Curriculum for

Bachelor of Technology

'First Year'

for University Teaching Departments (UTD)
under
Dean, Faculty of Engineering & Technology (FET)

(w. e. f. session 2024-2025)

Guru Jambheshwar University of Science and Technology Hisar-125001, Haryana

Abbreviation

PTG	-	Printing Technology
PKG	-	Packaging Technology
ME	-	Mechanical Engineering
ECE	-	Electronics & Communication Engineering
EE	-	Electrical Engineering
FT	-	Food Technology
CE	-	Civil Engineering
EC	-	Electronics & Computer Engineering
EBME	-	Electronics & Bio-Medical Engineering
CSE	-	Computer Science Engineering
IT	-	Information Technology
AI&ML	-	Artificial Intelligence & Machine Learning
AI&DS	-	Artificial Intelligence & Data Science

General, Course Structure & Theme
&
Semester-wise credit distribution

A. Code and definition:-

Code	Definitions
L	Lecture
Tut	Tutorial
T	Theory
P	Practical
C	Credits
BSC	Basic Science Courses
ESC	Engineering Science Courses
HSMC	Humanities and Social Sciences including Management
MC	Mandatory courses

B. Definition of Credit:-

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (Tut) per week	1 Credit
1 Hr. Practical (P) per week	0.5 Credits

C. Range of credits –

A range of credits for all semesters is 160 for a student to be eligible to get Under Graduate degree in Engineering. A student will be eligible to get Under Graduate degree with Honours, if he/she completes an additional 20 credits. These could be acquired through MOOCs.

Sr. No.	Category	Suggested Breakup of Credits (Total 160)
1	Humanities and Social Sciences including Management courses	12*
2	Basic Science courses	25*
3	Engineering Science courses including workshop, drawing, basics of electrical/mechanical/computer etc.	24*
4	Professional core courses	48*
5	Professional Elective courses relevant to chosen specialization/ branch	18*
6	Open subjects – Electives from other technical and /or emerging subjects	18*
7	Project work, seminar and internship in industry or elsewhere	15*
8	Mandatory Courses [Induction Training, Environmental Sciences, Indian Constitution, Essence of Indian Traditional Knowledge]	(non-credit)
	Total	160*

*Minor variation is allowed as per need of the respective disciplines.

D. Structure of the First year in B. Tech. Programme:-

Sr. No.	Category	Credits
1	HSMC	03
2	BSC	19
3	ESC	16
4	MC	00
	Total	38

E. Credit distribution in the First year:

	Lecture (L) (No. of hrs/week)	Tutorial (Tu) (No. of hrs/week)	Laboratory/ Practical (P) (No. of hrs/week)	Total credits (C)
Physics	3	1	3	5.5
Chemistry	3	1	3	5.5
Maths-I	3	1	0	4
Maths -II	3	1	0	4
Programming for Problem solving	3	0	4	5
English	2	0	2	3
Engineering Graphics & Design	1	0	4	3
Workshop/Manufacturing Practices	1	0	4	3
Basic Electrical Engineering	3	1	2	5
Total				38

F. Category of Courses in the First year:-

BASIC SCIENCE COURSES

Sr. No.	Course Code	Course Title	Credits
1	BSC101	Physics	5.5
2	BSC102	Chemistry	5.5
3	BSC103/105	Maths –I	4.0
4	BSC104/106	Maths –II	4.0

ENGINEERING SCIENCE COURSES

Sr. No.	Course Code	Course Title	Credits
1	ESC101	Basic Electrical Engineering	5.0
2	ESC102	Engineering Graphics & Design	3.0
3	ESC103	Programming for Problem Solving	5.0
4	ESC104	Workshop/Manufacturing Practices	3.0
5	ESC105	IDEA Lab	0.0

HUMANITIES & SOCIAL SCIENCES INCLUDING MANAGEMENT

Sr. No.	Course Code	Course Title	Credits
1	HSMC101	English	3.0

MANDATORY COURSES

Sr. No.	Course Code	Course Title	Credits
1	MC 101	Induction Training	0.0
2	MC102	Environmental Sciences	0.0
3	MC103	Indian Constitution	0.0

G. Course Assessment Distribution

Each course will be evaluated out of 100 marks irrespective of the credits assigned to it. The marks obtained by a student out of 100 will be treated as notional marks. These notional marks (marks obtained) will be multiplied by the Credits to get grade point for each paper/course. The course assessment distribution for internal and external evaluations is given below.

For Theory Courses
Internal: 30; External: 70

For laboratory Courses
Internal: 50; External: 50

B. Tech. Scheme (Semester I)

Sr. No.	Category	Course Code		Course Title	Hours per Week			Course Credits		
		Theory	Practical		L	Tut	P	Theory	Practical	Total
1	Basic Science Courses	BSC101 (I)-T	BSC101 (I)-P	**Physics: Introduction to Electromagnetic Theory** (***Group A***: Mechanical Engineering, Civil Engg., Food Tech.)	3	1	3	4.0	1.5	5.5
		BSC101 (IV)-T	BSC101 (IV)-P	**Physics: Oscillation, Waves and Optics** (***Group A****:* Printing Technology, Packaging Technology, Electrical Engineering, Electronics & Bio-Medical Engineering, Electronics & Communication Engineering, Electronics & Computer Engineering)						
		BSC102 -T	BSC102 -P	Chemistry - ***Group B***	3	1	3	4.0	1.5	
2	Basic Science Courses	BSC103-T	--	Maths -I (PTG/PKG/ME/ECE/EE/EBME/CE/FT/E&C)	3	1	0	4.0	0.0	4.0
		BSC105-T	--	Maths -I (CSE/IT/AI&ML/AI&DS)						
3	Engineering Science Courses	ESC101-T	ESC101-P	Basics Electrical Engineering - ***Group A***	3	1	2	4.0	1.0	5.0
		ESC103-T	ESC103-P	Programming for Problem Solving - ***Group B***	3	0	4	3.0	2.0	5.0
4	Engineering Science Courses	ESC104-T	ESC104-P	Workshop/Manufacturing Practices - ***Group A***	1	0	4	1.0	2.0	3.0
		--	ESC102-P	Engineering Graphics & Design - ***Group B***						
5	Engineering Science Courses	--	ESC105-P	IDEA Lab - ***Group B***	0	0	2	0.0	0.0	0.0
6	Humanities & Social Sciences and Management Courses	HSMC101-T	HSMC101-P	English - ***Group A***	2	0	2	2.0	1.0	3.0
7	Mandatory Courses	MC102-T	--	Environmental Sciences - ***Group B***	3	0	0	0.0	0.0	0.0
		MC103-T	--	Indian Constitution - ***Group A***						
		MC101		Induction Training - ***Group A + Group B***	As per AICTE Guidelines					

Total Credits- [Group A=20.5; Group B=17.5]

