation detectors- ionization chamber, GM counter scintillation and solid state detectors, cloud chamber, and bubble chamber.

### Suggested Text Books

1. J. Pain, "The physics of vibrations and waves", Wiley, 2006.
2. Ghatak, "Optics", McGraw Hill Education, 2012.
3. F.W Sears, "Electricity and Magnetism", Narosa publication.
4. D. Halliday, R. Resnick & K.S. Krane, "Physics Vol-I & II", Wiley Eastern publication
5. Beiser, S. Mahajan and S.R. Choudhury, "Concepts of Modern Physics", 7th Edition, McGraw Hill Ed. (India) Pvt. Ltd.

### CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	2	1	-	-	-	-	-	-	-	-	-	-
CO2.	2	1	-	-	-	-	-	-	-	-	-	-
CO3.	2	1	-	-	-	-	-	-	-	-	-	-
CO4.	2	1	-	-	-	-	-	-	-	-	-	-
CO5.	2	1	-	-	-	-	-	-	-	-	-	-
3 –High 2-Medium 1-Low												

<b>Course code</b>	<b>BSC/1(iv)-T</b>		
<b>Category</b>	<b>Basic Science Course</b>		
<b>Course title</b>	<b>Physics: Oscillations, waves and optics</b>		
<b>Scheme and Credits</b>	<b>L</b>	<b>T</b>	<b>Credits</b>
	<b>3</b>	<b>1</b>	<b>4</b>
<b>Course Assessment Methods</b>	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination ( 70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> <li>☐ A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</li> </ul>		

**Pre-requisite:** Mathematics course on Differential equations

- Course Objectives:**
- ☐ Analyzing oscillations and waves mathematically.
  - ☐ Solving simple problems of geometric optics.
  - ☐ Predicting diffraction and interference patterns.
  - ☐ Operating small telescopes and record images.
  - ☐ Understanding different type of laser and lasing action with app

**Course Outcomes:**

Students will be able to appreciate and analyze

- CO1. Harmonic Oscillator and its wide applicability
- CO2. Diffraction and interference effects of light
- CO3. Behavior of waves at the boundary
- CO4. Principle and working of LASERs and their types

**Course Contents:**

**UNIT – I**

**Harmonic Motion**

Mechanical and electrical simple harmonic oscillators, damped harmonic oscillator – heavy, critical and light damping, energy decay in a damped harmonic oscillator, quality factor, forced mechanical and electrical oscillators, electrical and mechanical impedance, steady state motion of forced damped harmonic oscillator, power absorbed by oscillator.

**UNIT – II**

**Waves and Dispersion**

Transverse wave on a string, Harmonic waves, waves at a boundary, impedance matching, standing waves and their eigen frequencies, longitudinal waves and its equation, acoustics waves, standing sound waves. Waves with dispersion, water waves, superposition of waves, wave groups and group velocity.

Fermat's principle of stationary time, mirage effect, laws of reflection and refraction, Light as an electromagnetic wave and Fresnel equations, reflectance and transmittance, Brewster's angle, total internal reflection, and evanescent wave.

### UNIT – III

#### Wave Optics

Huygens' principle, superposition of waves and interference of light by division of wavefront and division of amplitude; Young's double slit experiment, Newton's rings; Fraunhofer diffraction from a single slit and N-slit, the Rayleigh criterion for limit of resolution and its application; Diffraction gratings and their resolving power;

### UNIT – IV

#### LASERS

Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by stimulated emission, population inversion, components of LASER, Properties of LASER beams: mono-chromaticity, coherence, directionality and brightness; different types of lasers: gas lasers (He-Ne), solid-state lasers (Ruby, Neodymium), Semiconductor lasers; Applications of LASER.

#### Suggested Text Books

1. H.J. Pain, -The physics of vibrations and waves, Wiley, 2006.
2. A. Ghatak, -Optics||, McGraw Hill Education, 2012.
3. Concepts of Modern Physics, by Arthur Beiser (McGraw-Hill)

#### CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	2	1	-	-	-	-	-	-	-	-	-	-
CO2.	2	1	-	-	-	-	-	-	-	-	-	-
CO3.	2	1	-	-	-	-	-	-	-	-	-	-
CO4.	2	1	-	-	-	-	-	-	-	-	-	-
3 –High    2-Medium    1-Low												



<b>Course code</b>	<b>BSC/1(v)-T</b>		
<b>Category</b>	<b>Basic Science Course</b>		
<b>Course title</b>	<b>Physics: Semiconductor Physics</b>		
<b>Scheme and Credits</b>	<b>L</b>	<b>T</b>	<b>Credits</b>
	<b>3</b>	<b>1</b>	<b>4</b>
<b>Course Assessment Methods</b>	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination ( 70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> <li>☐ A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</li> </ul>		

#### About the Course:

Through their careers in engineering, B. Tech. students are expected to give a basic exposure to physics that will better prepare them for more rigorous course in their degree. This course is designed to introduce the basics of semiconductors from view point of engineering students

**Pre-requisite:** Introduction to Quantum Concepts” Desirable

**Course Objectives:**

- ☐ Acquiring detailed idea about the electronic bands
- ☐ Characterize materials on the basis of band gap.
- ☐ Equipping with knowledge on semiconductor physics
- ☐ Studying light semiconductor interactions.
- ☐ Finding the band gap and defects concentration.

#### Course Outcomes:

##### By the end of the course students will be able to:

- CO1. describe physics behind semiconductors and its devices.
- CO2. demonstrate and differentiate the materials types based on their band gap values and applying it for other applications.
- CO3. apply, formulate and solve engineering problems like Appreciating formation of junctions in PN diode and its theory..
- CO4. compare various devices like devices working based on PN junction and Metal Semiconductor junction devices.
- CO5. defend critically and to use appropriate concepts in problems or situations involving the fundamental principles of physics in electronics devices.
- CO6. create, think and participate deeply, creatively, and analytically in emerging area of engineering and technology.

**Course contents:****UNIT-I****Electronic Materials**

Review of Quantum Concepts, Free electron theory, Density of states and energy band diagrams, Kronig-Penny model (Qualitative) and Energy bands in solids, E-K diagram, Direct and indirect bandgaps, Types of electronic materials: metals, semiconductors, and insulators, Occupation probability of electrons, Fermi level, Effective mass.

**UNIT - II****Semiconductors**

Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier- concentration and temperature (equilibrium carrier statistics), Carrier generation and recombination, Carrier transport: diffusion and drift, p-n junction, Metal- semiconductor junction (Ohmic and Schottky).

**UNIT - III****Light-Semiconductor Interaction**

Optical transitions in bulk semiconductors: absorption, spontaneous emission, and stimulated emission; Density of states for photons, Transition rates (Fermi's golden rule), Optical loss and gain; Photovoltaic effect, Exciton, Drude model.

**UNIT - IV****Measurements & Engineered Semiconductor Materials**

Four-point probe and van der Pauw measurements for carrier density, resistivity, and hall mobility; Hot-point probe measurement, capacitance-voltage measurements, parameter extraction from diode I-V characteristics, DLTS, band gap by UV-VIS spectroscopy, absorption/transmission. Density of states in 2D, 1D and 0D (qualitatively). Practical examples of low- dimensional systems such as quantum wells, wires, and dots: design, fabrication, and characterization techniques.

**Suggested Text Books**

1. B. E. A. Saleh and M. C. Teich, Fundamentals of Photonics, John Wiley & Sons, Inc., (2007).
2. S. M. Sze, Semiconductor Devices: Physics and Technology, Wiley (2008).
3. P. Bhattacharya, Semiconductor Optoelectronic Devices, Prentice Hall of India (1997).
4. Online course: —Semiconductor Optoelectronics|| by M R Shenoy on NPTEL
5. Solid State Physics, by C. Kittel (Wiley Eastern)

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	2	1	-	-	-	-	-	-	-	-	-	-
CO2.	2	1	-	-	-	-	-	-	-	-	-	-
CO3.	2	1	-	-	-	-	-	-	-	-	-	-
CO4.	2	1	-	-	-	-	-	-	-	-	-	-
CO5.	2	1	-	-	-	-	-	-	-	-	-	-
CO6.	2	1	-	-	-	-	-	-	-	-	-	-
3 –High 2-Medium 1-Low												

<b>Course code</b>	<b>BSC/1(vi)-T</b>		
<b>Category</b>	<b>Basic Science Course</b>		
<b>Course title</b>	<b>Physics: Waves Optics, Quantum Mechanics and Solids</b>		
<b>Scheme and Credits</b>	<b>L</b>	<b>T</b>	<b>Credits</b>
	<b>3</b>	<b>1</b>	<b>4</b>
<b>Course Assessment Methods</b>	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination ( 70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> <li>☐ A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</li> </ul>		

**Pre-requisites:** High-school education

- Course Objectives:**
- ☐ Developing basic understanding of optics and its applications,
  - ☐ Studying light propagation.
  - ☐ Understanding basics of wave optics and lasers,
  - ☐ To have basic knowledge about Quantum Mechanical phenomena's.
  - ☐ To gain knowledge on solids and semiconducting materials.

### Course outcomes

Students will be familiar with

- CO1. Wave motion
- CO2. principles, types and applications of lasers
- CO3. basic laws related to quantum mechanics
- CO4. Simple quantum mechanics calculations
- CO5. Various terms related to semiconducting properties of materials

### Course Contents:

#### UNIT – I

##### Wave and Light Motion

Waves: Mechanical and electrical simple harmonic oscillators, damped harmonic oscillator, forced mechanical and electrical oscillators, impedance, steady state motion of forced damped harmonic oscillator, Non-dispersive transverse and longitudinal waves: Transverse wave on a string, the wave equation on a string, Harmonic waves, reflection and transmission of waves at a boundary, impedance matching, standing waves and their Eigen frequencies, longitudinal waves and the wave equation for them, acoustics waves.

**Light and Optics:** Light as an electromagnetic wave and Fresnel equations, reflectance and

transmittance, Brewster's angle, total internal reflection, and evanescent wave.

## UNIT – II

### Wave Optics and Lasers

Huygens' principle, superposition of waves and interference of light by wave-front splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer. Fraunhofer diffraction from a single slit and a circular aperture, the Rayleigh criterion for limit of resolution and its application to vision; Diffraction gratings and their resolving power.

Lasers: Einstein's theory of matter radiation interaction and A and B coefficients; amplification of light by population inversion, Three level Lasers, different types of lasers: gas (He-Ne), solid-state (ruby, Neodymium), Semiconductor; Properties of laser beams: mono-chromaticity.

## UNIT – III

### Introduction to Quantum Mechanics

Wave nature of Particles, Time-dependent and time-independent Schrodinger equation for wave function, Born interpretation, probability current, Expectation values, Free-particle wave function and wave-packets, Uncertainty principle.

Solution of stationary-state Schrodinger equation for one dimensional problems– particle in a box, particle in attractive delta-function potential, square-well potential, linear harmonic oscillator. Scattering from a potential barrier and tunneling; related examples like alpha- decay, field-ionization and scanning tunneling microscope, tunneling in semiconductor structures.

## UNIT – IV

### Introduction to Solids and Semiconductors

Free electron theory of metals, Fermi level, density of states in 1, 2 and 3 dimensions (qualitative only), Bloch's theorem for particles in a periodic potential, Kronig- Penney model and origin of energy bands.

Types of electronic materials: metals, semiconductors, and insulators. Intrinsic and extrinsic semiconductors, Dependence of Fermi level on carrier-concentration and temperature, Carrier generation and recombination, Carrier transport: diffusion and drift, p -n junction.

