

 Estd. 1962 "A++" Accredited by NAAC (2021) With CGPA 3.52	SHIVAJI UNIVERSITY, KOLHAPUR 416 004, MAHARASHTRA PHONE : EPABX - 2609000, BOS Section - 0231-2609094, 2609487 Web : www.unishivaji.ac.in Email: bos@unishivaji.ac.in शिवाजी विद्यापीठ, कोल्हापूर ४१६ ००४, महाराष्ट्र दूरध्वनी - इपीबीएक्स - २०६०९०००, अभ्यासमंडळे विभाग : ०२३१- २६०९०९४. २६०९४८७ वेबसाईट : www.unishivaji.ac.in ईमेल : bos@unishivaji.ac.in	 
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SU/BOS/Sci & Tech/ 488

Date: 26/08/2024

To,

The Principal / Director,
 All Concerned Affiliated Colleges / Institutions,
 Shivaji University, Kolhapur.

Subject: Regarding New syllabus of **B. Tech. Programme (Affiliated College)**
 Part - I (Sem-I-II) under the Faculty of Science and Technology as per
 National Education Policy 2020.

Sir/Madam,

With reference to the subject mentioned above, I am directed to inform you that the university authorities have accepted and granted approval to the revised syllabi, Nature of Question paper and equivalence of B. Tech. Part - I (Sem - I & II) under the Faculty of Science & Technology as per National Education Policy 2020.

No.	Affiliated College Course Syllabus
1	Civil Engineering
2	Mechanical Engineering
3	Electrical Engineering and Technology
4	Electronics and Telecommunication Engineering
	Electronics & Computer Science Engineering
5	Computer Science and Engineering
	Computer Science and Engineering (Artificial Intelligence & Machine Learning)
	Computer Science and Engineering (Data Science)

This Syllabus, shall be implemented from the academic year **2024-25** onwards. A soft copy containing the syllabus is attached herewith and it is available on university website www.unishivaji.ac.in. **(Student Online Syllabus).**

The question papers on the pre-revised syllabi of above-mentioned course will be set for the examinations to be held in October/ November 2024 & March / April 2025. These chances are available for repeater students, if any

You are, therefore, requested to bring this to the notice of all students and teachers concerned.

Thanking you,

Yours faithfully,

Dr. S. M. Kubal
 Dy. Registrar

Copy to: for Information and necessary action

1	The I/c Dean, Faculty of Science & Technology	7	Appointment Section A & B
2	The Chairpersan, Respective Board of Studies	8	Affiliation Section (T.1) (T.2)
3	OE 4 Section	9	P.G.Admission Section, /P.G Seminar Section
4	Eligibility Section,	10	Computer Centre (IT Cell)
6	Internal Quality Assurance Cell	11	Eligibility Section

Shivaji University, Kolhapur

Faculty of Science and Technology

B. Tech. Curriculum Structure as per NEP 2020 From Academic Year: 2024-25

Programme Educational Objectives (PEO):

PEO1	
PEO2	
PEO3	
PEO4	

Programme Outcomes (PO):

Engineering Graduates will be able to:

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

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

Programme Specific Outcomes (PSO):

PSO	

SCHEME OF INSTRUCTION & SYLLABI

Branch: - Common to all Branches of Engineering

Scheme of Instructions: First Year B. Tech. Common to all Branches of Engineering

Engineering Physics Group

Semester–I (w.e.f. A.Y. 2024-25)

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	BSC		Engineering Physics	3	--	--	3	3	30	10	60	100
2	BSC		Engineering Mathematics –I	3	1	--	4	4	30	10	60	100
3	ESC		Basic Civil Engineering	2	--	--	2	2	30	10	60	100
4	ESC		Engineering Graphics	3	--	--	3	3	30	10	60	100
5	ESC		Basic Electrical Engineering	2	--	--	2	2	30	10	60	100
6	BSC		Engineering Physics Lab	--	--	2	2	1	--	25	--	25
7	ESC		Engineering Graphics Lab	--	--	2	2	1	--	25	25	50
8	HSSM		Professional Communication–I	--	--	2	2	1	--	25	50	75
9	VSEC		Skill Enhancement Course-I	--	--	2	2	1	--	25	25	50
10	CCA		Yoga and NSS	--	--	4	4	2	--	50	--	50
11	VSEC		Programming Languages-I	1	--	2	3	2	--	25	25	50
			Total	14	1	14	29	22	150	225	425	800