B. Tech. Scheme (Semester II)

Sr. No.	Category	Course Code		Course Title	Hours per Week			Course Credits		
		Theory	Practical		L	Tut	P	Theory	Practical	Total
1	**Basic Science Courses**	BSC101 (V)-T	BSC101 (V)-P	**Physics: Semiconductor Physics** (***Group B****:* Computer Science and Engineering, Information Technology, AI&ML, AI& Data Science)	**3**	**1**	**3**	**4.0**	**1.5**	**5.5**
		BSC102 -T	BSC102 -P	Chemistry - ***Group A***						
2	**Basic Science Courses**	BSC104-T	--	Maths -II (PTG/PKG/ME/ECE/EE/EBME/CE/FT/E&C)	**3**	**1**	**0**	**4.0**	**0.0**	**4.0**
		BSC106-T	--	Maths -II (CSE/IT/AI&ML/AI&DS)						
3	**Engineering Science Courses**	ESC101-T	ESC101-P	Basics Electrical Engineering - ***Group B***	**3**	**1**	**2**	**4.0**	**1.0**	**5.0**
		ESC103-T	ESC103-P	Programming for Problem Solving - ***Group A***	**3**	**0**	**4**	**3.0**	**2.0**	**5.0**
4	**Engineering Science Courses**	ESC104-T	ESC104-P	Workshop/Manufacturing Practices - ***Group B***	**1**	**0**	**4**	**1.0**	**2.0**	**3.0**
		--	ESC102-P	Engineering Graphics & Design - ***Group A***						
5	**Engineering Science Courses**	--	ESC105-P	IDEA Lab - ***Group A***	**0**	**0**	**2**	**0.0**	**0.0**	**0.0**
6	**Humanities & Social Sciences and Management Courses**	HSMC101-T	HSMC101-P	English - ***Group B***	**2**	**0**	**2**	**2.0**	**1.0**	**3.0**
7	**Mandatory Courses**	MC102-T	--	Environmental Sciences - ***Group A***	**3**	**0**	**0**	**0.0**	**0.0**	**0.0**
		MC103-T	--	Indian Constitution - ***Group B***						

Total Credits- [Group A=17.5; Group B=20.5]

Note:

- All B. Tech. Programmes running in the University are divided into following two groups:

Group	Disciplines
A	• Printing Technology • Packaging Technology • Mechanical Engineering • Electronics & Communication Engineering • Electrical Engineering • Electronics & Computer Engineering • Electronics & Bio-Medical Engineering • Food Technology • Civil Engineering
B	• Computer Science and Engineering • Computer Science and Engineering (Artificial Intelligence & Machine learning) • Information Technology • Artificial Intelligence & Data Science

- The following mandatory courses taught in 2nd semester will be included in 3rd semester to groups A & B:

Environmental Sciences	Group B
Indian Constitution	Group A

- Each University Teaching Department of Engineering has opted one of the following seven options in Physics Course most suitable to their students.
  - **I** Introduction to Electromagnetic Theory
  - **II** Introduction to Mechanics
  - **III** Optics, Fiber 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

The following options are opted for each discipline.

Discipline	Option
• Mechanical Engineering	Introduction to Electromagnetic Theory
• Printing Technology • Packaging Technology	Oscillation, Waves and Optics
• Electronics and Communication Engineering • Electronics and Biomedical Engineering	Oscillation, Waves and Optics
• Electrical Engineering • Electrical and Computer Engineering	Oscillation, Waves and Optics
• Civil Engineering	Introduction to Electromagnetic Theory
• Food Technology	Introduction to Electromagnetic Theory
• Computer Science and Engineering • Information Technology • Computer Science and Engineering (AI&ML)	Semiconductor Physics
• AI & Data Science (AI&DS)	Semiconductor Physics

Theory Courses

Course code	**BSC101(I)-T**			
Category	**Basic Science Course**			
Course title	**Physics: Introduction to Electromagnetic Theory**			
Scheme and Credits	**L**	**Tut**	**Credits**	
	3	**1**	**4.0**	
Course Assessment Methods	**Internal Examination (30 marks):** • 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. • Class Performance will be measured through percentage of lectures attended (04 marks) • Assignments, quiz etc. will have weightage of 06 marks **End semester examination (70 marks)**: • 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. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.			

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. demonstrate the different forms of Maxwell equations in different mediums.
CO3. apply, formulate and solve engineering problems on Maxwell equations as per their course or practical application requirements.
CO4. compare 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, dielectric sphere in uniform Electric field.

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 B and 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 breaking 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, 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, Basic Principles of Transmission Lines, Equivalent Circuit Representation, General Transmission Line Equation,

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	**BSC101(II)-T**			
Category	**Basic Science Course**			
Course title	**Physics: Introduction to Mechanics**			
Scheme and Credits	**L**	**Tut**	**Credits**	
	3	**1**	**4.0**	
Course Assessment Methods	**Internal Examination (30 marks):** • 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. • Class Performance will be measured through percentage of lectures attended (04 marks) • Assignments, quiz etc. will have weightage of 06 marks **End semester examination (70 marks)**: • 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. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.			

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

Transformation of scalars and vectors under Rotation transformation; Forces in Nature; Newton‘s lawsand its completeness in describing particle motion; Form invariance of Newton‘s Second Law; Solving Newton‘s equations of motion in polar coordinates; Problems

including constraints and friction; Extension to cylindrical and spherical coordinates. Potential energy function; F = - Grad V, equipotential surfaces and meaning of gradient.

Unit II

Conservative and non-conservative forces, curl of a force field; Central forces; Conservation of AngularMomentum; Energy equation and energy diagrams; Elliptical, parabolic and hyperbolic orbits; Kepler problem; Application: Satellite maneuvers;
Non-inertial frames of reference; Rotating coordinate system: Five-term acceleration formula. Centripetal and Coriolis accelerations; Applications: Weather systems, Foucault pendulum; Harmonic oscillator; Damped harmonic motion – over-damped, critically damped and lightly-damped oscillators; Forced oscillations and resonance.

Unit III

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; Examples 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

Free body diagrams with examples on modelling 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.

T**ext and Reference Books:**

1. Engineering Mechanics, 2nd 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, 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	**BSC101(III)-T**			
Category	**Basic Science Course**			
Course title	**Physics: Optics, Fiber Optics, Magnetism and Nuclear Physics**			
Scheme and Credits	**L**	**Tut**	**Credits**	
	3	**1**	**4.0**	
Course Assessment Methods	**Internal Examination (30 marks):** • 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. • Class Performance will be measured through percentage of lectures attended (04 marks) • Assignments, quiz etc. will have weightage of 06 marks **End semester examination (70 marks)**: • 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. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.			

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, Fraunhoffer and Fresnel diffraction, Fraunhoffer 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. mpere'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, GF.M 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												

Course code	**BSC101(IV)-T**			
Category	**Basic Science Course**			
Course title	**Physics: Oscillations, waves and optics**			
Scheme and Credits	**L**	**Tut**	**Credits**	
	3	**1**	**4.0**	
Course Assessment Methods	**Internal Examination (30 marks):** • 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. • Class Performance will be measured through percentage of lectures attended (04 marks) • Assignments, quiz etc. will have weightage of 06 marks **End semester examination (70 marks)**: • 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. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.			

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, complex number notation and phasor representation of simple harmonic motion, 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 wavefront splitting and amplitude splitting; Young's double slit experiment, Newton's rings, Michelson interferometer, Fraunhoffer 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

UNIT – IV

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 lasers (He-Ne), solid-state lasers (ruby, Neodymium), Semiconductor lasers; Properties of laser beams: mono-chromaticity, coherence, directionality and brightness, applications of lasers in science, engineering and medicine.