### Suggested Text Books

1. J. Pain, "The physics of vibrations and waves", Wiley, 2006.
2. Ghatak, "Optics", McGraw Hill Education, 2012.
3. D. J. Griffiths, "Quantum mechanics", Pearson Education, 2014.
4. B.G. Streetman, "Solid State Electronic Devices", Prentice Hall of India, 1995.
5. Beiser, S. Mahajan and S.R. Choudhury, "Concepts of Modern Physics", 7th Ed., McGraw Hill Ed. (India) Pvt. Ltd.
6. Solid State Physics, by C. Kittel (Wiley Eastern)

### CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	2	1	-	-	-	-	-	-	-	-	-	-
CO2.	2	1	-	-	-	-	-	-	-	-	-	-
CO3.	2	1	-	-	-	-	-	-	-	-	-	-
CO4.	2	1	-	-	-	-	-	-	-	-	-	-
CO5.	2	1	-	-	-	-	-	-	-	-	-	-
3 –High	2-Medium	1-Low										

<b>Course code</b>	<b>BSC/1(vii)-T</b>		
<b>Category</b>	<b>Basic Science Course</b>		
<b>Course title</b>	<b>Physics: Introduction to Quantum Physics</b>		
<b>Scheme and Credits</b>	<b>L</b>	<b>T</b>	<b>Credits</b>
	<b>3</b>	<b>1</b>	<b>4</b>
<b>Course Assessment Methods</b>	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination ( 70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> <li>☐ A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</li> </ul>		

**Pre-requisite :** Mathematics course on differential equations and linear algebra

**Course Objectives:**

- ☐ Equipping oneself with Mathematical Preliminaries for Quantum Mechanics
- ☐ Appreciating failure of Classical Mechanics and need for Quantum Mechanics.
- ☐ Defining Postulates of Quantum Mechanics and its applications
- ☐ Solving and Applying Schrodinger Equation ☐ Applying Quantum Mechanics to Solids

**Course Outcomes:**

**By the end of the course students will be able to:**

- CO1. describe physics of quantum physics.
- CO2. demonstrate the significance of operators and eigenvalue problems in quantum mechanics.
- CO3. apply one-dimensional problems involving transmission, reflection and tunneling of quantum probability amplitudes
- CO4. pursue simulation and modeling of systems encountered in nanotechnologies having basic knowledge of physics.
- CO5. defend critically and to use appropriate concepts in problems or situations involving the fundamental principles of physics in electronics devices.
- CO6. create an informed appreciation of the paradigm shift already in evidence in technologies behind modern services and products.

## Course contents:

### UNIT-I

#### Mathematical Preliminaries and Introduction

Complex numbers, Linear Vector Spaces, inner product, operators, eigenvalue problem, Hermitian operators, Hermite polynomials, Quantum theory of light, Blackbody Radiation, Photoelectric effect, Compton effect, X-rays production, spectrum & diffraction (Bragg's law), pair production, photons & gravity, Gravitational Red Shift, Black holes, de-Broglie hypothesis, particle diffraction.

### UNIT-II

#### Postulates of Quantum Mechanics and Applications

Postulates of quantum mechanics, wave function, Born interpretation and normalization, Schrodinger theory, Time-dependent and Time-independent Schrodinger equation, Operators, expectation values, Ehrenfest theorem, particle diffraction, Free-particle wavefunction and wave-packets, uncertainty principle and its applications

### UNIT – III

#### Applying the Schrodinger equation

Solution of stationary-state Schrodinger equation for one dimensional problem, Particle in a box (infinite potential well), Potential step, Finite Potential Well and Barrier, Tunnelling, Linear harmonic oscillator (one-dimensional), 3-D rigid box and degeneracy.

### UNIT – IV

#### Application of Quantum Mechanics to Solids

Free Electron theory of Metals (Classical and Sommerfeld), Fermi level, density of states, Bloch's theorem for particles in a periodic potential, Kronig-Penney Model and origin of energy bands, conductors, insulators and semiconductors, Fermi level, density of states, Effective mass, E-K diagrams, Specific heat of solids

#### Suggested Text Books

1. Concepts of Modern Physics, by Arthur Beiser (McGraw-Hill)
2. Eisberg and Resnick, Introduction to Quantum Physics
3. D. J. Griffiths, Introduction to Quantum mechanics (Prentice Hall)
4. Solid State Physics, by C. Kittel (Wiley Eastern)

#### CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	2	1	-	-	-	-	-	-	-	-	-	-
CO2.	2	1	-	-	-	-	-	-	-	-	-	-
CO3.	2	1	-	-	-	-	-	-	-	-	-	-
CO4.	2	1	-	-	-	-	-	-	-	-	-	-
CO5.	2	1	-	-	-	-	-	-	-	-	-	-
CO6.	2	1	-	-	-	-	-	-	-	-	-	-
3 –High 2-Medium 1-Low												

Course code	BSC/2-T		
Category	Basic Science Course		
Course title	Chemistry		
Scheme and Credits	L	T	Credits
	3	1	4
Course Assessment Methods	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination (70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> </ul>		

### Course Outcomes

#### By the end of the course students will be able to:

- CO1. Analyze structure of molecules in terms of atomic and molecular orbitals.
- CO2. Rationalize bulk properties and processes using thermodynamic considerations.
- CO3. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.
- CO4. Rationalize periodic properties such as ionization potential, electro negativity, oxidation states and electronegativity.
- CO5. List major chemical reactions that are used in the synthesis of molecules.
- CO6. Describe intermolecular forces and working of lithium ion batteries.

#### Course contents:

#### UNIT I

##### Molecular structure and batteries. (11 lectures)

Molecular orbitals theory and Energy level diagrams of diatomic molecules (CO, NO, N<sub>2</sub>). Pi-molecular orbitals of butadiene and benzene and aromaticity, Crystal field theory and the energy level diagrams for transition metal ions and their magnetic properties, Band structure of solids and the role of doping on band structures.

Lithium ion batteries-construction, working principle, operation and applications.

#### UNIT II

##### Spectroscopic techniques and Intermolecular Forces (11 lectures)

Principles of spectroscopy and selection rules, Electronic spectroscopy, Fluorescence and its applications in medicine, Infrared spectroscopy and applications, Nuclear magnetic resonance and magnetic resonance imaging, Diffraction and Scattering.

Intermolecular forces: Ionic, dipolar and van Der Waals interactions, Equations of state of real gases and critical phenomena.

### UNIT III

#### Thermodynamics and Periodic properties

(10 lectures)

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies, Free energy and emf, Cell potentials, the Nernst equation and applications, Water chemistry and Corrosion, Use of free energy considerations in metallurgy through Ellingham diagrams.

Effective nuclear charge, penetration of orbitals, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases.

### UNIT IV

#### Stereochemistry and Organic reactions

(10 lectures)

Representations of 3 dimensional structures, structural isomers and stereoisomers, configurations and symmetry and chirality, enantiomers, diastereomers, optical activity, absolute configurations and conformational analysis.

Introduction to reactions involving substitution, addition, elimination, oxidation, reduction, cyclization and ring openings, Synthesis of a commonly used drug molecule.

#### Suggested Text Books

1. University chemistry, by B. H. Mahan
2. Chemistry: Principles and Applications, by M. J. Sienko and R. A. Plane (iii) Fundamentals of Molecular Spectroscopy, by C. N. Banwell
3. Engineering Chemistry (NPTEL Web-book), by B. L. Tembe, Kamaluddin and M. S. Krishnan
4. Physical Chemistry, by P. W. Atkins
5. Chemistry-I by Gourkrishna Dasmohapatra
6. Textbook of engineering chemistry by Jaya Shree Anireddy.
7. Organic Chemistry: Structure and Function by K. P. C. Vollhardt and N. E. Schore, 5th Edition <http://bcs.whfreeman.com/vollhardtschore5e/default.asp>

#### CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	3	2	-	3	-	-	1	1	-	-	-	2
CO2.	3	3	3	2	-	-	2	-	-	-	1	-
CO3.	3	2	2	-	3	-	-	-	-	-	-	-
CO4.	2	2	3	3	-	3	-	-	-	-	-	1
CO5.	3	-	3	-	-	2	3	-	-	-	-	-
CO6.	3	2	2	2	2	-	3	2	-	-	-	2
3 –High 2-Medium 1-Low												



<b>Course code</b>	<b>BSC/3-T</b>		
<b>Category</b>	<b>Basic Science Course</b>		
<b>Course title</b>	<b>Mathematics -I</b>		
<b>Scheme and Credits</b>	<b>L</b>	<b>T</b>	<b>Credits</b>
	<b>3</b>	<b>1</b>	<b>4</b>
<b>Course Assessment Methods</b>	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination (70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> <li>☐ A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</li> </ul>		

## Course Outcomes

### By the end of the course students will be able to:

- CO1. define the concepts and related terminology of calculus and linear algebra including definite and improper integrals, matrices, infinite series, eigen values and eigen vectors etc.
- CO2. understand the contribution and significance of various theorems and methods such as Rolle's theorem, Lagrange's mean value theorem, Taylor's theorem, Lagrange's multiplier method, Cayley-Hamilton theorem etc.
- CO3. solve the different problems of calculus and linear algebra with the assistance of suitable theorems and methods.
- CO4. Analyze and evaluate different approaches and methods of calculus and linear algebra in solving engineering domain problems.
- CO5. compile and integrate the knowledge of calculus and linear algebra to solve the real-world problems.

## Calculus and Linear Algebra

### Detailed contents:

#### Unit I

Definition of definite and improper integrals and their simple problems; Beta and Gamma functions and their properties, Relation between Beta and Gamma function, Reduction formula for Gamma function; Applications of definite integrals to evaluate surface areas and volumes of revolutions in Cartesian coordinates. Rolle's Theorem, Lagrange's mean value theorem, Cauchy mean value theorem; Indeterminate forms and L'Hospital's rule; Maxima and minima.

### Unit II

Introduction to sequence and Infinite series, Test for convergence/divergence, Comparison test, D'Alembert's ratio test, Cauchy Root test, Raabe's test, Cauchy integral test, Logarithmic test, Alternating series, Absolute convergence and conditional convergence. Taylor's and Maclaurin theorems with remainders, Taylor's series, series for exponential, trigonometric and logarithmic functions.

### Unit III

Functions of two or more variables, partial derivatives, total derivative; Derivative of composite and implicit functions, Homogeneous functions, Euler's theorem, Jacobian, Taylor's and Maclaurin's theorem for function of two variables, Maxima, minima and saddle points of functions of two variables, Method of Lagrange multipliers, Differentiation under the integral sign.

### Unit IV

Rank of a matrix, elementary transformations, elementary matrices, inverse using elementary transformations, normal form of a matrix, Consistency of System of linear equations; Symmetric, skew-symmetric and orthogonal matrices; Eigenvalues and eigenvectors; Properties of eigen values, Cayley-Hamilton Theorem and its applications, Diagonalization of matrices.

#### Text and Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson,
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
4. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11th
5. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.

#### CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	3	2	1	1								1
CO2.	3	3	1	1	2							1
CO3.	2	3	3	3	3	1			1	1		2
CO4.	1	3	3	3	3	1	1		1			1
CO5.	1	3	3	3	3	3	2	1	1	1	1	3
3 –High 2-Medium 1-Low												

Course code	BSC/4-T		
Category	Basic Science Course		
Course title	Mathematics -II		
Scheme and Credits	L	T	Credits
	3	1	4
Course Assessment Methods	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination (70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> <li>☐ A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</li> </ul>		

### Course Outcomes

#### By the end of the course students will be able to:

- CO1. define the concepts and related terminology of calculus, ordinary differential equation and multiple integrals, vector calculus, differential equations, Laplace transforms etc.
- CO2. understand the contribution and significance of various theorems and methods such as Green's theorem, Stokes' theorem, Variation of parameters, etc.
- CO3. solve the different problems of calculus, ordinary differential equation and Laplace transform with the assistance of suitable theorems and methods.
- CO4. Analyze and evaluate different approaches and methods of calculus, ordinary differential equation and Laplace transform in solving engineering domain problems.
- CO5. compile and integrate the knowledge of calculus, ordinary differential equation and Laplace transform to solve the real-world problems.

### Calculus, Ordinary Differential Equations and Complex Variable

#### Detailed contents:

#### Unit I

Multiple Integration: Double integrals (Cartesian and polar), change of order of integration in double integrals, Change of variables (Cartesian to polar), Applications: areas and volumes, Center of mass and Gravity (constant and variable densities); Triple integrals (Cartesian, spherical polar and cylindrical), Application: Volumes.

## Unit II

Differentiation of vectors, scalar and vector point functions, Gradient of a scalar field and directional derivatives, Divergence and curl of a vector field and their physical interpretations, Scalar line integrals, vector line integrals, scalar surface integrals, vector surface integrals, Volume integral, Theorems of Green, Gauss and Stokes (Without proof) and their simple applications.

## Unit III

Exact, linear and Bernoulli's equations, Euler's equations, Equations not of first degree: equations solvable for  $p$ , equations solvable for  $y$ , equations solvable for  $x$  and Clairaut's type. Second and higher order linear differential equations with constant coefficients, method of variation of parameters, Cauchy-Euler equation; Legendre linear equations.

## Unit IV

Laplace transforms of elementary functions, properties of Laplace transforms, existence conditions, transforms of derivatives, transforms of integrals, multiplication by  $t^n$ , division by  $t$ , evaluation of integrals by Laplace transforms. Laplace transform of Unit step function, unit impulse function and periodic function, inverse transforms, convolution theorem, application to linear differential equations with constant coefficients.