L-Lecture

T-Tutorial

P-Practical

MSE-Mid Semester Examination ISE/CA-In Semester Evaluation/Continuous Assessment ESE-End Semester Examination (For Laboratory End Semester performance external Examination)

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective other than Particular Programme (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular and Extracurricular Activities (CCA)
Semester Credits	08	08	--	--	--	03	01	--	02
Cumulative Sum	08	08	--	--	--	03	01	--	02

SCHEME OF INSTRUCTION & SYLLABI

Branch: - Common to all Branches of Engineering

Scheme of Instructions: First Year B. Tech. Common to all Branches of Engineering

Engineering Chemistry Group

Semester–I (w.e.f. A.Y. 2024-25)

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	BSC		Engineering Chemistry	3	--	--	3	3	30	10	60	100
2	BSC		Engineering Mathematics –I	3	1	--	4	4	30	10	60	100
3	ESC		Basic Mechanical Engineering	2	--	--	2	2	30	10	60	100
4	ESC		Engineering Mechanics	3	--	--	3	3	30	10	60	100
5	ESC		Basic Electronics Engineering	2	--	--	2	2	30	10	60	100
6	BSC		Engineering Chemistry Lab	--	--	2	2	1	--	25	-	25
7	ESC		Engineering Mechanics Lab	--	--	2	2	1	--	25	25	50
8	HSSM		Professional Communication–I	--	--	2	2	1	--	25	50	75
9	VSEC		Skill Enhancement Course-I	--	--	2	2	1	--	25	25	50
10	CCA		Yoga and NSS	--	--	4	4	2	--	50	-	50
11	VSEC		Programming Languages-I	1	--	2	3	2	--	25	25	50
			Total	14	1	14	29	22	150	225	425	800

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MSE-Mid Semester Examination ISE/CA-In Semester Evaluation/Continuous Assessment ESE-End Semester Examination (For Laboratory End Semester performance external Examination)

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective other than Particular Programme (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular and Extracurricular Activities (CCA)
Semester Credits	08	08	--	--	--	03	01	--	02
Cumulative Sum	08	08	--	--	--	03	01	--	02

SCHEME OF INSTRUCTION & SYLLABI

Branch: - Common to all Branches of Engineering

Scheme of Instructions: First Year B. Tech. Common to all Branches of Engineering

Engineering Physics Group

Semester–II (w.e.f. A.Y. 2024-25)

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	BSC		Engineering Physics	3	--	--	3	3	30	10	60	100
2	BSC		Engineering Mathematics –II	3	1	--	4	4	30	10	60	100
3	ESC		Basic Civil Engineering	2	--	--	2	2	30	10	60	100
4	ESC		Engineering Graphics	3	--	--	3	3	30	10	60	100
5	ESC		Basic Electrical Engineering	2	--	--	2	2	30	10	60	100
6	BSC		Engineering Physics Lab	--	--	2	2	1	--	25	--	25
7	ESC		Engineering Graphics Lab	--	--	2	2	1	--	25	25	50
8	HSSM		Professional Communication–II	--	--	2	2	1	--	25	50	75
9	VSEC		Skill Enhancement Course-II	--	--	2	2	1	--	25	25	50
10	HSSM		Indian Knowledge Systems (IKS)	2	--	--	2	2	--	50	--	50
11	VSEC		Programming Languages-II	1	--	2	3	2	--	25	25	50
			Total	16	1	10	27	22	150	225	425	800