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												

Course code	**BSC101(V)-T**			
Category	**Basic Science Course**			
Course title	**Physics: Semiconductor Physics**			
Scheme and Credits	**L**	**Tut**	**Credits**	
	3	**1**	**4.0**	
Course Assessment Methods	**Internal Examination (30 marks):** • 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. • Class Performance will be measured through percentage of lectures attended (04 marks) • Assignments, quiz etc. will have weightage of 06 marks **End semester examination (70 marks)**: • 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. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.			

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 (to introduce origin of band gap), Energy bands in solids, E-k diagram, Direct and indirect band gaps, Types of electronic materials: metals, semiconductors, and insulators, Density of states, Occupation probability, Fermi level, Effective mass, Phonons.

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), Semiconductor materials of interest for optoelectronic devices.

UNIT - III

Light-Semiconductor Interaction

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

UNIT - IV

Measurements & Engineered Semiconductor Materials

Four-point probe and vander 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. Hetero junctions and associated band-diagrams

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 onNPTEL
5. Solid State Physics, by C. Kittel (WileyEastern)

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	**BSC101(VI)-T**			
Category	**Basic Science Course**			
Course title	**Physics: Waves Optics, Quantum Mechanics and Solids**			
Scheme and Credits	**L**	**Tut**	**Credits**	
	3	**1**	**4.0**	
Course Assessment Methods	**Internal Examination (30 marks):** • 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. • Class Performance will be measured through percentage of lectures attended (04 marks) • Assignments, quiz etc. will have weightage of 06 marks **End semester examination (70 marks)**: • 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. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.			

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. Farunhofer 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 Lasres, 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												

Course code	**BSC101(VII)-T**			
Category	**Basic Science Course**			
Course title	**Physics: Introduction to Quantum Physics**			
Scheme and Credits	**L**	**Tut**	**Credits**	
	3	**1**	**4.0**	
Course Assessment Methods	**Internal Examination (30 marks):** • 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. • Class Performance will be measured through percentage of lectures attended (04 marks) • Assignments, quiz etc. will have weightage of 06 marks **End semester examination (70 marks)**: • 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. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.			

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, eigen value problems, 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 problems, Particle in a box (infinite potential well), Potential step, Finite Potential Well and Barrier, Tunneling, 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 Sommerfield), 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												

<table>
<tr><td>Course code</td><td colspan="4">BSC102-T</td></tr>
<tr><td>Category</td><td colspan="4">Basic Science Course</td></tr>
<tr><td>Course title</td><td colspan="4">Chemistry</td></tr>
<tr><td>Scheme and Credits</td><td>L</td><td>Tut</td><td>Credits</td><td></td></tr>
<tr><td></td><td>3</td><td>1</td><td>4.0</td><td></td></tr>
<tr><td>Course Assessment Methods</td><td colspan="4">Internal Examination (30 marks):
• 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.
• Class Performance will be measured through percentage of lectures attended (04 marks)
• Assignments, quiz etc. will have weightage of 06 marks
End semester examination (70 marks):
• 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.
• A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</td></tr>
</table>

Course Outcomes

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

CO1. analyze microscopic chemistry 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 potential energy surfaces of different molecules.

Course contents:

UNIT I

Atomic and molecular structure

Schrodinger equation, Particle in a box solutions and their applications for conjugated molecules, Forms of the hydrogen atom wave functions and the plots of these functions to explore their spatial variations, Molecular orbitals of diatomic molecules and plots of the multicenter orbitals, Equations for atomic and molecular orbitals, Energy level diagrams of diatomic. 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.

UNIT II

Spectroscopic techniques and applications

Principles of spectroscopy and selection rules, Electronic spectroscopy, Fluorescence and its applications in medicine, Vibrational and rotational spectroscopy of diatomic molecules.

Applications, Nuclear magnetic resonance and magnetic resonance imaging, surface characterisation techniques, Diffraction and scattering. Intermolecular forces and potential energy surfaces Ionic, dipolar and van Der Waals interactions, Equations of state of real gases and critical phenomena.

UNIT III

Use of free energy in chemical equilibrium and Periodic properties

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

Effective nuclear charge, penetration of orbitals, variations of s, p, d and f orbital energies of atoms in the periodic table, electronic configurations, atomic and ionic sizes, ionization energies, electron affinity and electronegativity, polarizability, oxidation states, coordination numbers and geometries, hard soft acids and bases, molecular geometries

UNIT IV

Stereochemistry and Organic reactions

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

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.
4. Krishnan
5. Physical Chemistry, by P. W. Atkins
6. Organic Chemistry: Structure and Function by K. P. C. Volhardt 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												

Maths-I

Calculus and Linear Algebra

General Course Information (Note: w.e.f session 2022-23 already)

Course Code: BSC103-T Course Credits: 4 (L:3+T:1) Type: Basic Science Course Contact Hours: 6 hours/week Mode: Lectures (L) Examination Duration: 3 hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Three minor tests, each of 20 marks, will be conducted. The third minor will be conducted in open book mode by the Course Coordinator. No date sheet will be issued for the third minor at the level of the Departments. For the purpose of internal assessment, the average of the highest marks obtained by a student in any of the two minor examinations will be considered. All the minor examination question papers will be prepared and evaluated by following the Outcome Based Education framework. Class Performance will be measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks). The end semester examination will be of 70 marks. For the end semester examination, nine questions are to be set by the examiner. All questions carry equal marks. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. The remaining eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt five questions in all, one compulsory and any other four questions by selecting one from each unit.

About the Course

The course aims at developing a strong mathematical background in Calculus and Linear Algebra. The course mainly builds up on the topics namely: calculus, convergence of series, partial differentiation, consistency of the system of equation, eigen values and eigen vectors. These topics would enable the students to devise solutions for given situations they may encounter in their engineering profession.

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. (LOTS: Level 1: Remember)

CO2. **Explain** the 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. (LOTS: Level 2: Understand)

CO3. **Solve** the different problems of calculus and linear algebra with the assistance of suitable theorems and methods. (LOTS: Level 3: Solve)

CO4. **Analyze** different approaches and methods of calculus and linear algebra in solving engineering domain problems. (HOTS: Level 4: Analyze)

CO5. **Compile** the knowledge of calculus and linear algebra to solve the real world problems. (HOTS: Level 6: Create)

Course 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 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.

Unit II

Introduction to sequence and Infinite series, Test for convergence/divergence, Comparison test, Cauchy integral test, Ratio test, Root 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.

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; 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, 2007.
2. E. Kreyszig, *Advanced Engineering Mathematics*, 9th Edition, John Wiley & Sons, 2006.
3. T. Veerarajan, *Engineering Mathematics for first year*, Tata McGraw Hill, New Delhi, 2008.
4. B. V. Ramana, *Higher Engineering Mathematics*, Tata McGraw Hill, New Delhi, 11th Reprint, 2010.
5. D. Poole, *Linear Algebra: A Modern Introduction*, 2nd Edition, Brooks/Cole, 2005.
6. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 36th Edition, 2010.