### Text and Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. W. E. Boyce and R. C. DiPrima, Elementary Differential Equations and Boundary Value Problems, 9th Edn., Wiley India, 2009.
4. S. L. Ross, Differential Equations, 3rd Ed., Wiley India, 1984.
5. E. A. Coddington, An Introduction to Ordinary Differential Equations, Prentice Hall India, 1995.
6. E. L. Ince, Ordinary Differential Equations, Dover Publications, 1958.
7. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2008.
8. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 36th Edition, 2010.

### CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	3	2	1	1								1
CO2.	3	3	1	1	2							1
CO3.	2	3	3	3	3	1			1	1		2
CO4.	1	3	3	3	3	1	1		1			1
CO5.	1	3	3	3	3	3	2	1	1	1	1	3
3 –High 2-Medium 1-Low												

<b>Course code</b>	BSC/5-T		
<b>Category</b>	Basic Science Course		
<b>Course title</b>	Mathematics -I (CSE/IT/AI & ML)		
<b>Scheme and Credits</b>	<b>L</b>	<b>T</b>	<b>Credits</b>
	3	1	4
<b>Course Assessment Methods</b>	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination (70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> </ul>		

### Course Outcomes

#### By the end of the course students will be able to:

- CO1. Define the concepts and related terminology of calculus and linear algebra including definite and improper integrals, Function of two variables, matrices, eigen values and eigen vectors etc.
- CO2. Understand the contribution and significance of various theorems and methods such as Rolle's theorem, Lagrange's mean value theorem, Taylor's theorem, Euler's theorem, Gauss elimination method, etc.
- CO3. Solve the different problems of calculus and linear algebra with the assistance of suitable theorems and methods.
- CO4. Analyze and evaluate different approaches and methods of calculus and linear algebra in solving engineering domain problems.
- CO5. Compile and integrate the knowledge of calculus and linear algebra to solve the real world problems.

### Calculus and Linear Algebra

#### Detailed contents

##### Unit I

Definition of definite and improper integrals and their simple problems; Beta and Gamma functions and their properties, Relation between Beta and Gamma function, Reduction formula for Gamma function; Applications of definite integrals to evaluate surface areas and volumes of revolutions in Cartesian coordinates. Rolle's theorem, Lagrange's mean value theorem, Cauchy mean value theorem, Taylor's and Maclaurin theorems with remainders; Indeterminate forms and L'Hospital's rule; Maxima and minima.

##### Unit II

Functions of two or more variables, partial derivatives, total derivative; Derivative of composite and implicit functions, Homogeneous functions, Euler's theorem, Jacobian, Taylor's and Maclaurin's theorem for function of two variables, Maxima, minima and saddle points of functions of two variables, Method of Lagrange multipliers, Differentiation under the integral sign.

### Unit III

Matrices, Rank of a matrix, elementary transformations, elementary matrices, inverse using elementary transformations, normal form of a matrix, Consistency of System of linear equations, linear dependence, independence of vectors, Linear transformations (maps), Matrix associated with a linear map and linear map associated with a matrix, Cramer's Rule, Gauss elimination and Gauss-Jordan elimination methods.

### Unit IV

Eigenvalues, eigenvectors, symmetric, skew-symmetric, and orthogonal Matrices, eigen bases. Properties of eigen values, Cayley-Hamilton Theorem and its applications. Diagonalization of matrices; orthogonal set, orthonormal set of vectors.

#### Text and Reference Books:

1. G.B. Thomas and R.L. Finney, Calculus and Analytic geometry, 9th Edition, Pearson, Reprint, 2002.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
3. D. Poole, Linear Algebra: A Modern Introduction, 2nd Edition, Brooks/Cole, 2005.
4. Veerarajan T., Engineering Mathematics for first year, Tata McGraw-Hill, New Delhi, 2008.
5. Ramana B.V., Higher Engineering Mathematics, Tata McGraw Hill New Delhi, 11<sup>th</sup>, Reprint, 2010.
6. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
7. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
8. V. Krishnamurthy, V.P. Mainra and J.L. Arora, An introduction to Linear Algebra, Affiliated East-West press, Reprint 2005.

#### CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	3	2	1	1								1
CO2.	3	3	1	1	2							1
CO3.	2	3	3	3	3	1			1	1		2
CO4.	1	3	3	3	3	1	1		1			1
CO5.	1	3	3	3	3	3	2	1	1	1	1	3
3 –High 2-Medium 1-Low												

Course code	BSC/6-T		
Category	Basic Science Course		
Course title	Mathematics -II (CSE/IT/AI & ML)		
Scheme and Credits	L	T	Credits
	3	1	4
Course Assessment Methods	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination (70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> <li>☐ A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</li> </ul>		

## Course Outcomes

### By the end of the course students will be able to:

- CO1. define the concepts and related terminology of probability and statistics including random variables, expectations, probability distributions, measures of central tendency, correlation, tests etc.
- CO2. understand the contribution and significance of various tests, inequalities and distributions such as Binomial distribution, Poisson distribution, Normal distribution, T-test, Chi-square test etc.
- CO3. solve the different problems of probability and statistics with the assistance of suitable tests and methods.
- CO4. Analyze and evaluate different approaches and methods of probability and statistics in solving engineering domain problems.
- CO5. compile and integrate the knowledge of probability and statistics to solve the real world problems.

## Probability and Statistics

### Detailed contents

#### Unit I

**Basic Probability:** Introduction, additive law of Probability, conditional probability, independent events, Bayes' theorem.

**Random Variables:** Discrete random variables, probability distribution, Probability mass function and distribution function, Expectation, Moments, Variance and standard deviation of Discrete Random Variables.

#### Unit II

**Continuous Probability distribution:** Continuous random variables and their properties, probability distribution, Probability density function and distribution function, functions and densities, Expectation, Moments, Variance and standard deviation of Continuous Random Variables.

**Probability distributions:** Binomial, Poisson and Normal- evaluation of statistical parameters for these distributions, Poisson approximation to the binomial distribution, Introduction to exponential and gamma densities.

**Unit III**

**Basic Statistics:** Measures of Central tendency: Mean, Median and Mode, Quartiles, Geometric mean, Harmonic mean, Measures of dispersion: Range, Quartile deviation, mean deviation, standard deviation, coefficient of variation, Moments, skewness and Kurtosis. Correlation, Rank correlation, Correlation coefficient, methods of calculations, Lines of regression.

**Unit IV**

**Curve fitting by the method of least squares:** Introduction, fitting of straight lines, second degree parabolas and more general curves, fitting of a geometric or power curve of the form  $y=ax^b$ , fitting of an exponential curve of the form  $y=ab^x$ .

**Test of significance:** Basic terminology, large sample test for single proportion, difference of proportions, single mean, difference of means and difference of standard deviations. Test for single mean, difference of means (t-test), Chi-square test for goodness of fit and independence of attributes.

**Text and Reference Books:**

1. Erwin Kreyszig, Advanced Engineering Mathematics, 9th Edition, John Wiley & Sons, 2006.
2. P. G. Hoel, S. C. Port and C. J. Stone, Introduction to Probability Theory, Universal Book Stall, 2003 (Reprint).
3. S. Ross, A First Course in Probability, 6th Ed., Pearson Education India, 2002.
4. W. Feller, An Introduction to Probability Theory and its Applications, Vol. 1, 3rd Ed., Wiley, 1968.
5. N.P. Bali and Manish Goyal, A text book of Engineering Mathematics, Laxmi Publications, Reprint, 2010.
6. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, 35th Edition, 2000.
7. Veerarajan T., Engineering Mathematics (for semester III), Tata McGraw-Hill, New Delhi, 2010.

**CO-PO Mapping**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	3	2	1	1								1
CO2.	3	3	1	1	2							1
CO3.	2	3	3	3	3	1			1	1		2
CO4.	1	3	3	3	3	1	1		1			1
CO5.	1	3	3	3	3	3	2	1	1	1	1	3
3 –High 2-Medium 1-Low												



Course code	ESC/1-T		
Category	Engineering Science Course		
Course title	Basic Electrical Engineering		
Scheme and Credits	L	T	Credits
	3	1	4
Course Assessment Methods	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination (70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> <li>☐ A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</li> </ul>		

### Course Outcomes

#### By the end of the course students will be able to:

- CO1. Recall various laws and theorems of AC and DC circuits.
- CO2. Interpret the fundamentals of electrical circuits, Electrical machines, measuring instruments and LT installation.
- CO3. Solve problems on AC-DC circuits and Machines
- CO4. Identify the applications of network theorems and resonance phenomenon in relevant area.
- CO5. Appraise the type of electrical machine, instrument and LT switchgear to be used for a particular application.

#### Course Contents:

#### UNIT I

##### DC Circuits (10 hours)

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff current and voltage laws, Mesh and nodal analysis of simple circuits with dc excitation, Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum power transfer theorem, Reciprocity theorem, Star to Delta conversion and vice versa, Time-domain analysis of first-order RL and RC circuits.

#### UNIT II

##### AC Circuits (10 hours)

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), Resonance (series and parallel circuits). Three-phase balanced circuits, voltage and current relations in star and delta connections, power factor, Measurement of Power and Power Factor using two wattmeter method.

#### UNIT III

##### Electrical Machines (12 hours)

Construction and working principle of Transformer, Ideal and practical transformer, phasor diagram and equivalent circuit of transformer, losses in transformers, voltage regulation and efficiency, Auto-transformer and its applications.

Generation of rotating magnetic fields, Construction and working of a three-phase induction motor, Applications of three phase induction motor, Construction and working of DC machine, Speed control of dc machine.

## UNIT IV

### Electrical Instruments and LT Installations (10 hours)

Electrical Instruments: Permanent Magnet Moving Coil, Electrodynamometer & Moving Iron type instruments, Induction type Energy meter.

Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, MCCB, Types of Wires and Cables, Earthing and its types.

### Suggested Text / Reference Books

1. Del Toro, "Electrical Engineering Fundamentals", Prentice Hall India, 1989.
2. S. K. Sahdev, "Basic Electrical Engineering", Pearson, 2017.
3. D. P. Kothari and I. J. Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010.
4. D. C. Kulshreshtha, "Basic Electrical Engineering", McGraw Hill, 2009.
5. L. S. Bobrow, "Fundamentals of Electrical Engineering", Oxford University Press, 2011.
6. B. L. Theraja & A. K. Theraja, "Basic Electrical Engineering", Volume 1, S. Chand, 2015.

### CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	3	2	-	-	-	-	-	-	-	-	-	1
CO2.	3	-	-	-	-	-	-	-	-	-	-	2
CO3.	3	2	-	1	-	-	-	-	-	-	-	1
CO4.	3	2	-	1	-	-	-	-	-	-	-	1
CO5.	3	1	-	-	-	-	-	-	-	-	-	1

3 –High 2-Medium 1-Low

<b>Course code</b>	<b>ESC/3-T</b>		
<b>Category</b>	<b>Engineering Science Course</b>		
<b>Course title</b>	<b>Programming for Problem Solving</b>		
<b>Scheme and Credits</b>	<b>L</b>	<b>T</b>	<b>Credits</b>
	<b>3</b>	<b>0</b>	<b>3</b>
<b>Course Assessment Methods</b>	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination (70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> <li>☐ A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</li> </ul>		

### Pre-requisites

Basics of Programming in C language

### About the Course

Programming for problem Solving is a basic and important for every graduate in Engineering. This course introduces basic constructs of programming language like algorithms, conversion of algorithms to programs etc. By studying this course students will get to know about C programming language with its various programming paradigms like branching, looping, arrays, functions, recursion, structure, pointers, etc. to be implemented for solving real world problems. It includes various sorting and searching algorithms as well with notion of order of complexity through simple programs

### Course Outcomes

**By the end of the course a student would be able to:**

- CO1. describe the algorithms to programs (in C language) to test and execute the programs and correct syntax and logical errors.
- CO2. demonstrate the use of conditional branching, iteration and recursion.
- CO3. apply programming to solve matrix addition and multiplication problems and searching and sorting problem, apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.
- CO4. compare the suitability of arrays, pointers and structures to formulate algorithms and programs for various problem situations
- CO5. justify a problem into functions and synthesize a complete program using divide and conquer approach.

**Course Contents:**

**UNIT I**

**Introduction to Programming**

Introduction to components of a computer system (disks, memory, processor, where a program is stored and executed, operating system, compilers etc.). (Number System: Binary, Octal, Decimal, Hexadecimal etc. and interconversion)

Idea of Algorithm: steps to solve logical and numerical problems. Representation of Algorithm: Flowchart/Pseudo code with examples.