L-Lecture

T-Tutorial

P-Practical

MSE-Mid Semester Examination ISE/CA-In Semester Evaluation/Continuous Assessment ESE-End Semester Examination (For Laboratory End Semester performance external Examination)

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective other than Particular Programme (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular and Extracurricular Activities (CCA)
Last Sem. Cumulative Sum	08	08	--	--	--	03	01	--	02
Semester Credits	08	08	--	--	--	03	03	--	--
Cumulative Sum	16	16	--	--	--	06	04	--	02

SCHEME OF INSTRUCTION & SYLLABI

Branch: - Common to all Branches of Engineering

Scheme of Instructions: First Year B. Tech. Common to all Branches of Engineering

Engineering Chemistry Group

Semester–II (w.e.f. A.Y. 2024-25)

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	BSC		Engineering Chemistry	3	--	--	3	3	30	10	60	100
2	BSC		Engineering Mathematics –II	3	1	--	4	4	30	10	60	100
3	ESC		Basic Mechanical Engineering	2	--	--	2	2	30	10	60	100
4	ESC		Engineering Mechanics	3	--	--	3	3	30	10	60	100
5	ESC		Basic Electronics Engineering	2	--	--	2	2	30	10	60	100
6	BSC		Engineering Chemistry Lab	--	--	2	2	1	--	25	--	25
7	ESC		Engineering Mechanics Lab	--	--	2	2	1	--	25	25	50
8	HSSM		Professional Communication–II	--	--	2	2	1	--	25	50	75
9	VSEC		Skill Enhancement Course-II	--	--	2	2	1	--	25	25	50
10	HSSM		Indian Knowledge Systems (IKS)	2	--	--	2	2	--	50	--	50
11	VSEC		Programming Languages-II	1	--	2	3	2	--	25	25	50
			Total	16	1	10	27	22	150	225	425	800

L-Lecture

T-Tutorial

P-Practical

MSE-Mid Semester Examination ISE/CA-In Semester Evaluation/Continuous Assessment ESE-End Semester Examination (For Laboratory End Semester performance external Examination)

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective other than Particular Programme (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular and Extracurricular Activities (CCA)
Last Sem. Cumulative Sum	08	08	--	--	--	03	01	--	02
Semester Credits	08	08	--	--	--	03	03	--	--
Cumulative Sum	16	16	--	--	--	06	04	--	02

Engineering Physics

Lectures : 3 Hrs/Week

Credit : 3

Evaluation Scheme

MSE : 30 Marks

ISE/CA : 10 Marks

ESE : 60 Marks

Course Objectives: The objective of the course is to

- 1) To provide the useful fundamental concepts of Physics to Engineering discipline.
- 2) To introduce the student with new techniques of modern physics relevant to engineering.
- 3) To empower the student to comprehend technological advances.

Course Outcomes:

COs	At the end of successful completion of the course, the student will be able to	Blooms Taxonomy
CO1	Explain the concepts of diffraction and polarization for engineering applications.	Understand
CO2	Explain basics of lasers and optical fibers and their use in some applications.	Understand
CO3	Illustrate the basic requirement of acoustical good hall and solve problems on sabines formula	Understand
CO4	Apply the knowledge of Quantum Mechanics to solve related problem	Apply
CO5	Apply peculiar properties of crystallography to solve engineering problems.	Apply
CO6	Comprehend use of concepts of physics and some properties of nanomaterials and their application.	Apply

Description:

Engineering Physics course is offered as the basic science course. This course contains different phenomena of light, concepts of Laser and fiber optics, basics of sound, wave –particle dualism and uncertainty principle, crystal structures and their properties, approaches and techniques of nanomaterials. These are useful fundamental concepts of Physics to Engineering disciplines and to make the student aware of new techniques in Physics applicable to engineering practices.