CO-PO Articulation Matrix: Maths-I

Calculus and Linear Algebra (BSC103-T)

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	1	-	-	-	-	-	-	-	-
CO2	1	1	1	2	-	-	-	-	-	-	-	-
CO3	2	2	-	3	-	-	-	-	-	-	-	-
CO4	3	3	1	3	-	-	-	-	-	-	-	-
CO5	2	3	3	3	-	-	-	-	-	-	-	-
Level of Attainments : BSC103-T												

Maths-II

Calculus, Ordinary Differential Equation and Laplace Transform

General Course Information (Note: w.e.f session 2022-23 already)

Course Code: BSC104-T Course Credits: 4 (L:3+T:1) Type: Basic Science Course Contact Hours: 6 hours/week Mode: Lectures (L) Examination Duration: 3 hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Three minor tests, each of 20 marks, will be conducted. The third minor will be conducted in open book mode by the Course Coordinator. No date sheet will be issued for the third minor at the level of the Departments. For the purpose of internal assessment, the average of the highest marks obtained by a student in any of the two minor examinations will be considered. All the minor examination question papers will be prepared and evaluated by following the Outcome Based Education framework. Class Performance will be measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks). The end semester examination will be of 70 marks. For the end semester examination, nine questions are to be set by the examiner. All questions carry equal marks. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. The remaining eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt five questions in all, one compulsory and any other four questions by selecting one from each unit.

About the Course

The students will be able to develop proficiency in different topics such as multiple integrals, vector calculus and solutions of ordinary differential equations. These topics would enable students to devise solutions for given situations they may encounter in their engineering profession.

Course Outcomes: By the end of the course students will be able to:

CO1. **Outline** the concepts and related terminology of calculus, ordinary differential equation and Laplace transform including multiple integrals, vector calculus etc. (LOTS: Level 1: Remember)

CO2. **Describe** the significance of various theorems and methods such as Green's theorem, Stokes' theorem, Variation of parameters, Laplace transform etc. (LOTS: Level 2: Understand)

CO3. **Apply** the suitable theorems and methods to solve the different problems of calculus, ordinary differential equation. (LOTS: Level 3: Apply)

CO4. **Evaluate** different approaches and methods of calculus, ordinary differential equation and Laplace transform in solving engineering domain problems. (HOTS: Level 5: Evaluate)

CO5. **Integrate** the knowledge of calculus, ordinary differential equation and Laplace transform to solve the real world problems. (HOTS: Level 6: Create)

Course 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).

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, Inverse Laplace transforms, Convolution theorem, application to ordinary 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, 2007.
2. E. 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. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 36th Edition, 2010.

CO-PO Articulation Matrix: Maths-II

Calculus, Ordinary Differential Equation and Laplace Transform (BSC104-T)

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1.	2	2	-	1	-	-	-	-	-	-	-	-
CO2.	1	2	-	2	-	-	-	-	-	-	-	-
CO3.	2	2	-	3	-	-	-	-	-	-	-	-
CO4.	2	3	1	3	-	-	-	-	-	-	-	-
CO5.	2	3	-	2	-	-	-	-	-	-	-	-
Level of Attainments : BSC104-T												

Maths-I (CSE/IT/CSE(AIML)/AI&DS)

Calculus and Linear Algebra

General Course Information (Note: w.e.f session 2022-23 already)

Course Code: BSC105-T Course Credits: 4 (L:3+T:1) Type: Basic Science Course Contact Hours: 6 hours/week Mode: Lectures (L) Examination Duration: 3 hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Three minor tests, each of 20 marks, will be conducted. The third minor will be conducted in open book mode by the Course Coordinator. No date sheet will be issued for the third minor at the level of the Departments. For the purpose of internal assessment, the average of the highest marks obtained by a student in any of the two minor examinations will be considered. All the minor examination question papers will be prepared and evaluated by following the Outcome Based Education framework. Class Performance will be measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks). The end semester examination will be of 70 marks. For the end semester examination, nine questions are to be set by the examiner. All questions carry equal marks. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. The remaining eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt five questions in all, one compulsory and any other four questions by selecting one from each unit.

About the Course

The aim of the course is to develop expertise in the learners about the topics Calculus and Linear Algebra. The course mainly builds up on the topics namely: calculus, consistency of the system of equation using different matrix methods, vector spaces and their linear transformations, eigen values and eigen vectors. These topics would enable the students to devise solutions for given situations they may encounter in their engineering profession.

Course Outcomes: By the end of the course students will be able to:

CO1. **Define** the terminology of calculus and linear algebra including definite and improper integrals, matrices, vector space, eigen values and eigen vectors etc. (LOTS: Level 1: Remember)

CO2. **Illustrate** the significance of various theorems and methods such as Rolle's theorem, Lagrange's mean value theorem, Taylor's theorem, Gauss elimination method, Gram-Schmidt orthogonalization process etc. (LOTS: Level 2: Understand)

CO3. **Use** suitable theorems and methods for solving different problems of calculus and linear algebra. (LOTS: Level 3: Solve)

CO4. **Evaluate** different approaches and methods of calculus and linear algebra in solving engineering domain problems. (HOTS: Level 5: Evaluate)

CO5. **Integrate** the knowledge of calculus and linear algebra to find innovative solutions to mathematical problems. (HOTS: Level 6: Create)

Course 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 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.

Unit II

Rank of a matrix, elementary transformations, elementary matrices, inverse of a matrix using elementary transformations, normal form of a matrix, Consistency of system of linear equations; Gauss elimination and Gauss-Jordan methods to solve system of non-homogenous linear equations.

Unit III

Vector Space, subspaces, span of a set, direct sum of subspaces, linear dependence, independence of vectors, basis, dimension; Linear transformations (maps), Matrix associated with a linear map and linear map associated with a matrix.

Unit IV

Eigenvalues, eigenvectors of a matrix, eigenbases; Properties of eigen values, Diagonalization of matrices; Inner product spaces, norm of a vector, Parallelogram law, orthogonal set, orthonormal set of vectors, Gram-Schmidt orthogonalization (without proof) and associated numericals.

Text and Reference Books:

1. G. B. Thomas and R. L. Finney, *Calculus and Analytic Geometry*, 9th Edition, Pearson, Reprint, 2007.
2. E. Kreyszig, *Advanced Engineering Mathematics*, 9th Edition, John Wiley & Sons, 2006.
3. D. Poole, *Linear Algebra: A Modern Introduction*, 2nd Edition, Brooks/Cole, 2005.
4. T. Veerarajan, *Engineering Mathematics for first year*, Tata McGraw Hill, New Delhi, 2008.
5. B. V. Ramana, *Higher Engineering Mathematics*, Tata McGraw Hill New Delhi, 11th Reprint, 2010.
6. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 35th Edition, 2000.
7. V. Krishnamurthy, V.P. Mainra and J. L. Arora, *An introduction to Linear Algebra*, Affiliated East–West press, Reprint 2005.