From algorithms to programs; source code, variables (with data types) variables and memory locations, Syntax and Logical Errors in compilation, object and executable code.

**UNIT II**

**Arithmetic expressions and precedence**

Conditional Branching and Loops: Writing and evaluation of conditionals and consequent branching, Iteration and loops.

Arrays: Arrays (1-D, 2-D), Character arrays and Strings, Basic Algorithms: Searching, Basic Sorting Algorithms (Bubble, Insertion and Selection), Finding roots of equations, notion of order of complexity through example programs (no formal definition required).

**UNIT III**

**Function**

Functions (including using built in libraries), Parameter passing in functions, call by value, passing arrays to functions: idea of call by reference.

Recursion: Recursion, as a different way of solving problems. Example programs, such as Finding Factorial, Fibonacci series, **Ackerman function etc., quick sort or Merge sort.**

**UNIT IV**

**Structure**

Structures, Defining structures and Array of Structures.

Pointers: Idea of pointers, Defining pointers, Use of Pointers in self-referential structures, notion of linked list (no implementation)

File handling (only if time is available, otherwise should be done as part of the lab)

**Text and Reference Books**

1. **Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill**
2. **E. Balaguruswamy, Programming in ANSI C, Tata McGraw-Hill**
3. **Brian W. Kernighan and Dennis M. Ritchie, The C Programming Language, Prentice Hall of India**

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	1	-	-	-	-	-	-	-	-	-	-	-
CO2.	1	-	-	-	-	-	-	-	-	-	-	-
CO3.	2	2	-	-	2	-	-	-	-	-	-	-
CO4.	2	2	-	-	-	-	-	-	-	-	-	-
CO5.	3	3	-	1	-	-	-	-	-	-	-	-
3 –High 2-Medium 1-Low												

<b>Course code</b>	ESC/4-T		
<b>Category</b>	Engineering Science Courses		
<b>Course title</b>	Workshop/Manufacturing Practices		
<b>Scheme and Credits</b>	<b>L</b>	<b>T</b>	<b>Credits</b>
	3	0	3
<b>Course Assessment Methods</b>	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination (70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> <li>☐ A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</li> </ul>		

### About the Course

This course will offer a detailed understanding of manufacturing processes used in industry such as casting, moulding, forming, cutting, machining and welding and will relate the requirements of a part to the possible manufacturing processes. The course also includes quality assurance of manufactured parts by inspection and testing. Students of all engineering disciplines are encouraged to take this class specially, the mechanical engineering students.

### Course Outcomes

**By the end of the course students will be able to:**

- CO1. define concepts regarding basic engineering material & industrial safety. They are also able to understand draw the plant layout.
- CO2. learn the various types of manufacturing process/methods.
- CO3. understand the machine tools & working principles of machines.
- CO4. understand the working of casting & welding processes & their applications in the manufacturing.
- CO5. understand carpentry, fitting & moulding processes.
- CO6. understand the modern machining processes and their needs in the industry. They are also able to understand draw the plant layout.

### Course Contents:

#### UNIT I

**Introduction and Engineering Materials:** Introduction to Manufacturing Processes and their Classification. Industrial Safety: Introduction, Types of Accidents, Causes and Common Sources of Accidents, Methods of Safety, First Aid. General Properties and Applications of Engineering Materials, Cast Iron, Mild Steel, Medium Carbon Steel, High Carbon Steel and High-Speed Steel.

**Plant Layout:** Plant Layout, Objectives of Layout, Types of Plant Layout and their Advantages.

### UNIT-II

**Manufacturing Methods:** Introduction to manufacturing processes, Classification of manufacturing processes, primary and secondary manufacturing processes, Sheet metal processes, Powder metallurgy, Forging, Machining processes, Joining Processes, Surface finishing Processes, Processes effecting change in properties.

**Forming processes, Fitting Operations, Power Tools and Principle of Machining:** Punching, blanking, piercing, forging, hot rolling and cold rolling, extrusion. Machining: Lathe, Parts of a lathe machine and operations of Lathe machine, Shaper machine, drilling machine, Milling machine. Clamping tools, Gauges and cutting tools, Introduction to power tools.

### UNIT-III

**Metal Casting and Welding:** Introduction to moulding and casting, Pattern and its types, Pattern allowances, runner, riser, gates, function of core, moulding sand and its constituents. Cupola furnace, casting defects. Gas welding. Resistance welding and its principle; Spot, Seam, Butt, Projection welding. Arc welding and its principle; Metal, Carbon, Submerged, MIG, TIG arc welding, function of flux, types of flames, Brazing, soldering.

**Introduction to Carpentry, Fitting, Plastic Moulding:** Types of wood, seasoning of wood and defects in wood. Introduction to Electrical and Electronics. Introduction and classification of Plastic moulding: Injection moulding and Blow moulding, Glass cutting.

### UNIT-IV

**Joining and Modern Machining Processes:** Introduction to welding, soldering, brazing, sintering, adhesive bonding, riveting. Advanced Manufacturing Methods: Introduction to Wire-cut Electric Discharge Machining (WEDM), Ultrasonic Machining (USM) and Laser Beam Machining (LBM).

**CNC machining and Additive Manufacturing:** Introduction to CNC machining and Additive manufacturing, their types and applications.

#### **Suggested Text/Reference Books:**

1. Hajra Choudhury S.K., Hajra Choudhury A.K. and Nirjhar Roy S.K., "Elements of Workshop Technology", Vol.I 2008 and Vol.II2010, Media promoters and publishers private limited, Mumbai.
2. B.S. Raghuwanshi, "A Course in Workshop Technology, Vol I (Manufacturing Processes) and Vol II (Machine Tools)" Dhanpat Rai & CO.
3. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4<sup>th</sup> edition, Pearson Education India Edition, 2002.
4. Gowri P. Hariharan and A. Suresh Babu, "Manufacturing Technology – I" Pearson Education, 2008.
5. Roy A. Lindberg, "Processes and Materials of Manufacture", 4<sup>th</sup> edition, Prentice Hall India, 1998.
6. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGraw Hill House, 2017.
7. Amitabh Ghosh and Ashok Kumar Malik, "Manufacturing Science", East-West Press.

#### **Course Articulation Matrix (CO to PO/PSO Mapping)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	-	1	1	-	-	-	-	-	-	-	-	1	2	2
CO2	2	2	1	2	-	-	-	-	-	-	-	-	1	2	2
CO3	3	2	2	2	-	-	-	-	-	-	-	-	1	2	2
CO4	3	3	2	2	-	-	-	-	-	-	-	-	1	2	3
CO5	3	3	2	3	-	-	-	-	-	-	-	-	1	3	3
CO6	3	3	2	3	-	-	-	-	-	-	-	-	2	3	3

1. (Slight/Low) 2. (Moderate/Medium) 3. (Substantial/High)

<b>Course code</b>	<b>HSMC/1-T</b>		
<b>Category</b>	<b>Humanities and Social Sciences including Management courses</b>		
<b>Course title</b>	<b>English</b>		
<b>Scheme and Credits</b>	<b>L</b>	<b>T</b>	<b>Credits</b>
	<b>2</b>	<b>0</b>	<b>2</b>
<b>Course Assessment Methods</b>	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination (70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> <li>☐ A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</li> </ul>		

### Course Outcomes

#### By the end of the course students will be able to:

- CO1. choose and use the appropriate vocabulary, phrases in different concepts
- CO2. provide knowledge about basics of grammar
- CO3. construct sentences using proper grammatical sentence structures
- CO4. inculcate and improve writing skills and develop coherence in writing
- CO5. write letters, e-mails, resume and press report etc. which are need of the present times in various professions
- CO6. develop effective listening skills for better comprehension of English spoken in different social and workplace contexts

### Course content

#### UNIT I

##### Vocabulary Building

Concept of Word Formation, Acquaintance with prefixes, suffixes and derivational constructions  
Synonyms, antonyms, and homophones.

#### UNIT II

##### Basic Writing Skills

Sentence Structures, creating coherence in writing, Art of paragraph writing, Techniques for writing precisely, Precis Writing

#### UNIT III

##### Identifying Common Errors in Writing

Subject-verb agreement and related errors, Noun-pronoun agreement and related errors, Errors in usage of articles, Errors in usage of prepositions

#### UNIT IV

##### Technical Writing

Business letter writing and its format, Email writing, Resume writing, Press report writing

### Suggested Readings:

1. Practical English Usage. Michael Swan. OUP. 1995.
2. Remedial English Grammar. F.T. Wood. Macmillan.2007 (iii)On Writing Well. William Zinsser. Harper Resource Book. 2001
3. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006.
4. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.

5. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
6. Common Errors in English, Abul Hashem, Ramesh Publishing House

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	-	-	-	-	-	-	-	-	3	3	1	2
CO2.	-	-	-	-	-	-	-	1	2	3	-	2
CO3.	-	-	-	-	-	-	-	1	2	3	-	2
CO4.	-	1	1	2		-	1	-	2	3	2	2
CO5.	-	-	-	-	-	-	2	-	3	3	2	2
CO6.	1	-	-	-	-	-	-	2	3	3	-	1
3 –High 2-Medium 1-Low												



<b>Course code</b>	<b>MC/2-T</b>		
<b>Category</b>	<b>Mandatory Courses</b>		
<b>Course title</b>	<b>Environmental Sciences</b>		
<b>Scheme and Credits</b>	<b>L</b>	<b>T</b>	<b>Credits</b>
	<b>3</b>	<b>0</b>	<b>0</b>
<b>Course Assessment Methods</b>	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination (70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> <li>☐ A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</li> </ul>		

### Course Outcomes

#### By the end of the course students will be able to:

- CO1. enhance and analyze human impacts on the environment.
- CO2. integrate concepts & methods from multiple discipline and apply to environmental problems.
- CO3. design and evaluate strategic terminologies and methods for sustainable management of environmental systems.
- CO4. create knowledge on various local environment aspects which forms an irreplaceable tool in the entire learning process.

### Course Contents

#### UNIT-I

Multidisciplinary nature of Environmental studies: Definition, scope and importance, need for public awareness; Concept, 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, characteristics features, structure and function of Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystem (Ponds, Stream, lakes, rivers, oceans, estuaries); Biodiversity: Introduction, 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 level, India as a mega-diversity nation, Hot-spot 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.

#### UNIT-II

Renewable and non-renewable resources, Natural resources and associated problems, Forest resources: Use and over-exploitation, deforestation, case studies, Timber extraction, mining, dams and their effects on forests and tribal people; Water resources: Use and over utilization of surface and ground water, floods, droughts conflicts over water, dams benefits and problems; Mineral resources: Use and exploitation, environmental effects of extracting and mineral resources; Food resources:

World food problem, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity; Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, case studies; Land resources: Land as a resource, land degradation, main induced landslides, soil erosion and desertification, Role of an individual in conservation of natural resources, Equitable use of resources for suitable lifestyle.

### UNIT-III

Definition of Environment Pollution; Causes, effects and control measures of: Air Pollution, Water Pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards; Solid waste Management: Causes effects and control measures of urban and industrial wastes; Role of and individual in prevention of pollution, Pollution case studies; Disaster management: floods, earthquake, cyclone and landslides; Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Case studies; different laws related to environment: 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

### UNIT-IV

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 problem and concern, case studies; Environment ethics: Issues and possible solutions; Wasteland reclamation; Consumerism and waste products; Human Population growth, variation among nation, Population explosion- Family Welfare Programme, 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.

#### Books

1. Fundamental concepts in Environmental studies by Dr. D.D. Mishra. S. Chand publications.
2. Essentials of Ecology and Environmental Science by Dr. S. V.S. Rana, PHI Learning Pvt. Ltd, Delhi
3. Environmental Chemistry by Anil Kumar De, Wiley Eastern Limited.
4. Environmental Science by T.G. Miller, Wadsworth Publishing Co, 13th edition.
5. Ecology and Environment by P. D. Sharma, Rastogi publications

#### CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	-	-	-	-	-	1	3	-	-	-	-	-
CO2.	-	-	-	-	-	1	3	-	-	-	-	-
CO3.	-	-	-	-	-	1	3	-	-	-	-	-
CO4.	-	-	-	-	-	1	3	-	-	-	-	-
3 –High 2-Medium 1-Low												

<b>Course code</b>	<b>MC/3-T</b>		
<b>Category</b>	<b>Mandatory Courses</b>		
<b>Course title</b>	<b>Indian Constitution</b>		
<b>Scheme and Credits</b>	<b>L</b>	<b>T</b>	<b>Credits</b>
	<b>3</b>	<b>0</b>	<b>0</b>
<b>Course Assessment Methods</b>	<p><b>Internal Examination (30 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Three minor tests each of 20 marks including third minor in open book mode will be conducted. The average of the highest marks obtained by a student in the any of the two minor examinations will be considered.</li> <li>☐ Class Performance will be measured through percentage of lectures attended (04 marks)</li> <li>☐ Assignments, quiz etc. will have weightage of 06 marks</li> </ul> <p><b>End semester examination (70 marks):</b></p> <ul style="list-style-type: none"> <li>☐ Nine questions are to be set by the examiner. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. Two questions are to be set from each unit. All questions will carry equal marks.</li> <li>☐ A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</li> </ul>		

## Course Contents

### UNIT I

Basic features and fundamental principles  
Meaning of the constitution law and constitutionalism  
Historical perspective of the Constitution of India  
Salient features and characteristics of the Constitution of India  
Scheme of the fundamental rights  
The scheme of the Fundamental Duties and its legal status

### UNIT II

The Directive Principles of State Policy – Its importance and implementation  
Federal structure and distribution of legislative and financial powers between the Union and the States  
Parliamentary Form of Government in India – The constitution powers and status of the President of India

### UNIT III

Amendment of the Constitutional Powers and Procedure  
The historical perspectives of the constitutional amendments in India Emergency  
Provisions: National Emergency, President Rule, Financial Emergency Local Self Government – Constitutional Scheme in India

### UNIT IV

Scheme of the Fundamental Right to Equality  
Scheme of the Fundamental Right to certain Freedom under Article 19  
Scope of the Right to Life and Personal Liberty under Article 21

## Practical Courses

<b>Course code</b>	<b>BSC/1(i)-P</b>
<b>Category</b>	<b>Basic Science Courses</b>
<b>Practical Course title</b>	<b>Physics: Introduction to Electromagnetic Theory</b>
<b>Contact Hours</b>	<b>04</b>
<b>Credits</b>	<b>02</b>
<b>Course Assessment Methods</b>	<p><b>Internal: 50 Marks; External: 50 Marks</b></p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.</p> <p>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.</p> <p>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.</p> <p>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

**Pre-requisites:** 10+2 Physics Lab.

### About the Course:

This laboratory course involves basic physics experiments with an essential focus on electricity and magnetism that enhance the understanding of the practical aspects of electromagnetism.

<b>S. No.</b>	<b>Course Outcomes:</b> <b>By the end of the lab course a student would be able to:</b>	<b>RBT Level</b>
<b>CO-1</b>	<b>Implement</b> various physical/electrical measuring techniques and the related operations.	(LOTS: Levels 3: Apply)
<b>CO-2</b>	<b>Analyze</b> measurement methods and its results	(HOTS: Level 4: Analyze)
<b>CO-3</b>	<b>Compare</b> various error approaches to reduce error and increase accuracy.	(HOTS: Level 5: Evaluate)

<b>CO-4</b>	<b>Integrate</b> knowledge of electricity and magnetism to solve real world problems related electromagnetism.	(HOTS: Level 6: Create)
<b>CO-5</b>	<b>Create</b> written records for the given assignments with problem objective definition, experimental solution and conclusions.	(HOTS: Level 6: Create)
<b>CO-6</b>	<b>Demonstrate</b> ethical practices while solving problems individually or in groups.	(LOTS: Level 3: Apply)

### List of Experiments/Assignments

#### Minimum 7 out of the following experiments (Indicative)

1. LC circuit and LCR circuit.
2. Resonance phenomena in LCR circuits.
3. Magnetic field from Helmholtz coil.
4. Measurement of Lorentz force in a vacuum tube.
5. To determine the Wavelength of a given laser by Diffraction Grating.
6. To find the frequency of A.C. mains by using sonometer.
7. To find the low resistance by Carey - Foster's bridge.
8. To study the characteristics of a solar cell.
9. To find the value of  $e/m$  for electrons by Helical method.
10. To find the value of co-efficient of self-inductance by using a Rayleigh bridge.
11. To find the value of Hall Co-efficient of semi-conductor.
12. To study the V-I characteristics of a p-n diode.
13. To find the band gap of intrinsic semi-conductor using four probe method.
14. To calculate the hysteresis loss by tracing a B-H curve.
15. Electron Spin Resonance Spectrometer

Note:

The above list is only indicative and actual experiments/assignments will be designed by the course coordinator. One experiment should be designed to be done in groups of two or three students. The experiment will meet the objective of the course and the levels of the given course outcomes. The list of experiment/assignments and schedule of submission will be prepared by the course coordinator at the beginning of the semester.

#### CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	3	-	-	-	-	-	-	-	2	-	-	-
CO2.	3	2	-	-	-	-	-	-	2	-	-	-
CO3.	3	-	-	-	-	-	-	-	1	-	2	-
CO4.	3	-	2	-	-	-	-	-	2	2	-	-
CO5.	2	-	-	-	-	-	-	-	-	3	2	-
CO6.	2	-	-	-	-	-	-	2	3	-	-	3
3 –High 2-Medium 1-Low												

Course code	BSC/1(ii)-P
Category	Basic Science Courses
Practical Course title	Physics: Introduction to Mechanics
Contact Hours	04
Credits	02
Course Assessment Methods	<p><b>Internal: 50 Marks; External: 50 Marks</b></p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.</p> <p>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.</p> <p>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.</p> <p>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

**Pre-requisites:** 10+2 Physics Lab.

**About the Course:**

This lab course involves basic physics experiments with an essential focus on the mechanical physics that are useful in understanding the practical aspect of mechanics and related fields.

S. No.	Course Outcomes: By the end of the lab course a student would be able to:	RBT Level
CO-1	<b>Implement</b> various physical/mechanical measuring techniques and the related operations like electromechanical or mechanical wav.	(LOTS: Levels 3: Apply)
CO-2	<b>Analyze</b> measurement methods and its results	(HOTS: Level 4: Analyze)
CO-3	<b>Compare</b> various error approach to reduce error and increase accuracy.	(HOTS: Level 5: Evaluate)

<b>CO-4</b>	<b>Integrate</b> knowledge to solve real world problems related mechanics and related situations	(HOTS: Level 6: Create)
<b>CO-5</b>	<b>Create</b> written records for the given assignments with problem objective definition, experimental solution and conclusions.	(HOTS: Level 6: Create)
<b>CO-6</b>	<b>Demonstrate</b> ethical practices while solving problems individually or in groups.	(LOTS: Level 3: Apply)

### List of Experiments/Assignments

#### Minimum 7 out of following experiments (Indicative)

1. Experiments on an air-track.
2. Experiment on moment of inertia measurement.
3. Experiments with gyroscope.
4. Resonance phenomena in mechanical oscillators.
5. To find the wavelength of sodium light by Newton's ring.
6. To determine the specific rotation of a cane sugar solution with the help of Polari meter.
7. To determine the height of an Object/Line with the help of a sextant.
8. To study the moment of inertia of fly wheel.
9. To find the frequency of A.C. mains by using sonometer.
10. To study the characteristics of (Cu-Fe, Cu-Constant) thermo-couple.
11. To study the V-I characteristics of a p-n diode.
12. To calculate the hysteresis loss by tracing a B-H curve.
13. Measurement of Susceptibility of Solids by Gouy's Method
14. To Determine the Variation of Magnetic Field along the Axis of a Circular Coil Carrying Current and Calculate the Radius of the coil.
15. To Study the Gaussian Beam Pattern Spot Size and The Angle of Divergence of Laser Beam.

Note:

The above list is only indicative and actual experiments/assignments will be designed by the course coordinator. One experiment should be designed to be done in groups of two or three students. The experiment will meet the objective of the course and the levels of the given course outcomes. The list of experiment/assignments and schedule of submission will be prepared by the course coordinator at the beginning of the semester.

#### CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	3	-	-	-	-	-	-	-	2	-	-	-
CO2.	3	2	-	-	-	-	-	-	2	-	-	-
CO3.	3	-	-	-	-	-	-	-	1	-	2	-
CO4.	3	-	2	-	-	-	-	-	2	2	-	-
CO5.	2	-	-	-	-	-	-	-	-	3	2	-
CO6.	2	-	-	-	-	-	-	2	3	-	-	3
3 –High 2-Medium 1-Low												

<b>Course code</b>	<b>BSC/1(iii)-P</b>
<b>Category</b>	<b>Basic Science Courses</b>
<b>Practical Course title</b>	<b>Physics: Optics, Fiber Optics, Magnetism and Nuclear Physics</b>
<b>Contact Hours</b>	<b>04</b>
<b>Credits</b>	<b>02</b>
<b>Course Assessment Methods</b>	<p><b>Internal: 50 Marks; External: 50 Marks</b></p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.</p> <p>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.</p> <p>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.</p> <p>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

**Pre-requisites:** 10+2 Physics Lab.

**About the Course:**

This lab. course involves basic physics experiments with an essential focus on the fundamentals of Optics, Fiber Optics, Magnetism and Nuclear Physics.

<b>S. No.</b>	<b>Course Outcomes:</b> <b>By the end of the lab course a student would be able to:</b>	<b>RBT Level</b>
<b>CO-1</b>	<b>Implement various</b> physics experiments and the related operations relevant to broader area in physics.	(LOTS: Levels 3: Apply)
<b>CO-2</b>	<b>Analyze</b> measurement methods and its results	(HOTS: Level 4: Analyze)
<b>CO-3</b>	<b>Compare</b> various error approach to reduce error and increase	(HOTS: Level 5: Evaluate)



	accuracy.	
<b>CO-4</b>	<b>Integrate knowledge</b> to solve real world problems and understanding related to engineering physics	(HOTS: Level 6: Create)
<b>CO-5</b>	<b>Create</b> written records for the given assignments with problem objective definition, experimental solution and conclusions.	(HOTS: Level 6: Create)
<b>CO-6</b>	<b>Demonstrate ethical</b> practices while solving problems individually or in groups.	(LOTS: Level 3: Apply)

### List of Experiments/Assignments

Minimum 7 out of following experiments (Indicative)

1. To find the wavelength of sodium light by Newton's ring.
2. To find the resolving power of telescope.
3. Find the velocity of ultrasonic waves in non-conducting medium by piezo-electric method.
4. To study the moment of inertia of fly wheel.
5. Bending of beam by Koenig's method
6. To study coupling of optical fiber with light source and measure the numerical aperture of optical fiber using a He-Ne Lasersource.
7. Electron Spin Resonance Spectrometer.
8. Finding frequency of A.C. mains by using sonometer.
9. To determine the specific rotation of a cane sugar solution with the help of Polarimeter.
10. To determine the wavelength of He-Ne Laser with the help of a single slit.
11. To determine the Wavelength of a given laser by Diffraction Grating.
12. To Study the Gaussian Beam Pattern Spot Size and The Angle of Divergence of Laser Beam
13. To Study Faraday Effect and Calculate the Verdet Constant of given sample.
14. Measurement of Dependence of Hall Coefficient on Temperatures

Note:

The above list is only indicative and actual experiments/assignments will be designed by the course coordinator. One experiment should be designed to be done in groups of two or three students. The experiment will meet the objective of the course and the levels of the given course outcomes. The list of experiment/assignments and schedule of submission will be prepared by the course coordinator at the beginning of the semester.

### CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	3	-	-	-	-	-	-	-	2	-	-	-
CO2.	3	2	-	-	-	-	-	-	2	-	-	-
CO3.	3	-	-	-	-	-	-	-	1	-	2	-
CO4.	3	-	2	-	-	-	-	-	2	2	-	-
CO5.	2	-	-	-	-	-	-	-	-	3	2	-
CO6.	2	-	-	-	-	-	-	2	3	-	-	3
3 –High 2-Medium 1-Low												

Course code	BSC/1(iv)-P
Category	Basic Science Courses
Practical Course title	Physics: Oscillations, waves and optics
Contact Hours	04
Credits	02
Course Assessment Methods	<p><b>Internal: 50 Marks; External: 50 Marks</b></p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.</p> <p>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.</p> <p>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.</p> <p>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

**Pre-requisites:** 10+2 Physics Lab.

**About the Course:**

This lab. Course involves basic physics experimentation with an essential focus on the various topics related to oscillations, waves and optics.