CO-PO Articulation Matrix: Maths-I (CSE/IT/CSE(AIML)/AI&DS)

Calculus and Linear Algebra (BSC105-T)

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	2	-	-	-	-	-	-	-	-
CO2.	1	1	-	2	-	-	-	-	-	-	-	-
CO3	1	3	-	3	-	-	-	-	-	-	-	-
CO4.	3	3	1	3	-	-	-	-	-	-	-	-
CO5.	3	2	-	2	-	-	-	-	-	-	-	-
Level of Attainments : BSC105-T												

Maths-II (CSE/IT/CSE (AIML)/ AI&DS)

Probability and Statistics

General Course Information (Note: w.e.f session 2022-23 already)

Course Code: BSC106-T Course Credits: 4 (L:3+T:1) Type: Basic Science Course Contact Hours: 6 hours/week Mode: Lectures (L) Examination Duration: 3 hours	**Course Assessment Methods; Max. Marks: 100 (Internal: 30; External: 70)** Three minor tests, each of 20 marks, will be conducted. The third minor will be conducted in open book mode by the Course Coordinator. No date sheet will be issued for the third minor at the level of the Departments. For the purpose of internal assessment, the average of the highest marks obtained by a student in any of the two minor examinations will be considered. All the minor examination question papers will be prepared and evaluated by following the Outcome Based Education framework. Class Performance will be measured through percentage of lectures attended (4 marks) Assignments (4 marks) and class performance (2 marks). The end semester examination will be of 70 marks. For the end semester examination, nine questions are to be set by the examiner. All questions carry equal marks. Question number one will be compulsory and based on the entire syllabus. It will contain seven short answers type questions. The remaining eight questions are to be given by setting two questions from each of the four units of the syllabus. A candidate is required to attempt five questions in all, one compulsory and any other four questions by selecting one from each unit.

About the Course

The aim of the course is to develop expertise in the learners about the topics Probability and Sampling theory. The course is mainly builds up on the topics namely: Probability theory, discrete and continuous probability distributions and sampling theory. These topics would enable the students to devise solutions for given situations they may encounter in their engineering profession. This course has direct application in the areas such telecommunications and finance.

Course Outcomes: By the end of the course students will be able to:

CO1. **Define** the terminology of probability and statistics including random variables, expectations, probability distributions, measures of central tendency, correlation, tests etc. (LOTS: Level 1: Remember)

CO2. **Explain** the significance of various tests and distributions such as Binomial distribution, Poisson distribution, Normal distribution, T-test, Chi-square test etc. (LOTS: Level 2: Understand)

CO3. **Solve** the different problems of probability and statistics with the assistance of suitable tests and methods. (LOTS: Level 3: Solve)

CO4. **Analyze** different approaches and methods of probability and statistics in solving engineering domain problems. (HOTS: Level 4: Analyze)

CO5. **Compile** the knowledge of probability and statistics to solve the real world problems. (HOTS: Level 6: Create)

Course Contents

Unit I

Overview of Mean, Median and Mode. Measures of dispersion: Range, Quartile Deviation, mean deviation, standard deviation, coefficient of variation. Moments, skewness and Kurtosis. Correlation, Rank correlation, Correlation coefficient. Simple linear regression, regression coefficients and its properties, Lines of regression.

Unit II

Introduction to basic concepts of probability and Baye's theorem. Random Variables: Discrete and continuous random variables. Probability mass function and probability density function, Distribution function and its properties. Mathematical Expectation: Addition and multiplication theorems of expectation. Moment generating function, Moments.

Unit III

Discrete Probability distributions: Bernoulli, Binomial, Poisson, Uniform distributions with their properties.

Continuous Probability distributions: Rectangular, Exponential, Normal, Gamma distributions with their properties.

Unit IV

Curve fitting by the method of least squares, Principle of least square, fitting of straight lines, second degree parabola and fitting of polynomial and exponential curves.

Test of significance: Null and Alternate hypotheses. Type I and Type II errors, Level of Significance.

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.

Text and Reference Books:

1. E. 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, Reprint 2003.
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. B. S. Grewal, *Higher Engineering Mathematics*, Khanna Publishers, 35th Edition, 2000.
6. T. Veerarajan, *Engineering Mathematics (for semester III)*, Tata McGraw Hill, New Delhi, 2010.

CO-PO Articulation Matrix: Maths-II (CSE/IT/CSE(AIML)/AI&DS)

Probability and Statistics (BSC106-T)

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	-	2	-	-	-	-	-	-	-	-
CO2.	2	2	1	2	-	-	-	-	-	-	-	-
CO3.	2	2	-	3	-	-	-	-	-	-	-	-
CO4.	2	3	1	3	-	-	-	-	-	-	-	-
CO5.	2	3	-	3	-	-	-	-	-	-	-	-
Level of Attainments : BSC106-T												

<table>
<tr><td>Course code</td><td colspan="4">ESC101-T</td></tr>
<tr><td>Category</td><td colspan="4">Engineering Science Course</td></tr>
<tr><td>Course title</td><td colspan="4">Basic Electrical Engineering</td></tr>
<tr><td rowspan="2">Scheme and Credits</td><td>L</td><td>Tut</td><td>Credits</td><td rowspan="2"></td></tr>
<tr><td>3</td><td>1</td><td>4.0</td></tr>
<tr><td>Course Assessment Methods</td><td colspan="4">Internal Examination (30 marks):
• 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.
• Class Performance will be measured through percentage of lectures attended (04 marks)
• Assignments, quiz etc. will have weightage of 06 marks
End semester examination (70 marks):
• 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.
• A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.</td></tr>
</table>

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, 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, Measurement of Power and Power Factor using two wattmeter method.

UNIT III

Electrical Machines (12)

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

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, ELCB, MCCB, Types of Wires and Cables, Earthing, Elementary calculations for energy consumption, power factor improvement.

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												

Course code	ESC103-T			
Category	Engineering Science Course			
Course title	Programming for Problem Solving			
Scheme and Credits	L	Tut	Credits	
	3	0	3.0	
Course Assessment Methods	**Internal Examination (30 marks):** • 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. • Class Performance will be measured through percentage of lectures attended (04 marks) • Assignments, quiz etc. will have weightage of 06 marks **End semester examination (70 marks)**: • 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. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.			

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.).
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												

Course code	ESC104-T			
Category	Engineering Science Courses			
Course title	Workshop/Manufacturing Practices			
Scheme and Credits	L	Tut	Credits	
	1	0	1.0	
Course Assessment Methods	**Internal Examination (30 marks):** • 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. • Class Performance will be measured through percentage of lectures attended (04 marks) • Assignments, quiz etc. will have weightage of 06 marks **End semester examination (70 marks)**: • 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. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.			

About the Course

This course will offer a detailed understanding of manufacturing processes used in industry such as casting, molding, 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 manufacturing processes, their types, advantages, and their applications.
CO2. classify the different types of manufacturing methods, tools and measuring instruments, which are commonly employed in the industry, to fabricate components using different materials.
CO3. elaborate the working mechanism of cupola furnace & various manufacturing processes.
CO4. analyze the importance of Advanced manufacturing methods.
CO5. decide the best suitable manufacturing method for the given work/ job.
CO6. develop a detailed understanding of manufacturing processes used in industry.

Course Contents:

UNIT I

Manufacturing Methods:

Manufacturing Processes: Primary Shaping processes, machining processes, Joining Processes, Surface finishing Processes, Processes effecting change in properties

Forming: Punching, blanking, piercing, forging, hot rolling and cold rolling, extrusion.

Machining: Principle of machining, Lathe, Parts of a lathe machine and operations of Lathe machine, Shaper machine, drilling machine, Milling machine. Comparison between conventional and non-Conventional machining.

UNIT II

Casting

Casting: Introduction, Basic steps in moulding and casting, Pattern and its types, Pattern

allowances, runner, riser, gates, function of core, moulding and its constituents. Cupola, furnace, casting defects, testing of castings.