S. No.	Course Outcomes: By the end of the lab course a student would be able to:	RBT Level
CO-1	<b>Implement</b> various physical/mechanical measuring techniques and the related operations like waves and optics.	(LOTS: Levels 3: Apply)
CO-2	<b>Analyze</b> measurement methods and its results	(HOTS: Level 4: Analyze)
CO-3	<b>Compare</b> various error approach to reduce error and increase accuracy.	(HOTS: Level 5: Evaluate)
CO-4	<b>Integrate</b> knowledge of electricity and magnetism to solve real world problems related waves and optics.	(HOTS: Level 6: Create)
CO-5	<b>Create</b> written records for the given assignments with problem objective definition, experimental solution and conclusions.	(HOTS: Level 6: Create)

<b>CO-6</b>	<b>Demonstrate</b> ethical practices while solving problems individually or in groups.	(LOTS: Level 3: Apply)
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### List of Experiments/Assignments

#### Minimum 7 out of following experiments (Indicative)

1. To verify the laws of transverse vibrations of stretched strings using a sonometer.
2. Finding frequency of A.C. mains by using sonometer.
3. To determine the specific rotation of a cane sugar solution with the help of Polarimeter.
4. To determine the wavelength of He-Ne Laser with the help of a single slit.
5. To determine the Wavelength of a given laser by Diffraction Grating.
6. To Study the Gaussian Beam Pattern Spot Size and The Angle of Divergence of Laser Beam
7. To Study Faraday Effect and Calculate the Verdet Constant of given sample.
8. To find the wavelength of sodium light by Newton's ring.
9. To find the resolving power of telescope.
10. Find the velocity of ultrasonic waves in non-conducting medium by piezo-electric method.
11. To study the moment of inertia of fly wheel.
12. Bending of beam by Koenig's method.
13. Maxwell Needle Apparatus.
14. Stoke's law experiment.
15. Electron Spin Resonance Spectrometer.

#### Note:

The above list is only indicative and actual experiments/assignments will be designed by the course coordinator. One experiment should be designed to be done in groups of two or three students. The experiment will meet the objective of the course and the levels of the given course outcomes. The list of experiment/assignments and schedule of submission will be prepared by the course coordinator at the beginning of the semester.

#### CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	3	-	-	-	-	-	-	-	2	-	-	-
CO2.	3	2	-	-	-	-	-	-	2	-	-	-
CO3.	3	-	-	-	-	-	-	-	1	-	2	-
CO4.	3	-	2	-	-	-	-	-	2	2	-	-
CO5.	2	-	-	-	-	-	-	-	-	3	2	-
CO6.	2	-	-	-	-	-	-	2	3	-	-	3
3 –High 2-Medium 1-Low												

<b>Course code</b>	<b>BSC/1(v)-P</b>
<b>Category</b>	<b>Basic Science Courses</b>
<b>Practical Course title</b>	<b>Physics: Semiconductor Physics</b>

<b>Contact Hours</b>	<b>04</b>
<b>Credits</b>	<b>02</b>
<b>Course Assessment Methods</b>	<p><b>Internal: 50 Marks; External: 50 Marks</b></p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.</p> <p>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.</p> <p>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.</p> <p>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

**Pre-requisites:** 10+2 Physics Lab.

**About the Course:**

This lab. Course involves basic physics experimentation with an essential focus on the specific topics that are useful for learning basics of semiconductor physics.

<b>S. No.</b>	<b>Course Outcomes: By the end of the lab course a student would be able to:</b>	<b>RBT Level</b>
<b>CO-1</b>	<b>Implement various</b> physical/electrical/electronics' measuring techniques and the related operations.	(LOTS: Levels 3: Apply)
<b>CO-2</b>	<b>Analyze</b> measurement methods and its results	(HOTS: Level 4: Analyze)
<b>CO-3</b>	<b>Compare</b> various error approach to reduce error and increase accuracy.	(HOTS: Level 5: Evaluate)

<b>CO-4</b>	<b>Integrate</b> knowledge of electricity and electronics to solve real world problems related semiconductors.	(HOTS: Level 6: Create)
<b>CO-5</b>	<b>Create</b> written records for the given assignments with problem objective definition, experimental solution and conclusions.	(HOTS: Level 6: Create)
<b>CO-6</b>	<b>Demonstrate ethical</b> practices while solving problems individually or in groups.	(LOTS: Level 3: Apply)

### List of Experiments/Assignments

Minimum 7 out of following experiments (Indicative)

1. To find the value of Planck's constant by using a photoelectric cell.
2. To determine the Wavelength of a given laser by Diffraction Grating.
3. Two Probe Method for Measurement of Resistivity of Insulators at Different Temperatures.
4. Measurement of Susceptibility of Solids by Gouy's Method.
5. To compare the capacitances of two capacitors by De'sauty bridge and hence to find the dielectric constant of a medium.
6. To find the frequency of A.C. mains by using sonometer.
7. To find the low resistance by Carey - Foster's bridge.
8. To study the characteristics of a solar cell.
9. To find the value of Hall Co-efficient of a semi-conductor.
10. To study the V-I characteristics of a p-n diode.
11. To find the band gap of intrinsic semi-conductor using four probe method.
12. Measurement of Magnetoresistance of Semiconductors.
13. Study of Dielectric Constant and Curie Temperature of Ferroelectric Ceramic.
14. To Study Faraday Effect and Calculate the Verdet Constant of given sample.

### Note:

The above list is only indicative and actual experiments/assignments will be designed by the course coordinator. One experiment should be designed to be done in groups of two or three students. The experiment will meet the objective of the course and the levels of the given course outcomes. The list of experiment/assignments and schedule of submission will be prepared by the course coordinator at the beginning of the semester.

### CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	3	-	-	-	-	-	-	-	2	-	-	-
CO2.	3	2	-	-	-	-	-	-	2	-	-	-
CO3.	3	-	-	-	-	-	-	-	1	-	2	-
CO4.	3	-	2	-	-	-	-	-	2	2	-	-
CO5.	2	-	-	-	-	-	-	-	-	3	2	-
CO6.	2	-	-	-	-	-	-	2	3	-	-	3
3 –High 2-Medium 1-Low												

<b>Course code</b>	<b>BSC/1(vi)-P</b>
<b>Category</b>	<b>Basic Science Courses</b>
<b>Practical Course title</b>	<b>Physics: Waves Optics, Quantum Mechanics and Solids</b>
<b>Contact Hours</b>	<b>04</b>
<b>Credits</b>	<b>02</b>
<b>Course Assessment Methods</b>	<p><b>Internal: 50 Marks; External: 50 Marks</b></p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.</p> <p>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.</p> <p>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.</p> <p>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

**Pre-requisites:** 10+2 Physics Lab.

**About the Course:**

This lab Course involves basic physics experimentation with an essential focus on Waves Optics, Quantum Mechanics and Solids.

<b>S. No.</b>	<b>Course Outcomes: By the end of the lab course a student would be able to:</b>	<b>RBT Level</b>
<b>CO-1</b>	<b>Implement various</b> physical measuring techniques and the related operations for Waves Optics, Quantum Mechanics and Solids.	(LOTS: Levels 3: Apply)
<b>CO-2</b>	<b>Analyze</b> measurement methods and its results	(HOTS: Level 4: Analyze)

<b>CO-3</b>	<b>Compare</b> various error approach to reduce error and increase accuracy.	(HOTS: Level 5: Evaluate)
<b>CO-4</b>	<b>Integrate</b> knowledge to solve real world problems related to Waves Optics, Quantum Mechanics and Solids	(HOTS: Level 6: Create)
<b>CO-5</b>	<b>Create</b> written records for the given assignments with problem objective definition, experimental solution and conclusions.	(HOTS: Level 6: Create)
<b>CO-6</b>	<b>Demonstrate ethical</b> practices while solving problems individually or in groups.	(LOTS: Level 3: Apply)

### List of Experiments/Assignments

#### Minimum 7 out of following experiments (Indicative)

1. To find the resolving power of telescope.
2. Find the velocity of ultrasonic waves in non-conducting medium by piezo-electric method.
3. To study the moment of inertia of fly wheel.
4. To find the wavelength of sodium light by Newton's ring.
5. Electron Spin Resonance Spectrometer.
6. Finding frequency of A.C. mains by using sonometer.
7. To determine the specific rotation of a cane sugar solution with the help of Polarimeter.
8. To determine the wavelength of He-Ne Laser with the help of a single slit.
9. To determine the Wavelength of a given laser by Diffraction Grating.
10. To find the value of Hall Co-efficient of a semi-conductor.
11. To study the V-I characteristics of a p-n diode.
12. To find the band gap of intrinsic semi-conductor using four probe method.
13. To Study the Gaussian Beam Pattern Spot Size and The Angle of Divergence of Laser Beam.
14. To Study Faraday Effect and Calculate the Verdet Constant of given sample.
15. Measurement of Dependence of Hall Coefficient on Temperatures.

#### Note:

The above list is only indicative and actual experiments/assignments will be designed by the course coordinator. One experiment should be designed to be done in groups of two or three students. The experiment will meet the objective of the course and the levels of the given course outcomes. The list of experiment/assignments and schedule of submission will be prepared by the course coordinator at the beginning of the semester.

#### CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	3	-	-	-	-	-	-	-	2	-	-	-
CO2.	3	2	-	-	-	-	-	-	2	-	-	-
CO3.	3	-	-	-	-	-	-	-	1	-	2	-
CO4.	3	-	2	-	-	-	-	-	2	2	-	-
CO5.	2	-	-	-	-	-	-	-	-	3	2	-
CO6.	2	-	-	-	-	-	-	2	3	-	-	3
3 –High 2-Medium 1-Low												

<b>Course code</b>	<b>BSC/1(vii)-P</b>
<b>Category</b>	<b>Basic Science Courses</b>
<b>Practical Course title</b>	<b>Physics: Introduction to Quantum Physics</b>
<b>Contact Hours</b>	<b>04</b>
<b>Credits</b>	<b>02</b>
<b>Course Assessment Methods</b>	<p><b>Internal: 50 Marks; External: 50 Marks</b></p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.</p> <p>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.</p> <p>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.</p> <p>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

**Pre-requisites:** 10+2 Physics Lab.

**About the Course:**

This lab. Course involves basic physics experimentation from various types relevant for understanding quantum physics concepts.

<b>S. No.</b>	<b>Course Outcomes: By the end of the lab course a student would be able to:</b>	<b>RBT Level</b>
<b>CO-1</b>	<b>Implement</b> various modern physics experiments and the related operations relevant to quantum physics.	(LOTS: Levels 3: Apply)
<b>CO-2</b>	<b>Analyze</b> measurement methods and its results	(HOTS: Level 4: Analyze)
<b>CO-3</b>	<b>Compare</b> various error approach to reduce error and increase accuracy.	(HOTS: Level 5: Evaluate)



CO-4	<b>Integrate</b> knowledge to solve real world problems and understanding related to quantum physics	(HOTS: Level 6: Create)
CO-5	<b>Create</b> written records for the given assignments with problem objective definition, experimental solution and conclusions.	(HOTS: Level 6: Create)
CO-6	<b>Demonstrate</b> ethical practices while solving problems individually or in groups.	(LOTS: Level 3: Apply)

### List of Experiments/Assignments

Minimum 7 out of following experiments (Indicative)

- To find the value of Planck's constant by using a photoelectric cell.**
- To determine the Wavelength of a given laser by Diffraction Grating.
- To study the Photo electric effect.
- Study of Zener Diode characteristics.
- Dispersive Power of Material of Prism.
- Atomic Spectra of Two Electron Systems.
- To study the characteristics of a solar cell
- To find the value of  $e/m$  for electrons by Helical method.
- To find the ionisation potential of Argon/Mercury using a thyratron tube.
- To find the value of Hall Co-efficient of semi-conductor.
- To study the V-I characteristics of a p-n diode.
- To study two probe method.
- Electron spin Resonance.
- To find the band gap of intrinsic semi-conductor using four probe method.
- To find the ionisation potential of Argon/Mercury using a thyratron tube.
- Measurement of Lande 'g' factor by Electron Spin Resonance Spectrometer.

### Note:

The above list is only indicative and actual experiments/assignments will be designed by the course coordinator. One experiment should be designed to be done in groups of two or three students. The experiment will meet the objective of the course and the levels of the given course outcomes. The list of experiment/assignments and schedule of submission will be prepared by the course coordinator at the beginning of the semester.

### CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	3	-	-	-	-	-	-	-	2	-	-	-
CO2.	3	2	-	-	-	-	-	-	2	-	-	-
CO3.	3	-	-	-	-	-	-	-	1	-	2	-
CO4.	3	-	2	-	-	-	-	-	2	2	-	-
CO5.	2	-	-	-	-	-	-	-	-	3	2	-
CO6.	2	-	-	-	-	-	-	2	3	-	-	3
3 –High 2-Medium 1-Low												

Course code	BSC/2-P
Category	Basic Science Courses
Practical Course title	Chemistry
Contact Hours	04
Credits	02
Course Assessment Methods	<p><b>Internal: 50 Marks; External: 50 Marks</b></p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.</p> <p>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.</p> <p>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.</p> <p>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

**Pre-requisites:** Experiments in chemistry induced at plus two levels in schools.

#### About the Course:

The chemistry laboratory course consists of experiments illustrating the principles of chemistry relevant to the study of science and engineering. This lab course involves implementation of scientific approach and to familiarize with the experiments in chemistry relevant for research projects in higher semesters.