UNIT III

Welding (arc welding & gas welding), Brazing

Welding, Arc welding and its principle, Metal arc welding, MIG welding, TIG welding, function of flux, Gas welding, types of flames, Brazing.

UNIT IV

CNC machining, Additive manufacturing: Introduction to CNC machining and Additive manufacturing.

Fitting operations & power tools: Clamping tools, Gauges, Fitting operations, Introduction to power tools.

Carpentry: Types of wood, seasoning of wood and defects in wood.

Plastic Moulding, Glass cutting: Plastic Injection moulding, Blow moulding, Glass cutting

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. II 2010, Media promoters and publishers private limited, Mumbai.
2. Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.
3. Gowri P. Hariharan and A. Suresh Babu,"Manufacturing Technology – I" Pearson Education, 2008.
4. Roy A. Lindberg, "Processes and Materials of Manufacture", 4th edition, Prentice Hall India, 1998.
5. Rao P.N., "Manufacturing Technology", Vol. I and Vol. II, Tata McGrawHill House, 2017.

CO-PO Mapping:

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

Course code	**HSMC 101-T**			
Category	**Humanities and Social Sciences including Management Courses**			
Course title	**English**			
Scheme and Credits	**L**	**Tut**	**Credits**	
	2	**0**	**2.0**	
Course Assessment Methods	**Internal Examination (30 marks):** • 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. • Class Performance will be measured through percentage of lectures attended (04 marks) • Assignments, quiz etc. will have weightage of 06 marks **End semester examination (70 marks)**: • 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. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.			

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. compose speech clearly on a specific topic using appropriate language in informal discussions
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
Root words from foreign languages and their use in English
Acquaintance with prefixes and suffixes from foreign languages in English to form derivatives.
Synonyms, antonyms, and standard abbreviations.

UNIT II

Basic Writing Skills

Sentence Structures
Use of phrases and clauses in sentences
Importance of proper punctuation
Creating coherence
Organizing principles of paragraphs in documents
Techniques for writing precisely

UNIT III

Identifying Common Errors in Writing

Subject-verb agreement
Noun-pronoun agreement
Misplaced modifiers

Articles and Prepositions
Redundancies and Clichés

UNIT IV

Nature, style of sensible Writing and Practices

Describing
Defining
Classifying
Providing examples or evidence
Writing introduction and conclusion
Comprehension, Précis Writing
Essay 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 Heasly. 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

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												

Course code	**MC102-T**

Category	Mandatory Courses			
Course title	Environmental Sciences			
Scheme and Credits	L	Tut	Credits	
	3	0	0.0	
Course Assessment Methods	**Internal Examination (30 marks):** • 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. • Class Performance will be measured through percentage of lectures attended (04 marks) • Assignments, quiz etc. will have weightage of 06 marks **End semester examination (70 marks)**: • 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. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.			

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 subs table 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												

Course code	**MC103-T**			
Category	**Mandatory Courses**			
Course title	**Indian Constitution**			
Scheme and Credits	**L**	**Tut**	**Credits**	
	3	**0**	**0.0**	
Course Assessment Methods	**Internal Examination (30 marks):** • 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. • Class Performance will be measured through percentage of lectures attended (04 marks) • Assignments, quiz etc. will have weightage of 06 marks **End semester examination (70 marks)**: • 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. • A candidate is required to attempt 05 questions in all, one compulsory and remaining four questions selecting one from each of the four units.			

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

Course code	**BSC101(I)-P**
Category	**Basic Science Courses**
Practical Course	**Physics: Introduction to Electromagnetic Theory**
Contact Hours	**03**
Credits	**1.5**
Course Assessment Methods	**Internal: 50 Marks; External: 50 Marks** 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. 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. 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. 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.

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.

Sr. No.	**Course Outcomes:** **By the end of the lab course a student would be able to:**	**RBT Level**
CO-1	**Implement** various physical/electrical measuring techniques and the related operations.	(LOTS: Levels 3: Apply)
CO-2	**Analyze** measurement methods and its results	(HOTS: Level 4: Analyze)

CO-3	**Compare** various error approaches to reduce error and increase accuracy.	(HOTS: Level 5: Evaluate)
CO-4	**Integrate** knowledge of electricity and magnetism to solve real world problems related electromagnetism.	(HOTS: Level 6: Create)
CO-5	**Create** written records for the given assignments with problem objective definition, experimental solution and conclusions.	(HOTS: Level 6: Create)
CO-6	**Demonstrate** 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	**BSC101(II)-P**
Category	**Basic Science Courses**
Practical Course	**Physics: Introduction to Mechanics**
Contact Hours	**03**
Credits	**1.5**
Course Assessment Methods	**Internal: 50 Marks; External: 50 Marks** 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. 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. 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. 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.

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	**Implement** various physical/mechanical measuring techniques and the related operations like electromechanical or mechanical wav.	(LOTS: Levels 3: Apply)
CO-2	**Analyze** measurement methods and its results	(HOTS: Level 4: Analyze)

CO-3	**Compare** various error approach to reduce error and increase accuracy.	(HOTS: Level 5: Evaluate)
CO-4	**Integrate** knowledge to solve real world problems related mechanics and related situations	(HOTS: Level 6: Create)
CO-5	**Create** written records for the given assignments with problem objective definition, experimental solution and conclusions.	(HOTS: Level 6: Create)
CO-6	**Demonstrate** 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												

Course code	**BSC101(III)-P**
Category	**Basic Science Courses**
Practical Course	**Physics: Optics, Fiber Optics, Magnetism and Nuclear Physics**
Contact Hours	**03**
Credits	**1.5**
Course Assessment Methods	**Internal: 50 Marks; External: 50 Marks** 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. 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. 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. 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.

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.

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

CO-3	**Compare** various error approach to reduce error and increase accuracy.	(HOTS: Level 5: Evaluate)
CO-4	**Integrate** knowledge to solve real world problems and understanding related to engineering physics	(HOTS: Level 6: Create)
CO-5	**Create** written records for the given assignments with problem objective definition, experimental solution and conclusions.	(HOTS: Level 6: Create)
CO-6	**Demonstrate** 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. 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	**BSC101(IV)-P**
Category	**Basic Science Courses**
Practical Course	**Physics: Oscillations, waves and optics**
Contact Hours	**03**
Credits	**1.5**
Course Assessment Methods	Internal: 50 Marks; External: 50 Marks 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. 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. 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. 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.

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	**Implement** various physical/mechanical measuring techniques and the related operations like waves and optics.	(LOTS: Levels 3: Apply)
CO-2	**Analyze** measurement methods and its results	(HOTS: Level 4: Analyze)
CO-3	**Compare** various error approach to reduce error and increase accuracy.	(HOTS: Level 5: Evaluate)

CO-4	**Integrate** knowledge of electricity and magnetism to solve real world problems related waves and optics.	(HOTS: Level 6: Create)
CO-5	**Create** written records for the given assignments with problem objective definition, experimental solution and conclusions.	(HOTS: Level 6: Create)
CO-6	**Demonstrate** 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. To verify the laws of transverse vibrations of stretched strings using a sonometer.
2. Finding frequency of A.C. mains byusing 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 oftelescope.
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'smethod.
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												

Course code	**BSC101(V)-P**
Category	**Basic Science Courses**
Practical Course	**Physics: Semiconductor Physics**
Contact Hours	**03**
Credits	**1.5**
Course Assessment Methods	**Internal: 50 Marks; External: 50 Marks** 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. 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. 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. 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.