S. No.	Course Outcomes: By the end of the lab course a student would be able to:	RBT Level
CO-1	Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc.	(LOTS: Levels 3: Apply)
CO-2	Develop skills relevant to synthesize organic polymers and analyse the salt sample.	(HOTS: Level 4: Analyse)

<b>CO-3</b>	Estimate rate constants of reactions from concentration of reactants/products as a function of time.	(HOTS: Level 5: Evaluate)
<b>CO-4</b>	To acquire the practical skill to use TLC for the identification of drugs.	(HOTS: Level 4: Analyse)
<b>CO-5</b>	Learn to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.	(HOTS: Level 6: Create)
<b>CO-6</b>	Function as a member of a team, communicate effectively and engage in further learning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum.	(LOTS: Levels 3: Apply)

### List of Experiments

Choice of 10-12 experiments from the following:

1. Determination of surface tension and viscosity
2. Thin layer chromatography
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water
5. Colligative properties using freezing point depression
6. Determination of the rate constant of a reaction
7. Determination of cell constant and conductance of solutions
8. Potentiometry - determination of redox potentials and emfs
9. Synthesis of a polymer/drug
10. Saponification/acid value of an oil
11. Chemical analysis of a salt
12. Lattice structures and packing of spheres
13. Models of potential energy surfaces
14. Chemical oscillations- Iodine clock reaction
15. Determination of the partition coefficient of a substance between two immiscible liquids
16. Adsorption of acetic acid by charcoal
17. Acid-Base titrations
18. Use of the capillary viscometers to demonstrate the isoelectric point as the pH of minimum viscosity for gelatin sols and/or coagulation of the white part of egg.

### Note:

The actual experiments/assignments will be designed by the course coordinator. One assignment should be designed to be done in groups of two or three students. The assignments must meet the objective of the course and the levels of the given course outcomes. The list of assignments and schedule of submission will be prepared by the course coordinator at the beginning of the semester.

### CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	2	2	-	2	1	-	-	-	2	-	-	-
CO2.	-	2	-	-	-	1	1	-	2	-	-	-
CO3.	-	2	-	1	-	-	-	-	2	-	-	-
CO4.	-	2	-	-	-	1	-	-	2	-	-	-
CO5.	-	2	-	3	1	-	1	2	2	-	-	-
CO6.	-	-	-	-	-	-	-	3	2	1	-	2
3 –High 2-Medium 1-Low												

<b>Course code</b>	ESC/1-P
<b>Category</b>	Engineering Science Courses
<b>Practical Course title</b>	BASIC ELECTRICAL ENGINEERING
<b>Contact Hours</b>	02
<b>Credits</b>	01
<b>Course Assessment Methods</b>	<p><b>Internal: 50 Marks; External: 50 Marks</b></p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.</p> <p>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.</p> <p>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.</p> <p>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

Sr. No.	Course outcomes	RBT* Level
	At the end of the course students will be able to:	
CO1.	<b>Perform</b> Experimental work and gain technical knowledge of electrical circuits, Electrical machines (DC machine & transformer) and measuring instruments along with safety measures.	<b>HOTS L4 (Analyzing)</b>
CO2.	<b>Verify</b> various laws and theorems in DC circuits.	<b>HOTS L4 (Analyzing)</b>
CO3.	<b>Evaluate</b> the performance of transformer and electrical machines under various operating conditions.	<b>HOTS L5 (Evaluating)</b>
CO4.	<b>Observe</b> time domain and frequency response of RLC series and parallel circuit and to judge the suitability for the application in filters.	<b>LOTS L2 (Understanding)</b>
CO5.	<b>Organize</b> reports based on experiments performed with effective demonstration and analysis of results.	<b>HOTS L6 (Creating)</b>
CO6.	<b>Demonstrate</b> ethical practices while solving problems individually or in groups.	<b>LOTS L3 (Applying)</b>

\*Revised Bloom's Taxonomy Action verbs/Level

## List of Experiments

1. To demonstrate the various basic safety precautions and use of instruments in Electrical Engineering Laboratories.
2. To verify the KVL and KCL.
3. To verify the Thevenin's and Norton's Theorems.
4. To verify the reciprocity and Superposition theorems.
5. To study frequency response of a series R-L-C circuit and determine resonant frequency and Q-factor for various values of R-L-C.
6. To study frequency response of a parallel R-L-C circuit and determine resonant frequency and Q-factor for various values of R-L-C.
7. To measure the power and power factor using three voltmeter / three ammeter method in a single-phase AC circuit.
8. To measure the power and power factor for a balanced 3 phase load by two wattmeter method.
9. To perform the direct load test of a Transformer and plot efficiency Vs load characteristics.
10. To study various types of meters such as: ammeter, voltmeter, Wattmeter, Multimeter, Energy Meter.
11. To demonstrate the cut-set of DC machine (Commutator-brush arrangement)
12. To demonstrate the cut-set of Induction machine.
13. To perform the torque-speed characteristics of a separately excited DC Motor.
14. To perform the O.C. and S.C. tests of a three phase Induction motor.

### NOTE:

At least eight experiments are to be performed in the semester, out of which at-least six experiments should be performed from above list. Remaining experiments may either be performed from the above list or designed & set by the concerned course coordinator as per the scope of the syllabus.

### CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	3	-	-	-	-	-	-	-	3	-	-	2
CO2.	3	3	-	1	-	-	-	-	-	-	-	1
CO3.	3	-	1	-	-	-	-	-	-	-	-	1
CO4.	3	-	1	-	-	-	-	-	-	-	-	1
CO5.	-	-	-	-	-	-	-	-	-	3	-	-
CO6.	-	-	-	-	-	-	-	3	3	-	-	-
3 –High 2-Medium 1-Low												

<b>Course code</b>	<b>ESC/3-P</b>
<b>Category</b>	<b>Engineering Science Courses</b>
<b>Practical Course title</b>	<b>Programming for Problem Solving</b>
<b>Contact Hours</b>	<b>04</b>
<b>Credits</b>	<b>02</b>
<b>Course Assessment Methods</b>	<p><b>Internal: 50 Marks; External: 50 Marks</b></p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.</p> <p>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.</p> <p>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.</p> <p>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

**Pre-requisites:** Basics knowledge of computer.

**About the Course:**

This lab Course involves implementation of basic constructs of programming language. The objective of the lab course is to train the students translate the simple algorithms to programs in C language efficiently.

<b>S.No.</b>	<b>Course Outcomes: By the end of the lab course a student would be able to:</b>	<b>RBT Level</b>
<b>CO-1</b>	<b>Implement</b> simple, iterative as well as recursive programs.	(LOTS: Levels 3: Apply)
<b>CO-2</b>	<b>Analyze</b> given algorithms to a working and correct program.	(HOTS: Level 4: Analyze)

<b>CO-3</b>	<b>Compare</b> solutions on the basis of the appropriateness of data structure used like arrays, strings and structures and manipulate through implementation.	(HOTS: Level 5: Evaluate)
<b>CO-4</b>	<b>Integrate</b> knowledge of programming with identification and correcting logical errors encountered at run time.	(HOTS: Level 6: Create)
<b>CO-5</b>	<b>Create</b> written records for the given assignments with problem definition, design of solution and conclusions.	(HOTS: Level 6: Create)
<b>CO-6</b>	<b>Demonstrate</b> ethical practices while solving problems individually or in groups.	(LOTS: Level 3: Apply)

### List of Experiments/Assignments

1. One assignment to familiarize with programming environment.
2. One assignment on simple computational problems using arithmetic expressions.
3. One assignment on problems involving if-then-else structures.
4. One assignment on iterative problems e.g., sum of series.
5. One assignment on One Dimensional Array manipulation.
6. One assignment on different Matrix problems, String operations.
7. One assignment on implementing simple functions.
8. One assignment on Recursive functions.
9. One assignment on pointers and structures.
10. One assignment on file operations.

### Note:

The actual experiments/assignments will be designed by the course coordinator. One assignment should be designed to be done in groups of two or three students. The assignments must meet the objective of the course and the levels of the given course outcomes. The list of assignments and schedule of submission will be prepared by the course coordinator at the beginning of the semester.

### CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	2	-	-	-	1	-	-	-	2	-	-	-
CO2.	2	2	-	-	1	-	-	-	1	-	-	-
CO3.	2	2	-	-	1	-	-	-	1	-	-	-
CO4.	3	2	3	-	-	-	-	-	3	-	-	-
CO5.	-	-	-	-	-	-	-	-	-	3	-	-
CO6.	-	-	-	-	-	-	-	3	-	-	-	3
3 –High 2-Medium 1-Low												

<b>Course code</b>	<b>ESC/4-P</b>
<b>Category</b>	<b>Engineering Science Courses</b>
<b>Practical Course title</b>	<b>Workshop/Manufacturing Practices</b>
<b>Contact Hours</b>	<b>04</b>
<b>Credits</b>	<b>02</b>
<b>Course Assessment Methods</b>	<p><b>Internal: 50 Marks; External: 50 Marks</b></p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.</p> <p>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.</p> <p>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.</p> <p>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

#### About the Course:

This lab course provides students with the opportunity to study and practice manufacturing processes. This lab provides students experiential learning with the nature and technique of manufacturing processes. Students can set up and operate machines, manufacture parts, measure process variables, and inspect manufactured parts. Skills acquired from time in the lab are integrated with prior and subsequent learning of other engineering topics such as engineering materials and quality planning and control.

Sr. No.	Course Outcomes	RBT Level
CO1	Students will be able to understand the concept and importance of plant layout.	L1
CO2	Students will be able to understand the tools, machines & Equipment in Carpentry Shop. They practice the carpentry work by making jobs in carpentry shop.	L2
CO3	Students will be able to understand the tools, machines & Equipment in Fitting & Sheet Metal Shop. They practice the Fitting & Sheet Metal work by making jobs in these shops.	L3



CO4	Students will be able to understand the tools, machines & Equipment in Machine Shop. They practice the Machine work by making jobs in Machine shop.	L4
CO5	Students will be able to understand the tools, machines & Equipment in Welding Shop. They practice the carpentry work by making jobs in Welding shop.	L5
CO6	Students will be able to understand the tools, machines & Equipment in Foundry Shop. They practice the carpentry work by making jobs in Foundry shop.	L6

**List of Experiments:**

1. To prepare plant layout of workshop and introduction of different shops.
2. To prepare lap and T-Joints with the help of electric arc welding.
3. To prepare butt joint with thin metal sheets using MIG and TIG welding.
4. To study different types of machine tools (lathe shaper, milling and drilling machines).
5. To prepare a job on lathe machine involving facing, outside turning, taper turning, step turning, radius making parting off and knurling.
6. To prepare a job such as V-block on shaper.
7. To study different types of fitting tools used in fitting shop.
8. To study different types of measuring tools used in metrology and determine least count of vernier caliper, micrometer and vernier height gauge.
9. To prepare different shapes using fitting tools such as cross shape, L-Shape or T-Shape in fitting shop.
10. To make a simple square /rectangle tray in sheet metal shop.
11. To prepare a job including different operation like blanking, piecing and bending extra in sheet metal shop.
12. To study various carpentry tools in the carpentry shop.
13. To prepare wooden T and Cross in the carpentry shop
14. To prepare mold and core assembly to put the metal in the mold and fettle the casting.

NOTE: The list is indicative. The teacher can alter/add more no. of experiments as per the requirement

**Course Articulation Matrix (CO to PO/PSO Mapping)**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	2	1	1	1	1	-	-	-	-	-	-	-	1	2	2
CO2	2	2	1	2	1	-	-	-	-	-	-	-	1	2	2
CO3	3	2	2	2	1	-	-	-	-	-	-	-	1	2	3
CO4	3	3	2	2	1	-	-	-	-	-	-	-	1	2	3
CO5	3	3	2	3	2	-	-	-	-	-	-	-	2	2	3
CO6	3	3	2	3	2	-	-	-	-	-	-	-	2	3	3

1.(Slight/Low) 2.(Moderate/Medium) 3.(Substantial/High)

<b>Course code</b>	ESC/2-P
<b>Category</b>	Engineering Science Courses
<b>Practical Course title</b>	Engineering Graphics & Design
<b>Contact Hours</b>	04
<b>Credits</b>	02
<b>Course Assessment Methods</b>	<p><b>Internal: 50 Marks; External: 50 Marks</b></p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.</p> <p>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.</p> <p>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.</p> <p>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

#### About the Course:

The objective of this lab course is to develop graphic skills for the preparation of two dimensional and three-dimensional drawings of objects manually or with the help of computer software like AutoCAD. The course is also intended to develop skills for reading, understanding and interpretation of engineering drawings.

S. No.	Course Outcomes	RBT Level
CO-1	Student should be able to learn about different drawing instruments, types of lines & dimensioning system.	(LOTS: Levels 1: remember)
CO-2	Students will be able to draw Orthographic Projections of points, lines, planes, solids and visualize three dimensional objects hence enabling them to design new products.	(LOTS: Levels 3: Apply)
CO-3	Student should be able to draw sectioned views of solids and can develop the lateral surface of solids.	(LOTS: Levels 3: Apply)

CO-4	Student should be able to draw the isometric of three-dimensional solids	(LOTS: Levels 3: Apply)
CO-5	Student should be able to draw the 2D and 3D views of practical objects with the help of computer software AutoCAD.	(LOTS: Levels 3: Apply)
CO-6	Student will be able to communicate engineering drawings with others effectively using manual drawing as well computerized graphical techniques.	(LOTS: Levels 3: Apply)

## Course Contents

### Module 1: Introduction to Engineering Drawing

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid, and Involute; Scales – Plain, Diagonal and Vernier Scales.

### Module 2: Orthographic Projections

Principles of Orthographic Projections- Conventions- Projections of Points and lines inclined to both planes; Projections of planes inclined Planes-Auxiliary Planes.

### Module 3: Projections of Regular Solids

Solids inclined to both the Planes-Auxiliary Views; Draw simple annotation, Dimensioning and Scale.

### Module 4: Sections and Sectional Views of Right Angular Solids

Prism, Cylinder, Pyramid, Cone–Auxiliary Views; Development of Surfaces of Right Regular Solids-Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, Objects from industry and dwellings (foundation to slab only).

### Module 5: Isometric Projections

Principles of Isometric projection– Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions.

### Module 6: Overview of Computer Graphics

Listing the computer technologies that impact on graphical communication, Demonstrating knowledge of the theory of CAD software [such as: The Menu System, Toolbars (Standard, Object Properties, Draw, Modify and Dimension), Drawing Area (Background, Crosshairs, Coordinate System), Dialog boxes and windows, Shortcut menus (Button Bars), The Command Line (where applicable), The Status Bar, Different methods of zoom as used in CAD, Select and erase objects; Isometric Views of lines, Planes, Simple and compound Solids].

### Module 7: Customization & CAD Drawing

Consisting of set up of the drawing page and the printer including scale settings, setting up of units and drawing limits; ISO and ANSI standards for coordinate dimensioning and tolerancing; Orthographic constraints, Snap to objects manually and automatically; Producing drawings by using various coordinate input entry methods to draw straight lines, Applying various ways of drawing circles.

### Module 8: Annotations, layering & other functions

Applying dimensions to objects, Applying annotations to drawings; Setting up and use of Layers, Layers to create drawings, Create, Edit and Use customized layers; Changing line lengths through modifying existing lines (extend/lengthen); Printing documents to paper using the print command; Orthographic projection techniques; Drawing sectional views of composite right regular geometric solids and Project the true shape of the sectioned surface; Drawing annotation, Computer-aided design(CAD) software modelling of parts and assemblies. Parametric and non-parametric solid, Surface and Wire frame models. Part editing and two-dimensional documentation of models. Planar projection theory, including sketching of Perspective, Isometric, Multiview, Auxiliary and Section

views. Spatial visualization exercises. Dimensioning guidelines, Tolerancing techniques; Dimensioning and Scale multi views of dwelling.

**Module 9: Demonstration of a simple team design project**

Geometry and topology of engineered components: Creation of engineering models and their presentation in standard 2D blue print form; Geometric dimensioning and Tolerancing; Use of solid-modelling software for creating associative models at the component and assembly levels; Floor plans that include: Windows, Doors and Fixture such as Wash Cabin (WC), Bath, Sink, Shower etc. Applying colour coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling; Introduction to Building Information Modelling (BIM).

**Suggested Text/Reference Books:**

1. Bhatt N.D., Panchal V.M.& Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House
2. Gill P.S., (2018), Engineering Graphics & Design, S.K. Kataria & Sons
3. Shah, M. B.& Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
4. Agrawal B.& Agrawal C. M. (2012), Engineering Graphics, TMH Publication
5. Narayana, K.L.&P Kannaiah (2008), Text book on Engineering Drawing, Scitech Publishers
6. (Corresponding set of) CAD Software Theory and User Manuals

**CO-PO Mapping:**

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	2	-	-	-	-	-	-	-	-	-	-	2
CO2.	2	3	-	-	-	-	-	-	-	3	-	3
CO3.	2	3	-	-	-	-	-	-	-	3	-	3
CO4.	2	3	-	-	-	-	-	-	-	3	-	3
CO5.	2	3	3	2	2	-	-	-	-	3	-	3
CO6.	2	3	-	-	-	-	-	-	-	3	-	3
3 –High 2-Medium 1-Low												

<b>Course code</b>	<b>HSMC/1-P</b>
<b>Category</b>	<b>Humanities and Social Sciences including Management courses</b>
<b>Practical Course title</b>	<b>English</b>
<b>Contact Hours</b>	<b>02</b>
<b>Credits</b>	<b>01</b>
<b>Course Assessment Methods</b>	<p><b>Internal: 50 Marks; External: 50 Marks</b></p> <p>The internal and external assessment is based on the level of participation in laboratory Sessions, timely submission of experiments/assignments, the quality of solutions designed for the assignments, the performance in VIVA-VOCE, the quality of laboratory file and ethical practices followed.</p> <p>There will be a continuous process for laboratory course evaluation. Two internal examinations (each of 50 marks) for the laboratory courses (Minor Laboratory Evaluations: MLE I and MLE II) will be conducted in the week before or after the internal examinations for the theory courses. The overall internal marks will be calculated as the average of the two minor laboratory course evaluations. The course coordinator will conduct these minor evaluations in the slots assigned to them as per their timetable. The Chairperson of the Department will only notify the week for the internal laboratory course evaluations. The marks for MLE I and MLE II must be submitted within a week of the conduct of these laboratory course evaluations.</p> <p>The external examination will be conducted by external examiner appointed by the Controller of Examination along with the internal examiner, preferably the laboratory course coordinator, appointed by the Chairperson of the Department. The final practical examination of duration three hours will be conducted only in groups of 20-25 students.</p> <p>The Course Coordinator/Internal Examiners/External Examiners will maintain and submit the bifurcation of marks obtained by the students in internal as well as external evaluations in the proformas (attached herewith as Annexures I and II) to the respective departments in addition to submitting and uploading of overall marks on the university portal as per the requirement of the result branch. The laboratory course coordinator will also conduct laboratory course exit survey and, compute and submit the attainment levels of the laboratory course based on direct and indirect evaluation components and submit it to the Chairperson office along with the internal assessment marks.</p>

**Pre-requisites: The students should be able to read, write and understand.**

#### **About the Course:**

The objective of the lab course is to train the students to understand the basic concepts of grammar and pronunciation. The lab course will enable the students to enhance their vocabulary and implement the same in day-to-day conversations. The activities like mock interviews, debates and presentations would provide them the platform to improvise their communication.

<b>S. No.</b>	<b>Course Outcomes: By the end of the lab course a student would be able to:</b>	<b>RBT Level</b>
CO-1	Apply the practical knowledge of using action words in sentence construction	(LOTS: Levels 3: Apply)
CO-2	Analyze the right kind of pronunciation with appropriate speech sounds	(HOTS: Level 4: Analyse)

CO-3	Apply the concepts of accurate English in using good vocabulary and communication skills.	(HOTS: Level 5: Evaluate)
CO-4	Understand the importance of pronunciation and apply the same day to day conversation.	(HOTS: Level 6: Create)
CO-5	Enable to spot the common grammatical errors related to sentence structure, preposition, concord, relative and conditional clauses and parallel structures.	(HOTS: Level 6: Create)
CO-6	Enable to spot the common grammatical errors related to sentence structure, preposition, concord, relative and conditional clauses and parallel structures.	(LOTS: Level 3: Apply)

### List of Assignments/Activities

1. Two activities of role play based on the content in the syllabus.
2. Two assignments associated with topics of grammar and phonetics.
3. Two activities based on presentation, debates and speech.
4. Mock interview for development of confidence.

### Note:

The actual experiments/assignments will be designed by the course coordinator. One assignment should be designed to be done in groups of two or three students. The assignments must meet the objective of the course and the levels of the given course outcomes. The list of assignments and schedule of submission will be prepared by the course coordinator at the beginning of the semester.

### CO-PO Mapping:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	-	-	-	-	-	-	-	1	1	3	-	3
CO2.	-	-	-	-	-	-	-	1	1	3	-	3
CO3.	-	-	-	-	-	-	-	1	1	3	-	3
CO4.	-	-	-	-	-	-	-	1	1	3	-	3
CO5.	-	-	-	-	-	-	-	1	1	3	-	3
CO6.	-	-	-	-	-	-	-	1	1	3	1	3
3 –High 2-Medium 1-Low												

<b>Course code</b>	<b>MC/1</b>
<b>Category</b>	<b>Mandatory courses</b>
<b>Practical Course title</b>	<b>Induction Training</b>
<b>Duration</b>	<b>3 weeks</b>
<b>Credits</b>	<b>0.0</b>
<b>About The program</b>	<p>Induction training is a well-planned event to educate the new entrants about the University environment, and connect them with the people in it. The purpose of Induction training is to help new students adjust and feel comfortable in the new environment, inculcate in them the ethos and culture of the University, help them build bonds with other students and faculty members, and expose them to a sense of larger purpose and self-exploration. The time during the Induction training is used to overcome weakness in some essential professional skills like computer, English language, basic science etc.</p> <p>This induction training is to be scheduled for conducting following activities as per modules mentioned in AICTE Induction Program.</p> <ul style="list-style-type: none"> <li>– ☑ M1: Lectures on Universal Human Values I (UHV-I)</li> <li>– ☑ M2: Physical health and related Activities</li> <li>– ☑ M3: Familiarization of Department/labs, Familiarization of different branches like examination, NSS, Library, Training and placement etc.</li> <li>– ☑ M4: Visits to Local Area</li> <li>– ☑ M5: Lectures &amp; Workshops by Eminent People</li> <li>– ☑ M6: Proficiency modules on English language and computer, Bridge course in Physics, Chemistry and Mathematics</li> <li>– ☑ M7: Literary activities</li> <li>– ☑ M8: Creative Arts and Culture activities</li> <li>– ☑ M9: Extra-Curricular Activities</li> </ul> <p>A detailed guide of Student Induction Program given by AICTE is at following link:  <a href="https://www.aicte-india.org/sites/default/files/Detailed%20Guide%20on%20Student%20Induction%20program.pdf">https://www.aicte-india.org/sites/default/files/Detailed%20Guide%20on%20Student%20Induction%20program.pdf</a></p>



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**External Laboratory Course Evaluation Proforma**

Name of the Programme:  
 Semester:  
 Nomenclature of the Course:  
 Course Code:

Internal Laboratory Course Evaluation Proforma

Minor Laboratory Course Evaluation-I (MLE-I) / Minor Laboratory Course Evaluation-II (MLE-II)

Name of the Programme:  
 Semester:  
 Nomenclature of the Course:  
 Course Code:

SR. No.	Roll. No.	Written work and /Or conduct of Experiment(s)	(VIVA-VOCE) based on laboratory Course Outcomes CO-2 to CO-4			Laboratory Record/File	Class Performance (Attendance/ Ethical practices  followed, Self- Learning and Team Spirit)	Total Marks 50
			CO-1	CO-2	CO-3			
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28.								
29.								
30.								

Total No. of Students:	Present:	Absent
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Name of the Course Coordinator	Signature of the Course Coordinator
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Note: The CO-wise weightage be decided by the individual Lab Course by the Course Coordinator in consultation with the Chairperson.



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External Laboratory Course Evaluation Proforma

Name of the Programme:

Semester:

Nomenclature of the Course:

Course Code:

SR. No.	Roll. No.	Written work and /or Conduct of Experiment(s) (20)	(VIVA-VOCE) (20)	Laboratory Record/File (10)	Total Marks (50)
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30.					
Total No. of Students:			Present:	Absent	
Name of the Examiners			Signature of the Examiners		