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 leaning basics of semiconductor physics.

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

CO-4	**Integrate** knowledge of electricity and electronics to solve real world problems related semiconductors.	(HOTS: Level 6: Create)
CO-5	**Create** written records for the given assignments with problem objective definition, experimental solution and conclusions.	(HOTS: Level 6: Create)
CO-6	**Demonstrate** 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. 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’sMethod.
5. To compare the capacitances of two capacitors by De'sauty bridge and hence to find the dielectric constant of amedium.
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 FerroelectricCeramic.
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												

Course code	**BSC101(VI)-P**
Category	**Basic Science Courses**
Practical Course	**Physics: Waves Optics, Quantum Mechanics and Solids**
Contact Hours	**03**
Credits	**1.5**
Course Assessment Methods	**Internal: 50 Marks; External: 50 Marks** 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. 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. 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. 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.

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.

Sr. No.	**Course Outcomes:** **By the end of the lab course a student would be able to:**	**RBT Level**
CO-1	**Implement** various physical measuring techniques and the related operations for Waves Optics, Quantum Mechanics and Solids.	(LOTS: Levels 3: Apply)
CO-2	**Analyze** measurement methods and its results	(HOTS: Level 4: Analyze)
CO-3	**Compare** various error approach to reduce error and increase accuracy.	(HOTS: Level 5: Evaluate)

CO-4	**Integrate** knowledge to solve real world problems related to Waves Optics, Quantum Mechanics and Solids	(HOTS: Level 6: Create)
CO-5	**Create** written records for the given assignments with problem objective definition, experimental solution and conclusions.	(HOTS: Level 6: Create)
CO-6	**Demonstrate** 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. 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												

Course code	**BSC101(VII)-P**
Category	**Basic Science Courses**
Practical Course	**Physics: Introduction to Quantum Physics**
Contact Hours	**03**
Credits	**1.5**
Course Assessment Methods	**Internal: 50 Marks; External: 50 Marks** 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. 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. 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. 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.

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.

Sr. No.	Course Outcomes: By the end of the lab course a student would be able to:	RBT Level
CO-1	**Implement** various modern physics experiments and the related operations relevant to quantum physics.	(LOTS: Levels 3: Apply)
CO-2	**Analyze** measurement methods and its results	(HOTS: Level 4: Analyze)

CO-3	**Compare** various error approach to reduce error and increase accuracy.	(HOTS: Level 5: Evaluate)
CO-4	**Integrate** knowledge to solve real world problems and understanding related to quantum physics	(HOTS: Level 6: Create)
CO-5	**Create** written records for the given assignments with problem objective definition, experimental solution and conclusions.	(HOTS: Level 6: Create)
CO-6	**Demonstrate** 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. 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. To study the Photoelectriceffect.
4. Study of Zener Diodecharacteristics.
5. Dispersive Power of Material ofPrism.
6. Atomic Spectra of Two Electron Systems.
7. To study the characteristics of a solarcell
8. To find the value of e/m for electrons by Helical method.
9. To find the ionisation potential of Argon/Mercury using a thyratron tube.
10. To find the value of Hall Co-efficient ofsemi-conductor.
11. To study the V-I characteristics of a p-n diode.
12. To study two probemethod.
13. Electron spin Resonance.
14. To find the band gap of intrinsic semi-conductor using four probe method.
15. To find the ionisation potential of Argon/Mercury using a thyratron tube.
16. Measurement of Lande ‘g’ factor byElectron 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	**BSC102-P**
Category	**Basic Science Courses**
Practical Course	**Chemistry**
Contact Hours	**03**
Credits	**1.5**
Course Assessment Methods	**Internal: 50 Marks; External: 50 Marks** 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. 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. 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. 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.

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.

Sr. 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)

CO-3	Estimate rate constants of reactions from concentration of reactants/products as a function of time.	(HOTS: Level 5: Evaluate)
CO-4	To acquire the practical skill to use TLC for the identification of drugs.	(HOTS: Level 4: Analyse)
CO-5	Learn to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments.	(HOTS: Level 6: Create)
CO-6	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. 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												

Course code	**ESC101-P**
Category	**Engineering Science Courses**
Practical Course	**BASIC ELECTRICAL ENGINEERING**
Contact Hours	**02**
Credits	**1.0**
Course Assessment Methods	**Internal: 50 Marks; External: 50 Marks** 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. 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. 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. 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.

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

*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 observe steady state and transient time response of R-L, R-C and R-L-C circuits to a step change in voltage.
8. To measure the power and power factor using three voltmeter / three ammeter method in a single phase AC circuit.
9. To measure the power and power factor for a balanced 3 phase load by two wattmeter method.
10. To perform the direct load test of a Transformer and plot efficiency Vs load characteristics.
11. To study various types of meters such as: ammeter, voltmeter, Wattmeter, Multimeter, Energy Meter.
12. To demonstrate the cut-set of dc machine (Commutator-brush arrangement)
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												

Course code	**ESC103-P**
Category	**Engineering Science Courses**
Practical Course	**Programming for Problem Solving**
Contact Hours	**04**
Credits	**2.0**
Course Assessment Methods	**Internal: 50 Marks; External: 50 Marks** 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. 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. 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. 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.

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.

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

CO-3	**Compare** solutions on the basis of the appropriateness of data structure used like arrays, strings and structures and manipulate through implementation.	(HOTS: Level 5: Evaluate)
CO-4	**Integrate** knowledge of programming with identification and correcting logical errors encountered at run time.	(HOTS: Level 6: Create)
CO-5	**Create** written records for the given assignments with problem definition, design of solution and conclusions.	(HOTS: Level 6: Create)
CO-6	**Demonstrate** 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 onsimple 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												

Course code	**ESC104-P**
Category	**Engineering Science Courses**
Practical Course	**Workshop/Manufacturing Practices**
Contact Hours	**04**
Credits	**2.0**
Course Assessment Methods	**Internal: 50 Marks; External: 50 Marks** 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. 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. 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. 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.

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 study the use of different types of manufacturing tools, cutting tools, materials and manufacturing operations.	L1
CO2	Students will be able to fabricate components using different manufacturing operations and tools.	L2
CO3	Students will be able to apply the theoretical knowledge into practical for completing the given work using various manufacturing processes.	L3

CO4	Students will be able to examine the defects induced in workpiece/ job during different manufacturing processes such as casting, welding, forging etc.	H1
CO5	Students will be able to judge the dimensional accuracy and surface finish of job prepared in machine shop, fitting shop, carpentry shop etc.	H2
CO6	Students will be able to improve their manufacturing skills by preparing a variety of jobs in different manufacturing shops.	H3

LIST OF EXPERIMENTS

1. To study different types of machine tools (lathe, shaper or planer or slotter, milling, drilling machine).
2. To prepare a job on a lathe machine involving facing, outside turning, taper turning, step turning, radius making and parting-off.
3. To prepare a job involving side and face milling on a milling machine.
4. To prepare horizontal surface/ vertical surface/ curved surface/ slots on V- grooves on a shaper.
5. To study different types of measuring tools used in metrology and determine least counts of vernier caliper and micrometer.
6. To study different types of fitting tools and marking tools used in fitting practices.
7. To prepare a layout on a metal sheet by making and prepare rectangular tray, pipe shaped components e.g. funnel.
8. To prepare joints for welding suitable for butt welding and lap welding.
9. To perform pipe welding.
10. To study various types of carpentry tools and prepare simple types of at least two wooden joints.
11. To prepare simple engineering components/ shapes by forging.
12. To prepare mould and core assembly, to put metal in the mould and fettle the casting.

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	1	1	2
CO2.	2	-	-	-	-	1	-	1	3	2	2	2
CO3.	2	-	-	-	-	1	1	1	3	2	2	2
CO4.	2	1	-	-	-	1	-	1	3	2	2	2
CO5.	2	1	-	-	-	1	-	1	3	2	2	2
CO6.	2	-	-	-	-	1	-	1	3	-	-	2
3 –High 2-Medium 1-Low												

Course code	**ESC102-P**
Category	**Engineering Science Courses**
Practical Course	**Engineering Graphics & Design**
Contact Hours	**05 (L: 1 T: 0 P: 4)**
Credits	**3.0**
Course Assessment Methods	**Internal: 50 Marks; External: 50 Marks** 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. 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. 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. 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.

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 he 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 modeling 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. BhattN.D.,PanchalV.M.&IngleP.R.,(2014),EngineeringDrawing,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												

Course code	**HSMC101-P**
Category	**Humanities and Social Sciences including Management courses**
Practical Course	**English**
Contact Hours	**02**
Credits	**1.0**
Course Assessment Methods	**Internal: 50 Marks; External: 50 Marks** 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. 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. 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. 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.

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.

Sr. No.	Course Outcomes: By the end of the lab course a student would be able to:	RBT Level
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												

Course code	**ESC105-P**
Category	**Engineering Science Courses**
Practical Course	**IDEA Lab**
Contact Hours	**02**
Credits	**0.0 (Audit Course)**
Course Assessment Methods	**Course Assessment Methods (Internal: 100)** The 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. 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 awardedon the basis of average of the two minor laboratory course evaluations and continuous lab performance. 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. The Course Coordinator / Internal Examiners will maintain and submit the bifurcation of marks obtained by the students in their respective internal evaluations in the specified proformas (attached herewith as Annexures I) to the respective departments in addition to the 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.

Sr. No.	**Course outcomes of IDEA Lab At end of the semester: Student will be able to**	**RBT Level**
CO-1	Experiment withgeneral purpose tools,mechanical tools, electrical tools, electronic instruments, and prototyping processes in IDEA Lab.	LOTS: Level 3 Apply
CO-2	Utilize the knowledge of tools, instruments and equipment to construct models using 3D printing, laser cutting, vinyl cutting, wood routing, and PCB prototype machine, etc.	LOTS: Level 3 Apply
CO-3	Assess the design requirements and select appropriate tools, instruments, and equipment for effective development of models in IDEA Lab.	HOTS: Level 4 Analyse
CO-4	Evaluate the quality, functionality, and performance of various models developed using equipment/tools in IDEA Lab.	HOTS: Level 5 Evaluate
CO-5	Create written records for the given experiment with problem definition, design of solution and conclusion.	HOTS: Level 6 Create
CO-6	Design a complete solution from idea to a prototype in presentable form in IDEA Lab.	HOTS: Level 6 Create

LIST OF EXPERIMENTS:

1. To familiarize with the functioning, operation and application of General Mechanical Tools in Idea Lab.
2. To perform 3D Scanning and Post-processing on the component / objectfor prototype development.
3. To design and fabricate the scanned component / objectusing 3D Printer.
4. To create and cut digital designs using Vinyl Cutter.
5. To design and carve / fabricate a given job usingCNC Wood Router Machine.
6. To design and cut / engravea given job using CO2 Laser Cutter Machine.
7. To program the Robotic Arm for performing various operations such as 3D printing, cutting, engraving, long distance writing, drawing, etc.
8. To develop a program for implementing pick and place functionality using Robotic Arm.
9. To familiarize with the functioning and applications of Electronic / Electrical instruments and tools in Idea Lab.
10. To familiarize with the architecture and working of Arduino / ESP / Raspberry Pi boards.
11. To develop programs for various IoT based applications using Arduino / ESP platform.
12. To develop programs for various IoT based applications using Raspberry Pi platform.
13. To design a circuit on Arduino/ESP/RaspberryPi platform through sensors and actuators.
14. To design a PCB using PCB prototype machine. Also mount and solder the components.
15. To design a PCB using conventional method. Also mount and solder the components.

Note:

The above list is only indicative and actual experiments will be designed by the Course Co-ordinator. Atleast ten experiments are to be performed in the semester, out of which six experiments should be performed from Sr. No. 1 to 8 and four experiments should be performed from Sr. No. 9 to 15 in the given list. At the end of the course, it is desirable for every student to design a project/prototype in presentable form using design thinking process (empathize, define, ideate, test and implement) through maximum utilization of all IDEA Lab machines/tools.

CO-PO Mapping:

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

Course code	**MC101**
Category	**Mandatory courses**
Practical Course	**Induction Training**
Duration	**3 weeks**
Credits	**0.0**
About The program	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. This induction training is to be scheduled for conducting following activities as per modules mentioned in AICTE Induction Program. ▪ M1: Lectures on Universal Human Values I (UHV-I) ▪ M2: Physical health and related Activities ▪ M3: Familiarization of Department/labs, Familiarization of different branches like examination, NSS, Library, Training and placement etc. ▪ M4: Visits to Local Area ▪ M5: Lectures & Workshops by Eminent People ▪ M6: Proficiency modules on English language and computer, Bridge course in Physics, Chemistry and Mathematics ▪ M7: Literary activities ▪ M8: Creative Arts and Culture activities ▪ M9: Extra-Curricular Activities A detailed guide of Student Induction Program given by AICTE is at following link: *https://www.aicte-india.org/sites/default/files/Detailed%20Guide%20on%20Student%20Induction%20program.pdf*

Annexure-I

Guru Jambheshwar University of Science and Technology
Hisar-125001

(Established by State Legislative Act 17 of 1995)

'A' GRADE NAAC Accredited

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	CO-4	CO-5	CO-6	
1.								
2.								
3.								
4.								
5.								
6.								
7.								
8.								
9.								
10.								
11.								
12.								
13.								
14.								
15.								
16.								
17.								
18.								
19.								
20.								
21.								
22.								
23.								
24.								
25.								
26.								
27.								
28.								
29.								
30.								
Total No. of Students:			Present:			Absent		

Name of the Course Coordinator	Signature of the Course Coordinator

Note: The CO-wise weightage be decided by the individual Lab Course by the Course Coordinator in consultation with the Chairperson.

Annexure-II

Guru Jambheshwar University of Science and Technology
Hisar-125001

(Established by State Legislative Act 17 of 1995)
'A' GRADE NAAC Accredited

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)
1.					
2.					
3.					
4.					
5.					
6.					
7.					
8.					
9.					
10.					
11.					
12.					
13.					
14.					
15.					
16.					
17.					
18.					
19.					
20.					
21.					
22.					
23.					
24.					
25.					
26.					
27.					
28.					
29.					
30.					
Total No. of Students:			Present:	Absent	

Name of the Examiners	Signature of the Examiners