Unit No	Content	Hours
Unit 1	Wave Optics	07 Hrs
	Introduction, Interference of light and types, Diffraction of light and types, construction of diffraction grating, Resolving power of plane transmission grating, Polarization of light, double refraction, Huygens' theory of double refraction, specific rotation, Laurent's half shade polarimeter, Numerical.	
Unit 2	LASER and Fiber Optics	07 Hrs
	LASER: Introduction, absorption, spontaneous emission and stimulated emission of radiations, Population inversion, Pumping energy, characteristics and engineering applications of laser, Ruby laser, He –Ne Laser. Fiber Optics: Introduction principle, construction, propagation of light through an optical fiber, block diagram of fibre optic communication system, acceptance angle, critical angle, Numerical aperture (No derivation), fractional Refractive Index change, Types of optical fibers, advantages and applications of optical fiber.	
Unit 3	Sound	07 Hrs
	Absorption coefficient, Reverberation, Reverberation time, Sabine's formula for reverberation time (no derivation), Conditions for good acoustics, Factors affecting architectural acoustics and their remedy.	
Unit 4	Wave Mechanics	07 Hrs
	Introduction, Wave-particle dualism , De-Broglie's Hypothesis -light and matter, De-Broglie's wavelength in terms of Kinetic Energy, Potential Difference and Temperature, Properties of matter waves, Heisenberg's uncertainty principle for position and momentum, Compton Effect, Compton shift (No Derivation) and its experimental verification, Numerical.	
Unit 5	Crystallography	07 Hrs
	Introduction, Basics of crystal structure -Space Lattice, Basis, crystalline solid and Unit cell (geometry and types), Seven crystal system, Analysis of unit cell for SC, BCC and FCC, Relation between density and lattice constant, Miller indices (procedure and sketches for planes), Symmetry elements in cube, Bragg's x-ray spectrometer, Numerical.	
Unit 6	Nanotechnology	07 Hrs
	Introduction, Nanomaterials, Nanoscience and Nanotechnology, Top down and bottom up approaches, Production techniques - Ball milling and Colloidal, Types of nanomaterial, Surface to Volume ratio and Quantum confinement effect, Characterizations - Scanning Tunneling Microscope and Atomic Force Microscope, properties of material at nanoscale, applications of nanomaterials.	

References:

Reference Books	
1	M. N. Avadhanulu and P. G. Kshirsagar, "A Text book of Engineering Physics", S. Chand and Company, New Delhi.
2	R. K. Gaur and S. L. Gupta "Engineering Physics", Dhanpat Rai Publications, New Delhi.
3	R. K. Gaur & Gupta S. L, Engineering Physics –Dhanapat Rai Publication
4	B. L. Theraja -Modern Physics - S. Chand & Company Ltd., Delhi
5	Subramanyam & Brij Lal, A Text Book of Optics –S. Chand & Company (P.) Ltd.
6	M. N. Avadhanulu & P. G. Kshirsagar - A Text Book of Engineering Physics -S. Chand Publication.
7	B. K. Pandey and S. Chaturvedi- Engineering Physics, Cengage Learning

Engineering Physics Lab**Practical** : 2 Hrs/Week**Evaluation Scheme****Credit** : 1**ISE/CA** : 25 Marks

Sr. No	TITLE OF EXPERIMENT
01	Diffraction at Cylindrical obstacle.
02	Calculation of divergence of LASER beam.
03	Determination of wavelength of LASER using diffraction grating.
04	Wavelength of different spectral lines of mercury using grating.
05	Polarimeter.
06	Optical fiber characteristic setup
07	Study of crystal structure.
08	Study of symmetry elements of cubic crystal.
09	Determination of 'd' (interplaner distance) using XRD pattern.
10	Study of Planes with the help of models related Miller Indices.
11	Measurement of band gap energy.
12	R. P. of grating

Note: - Out of the above, minimum of 8 experiments are to be performed.

Engineering Mathematics - I

Lectures : 3 Hrs/Week

Tutorial : 1

Credit : 4

Evaluation Scheme

MSE : 30 Marks

ISE/CA : 10 Marks

ESE : 60 Marks

Course Pre-Requisite	Basics of matrices, complex algebra, derivative and its properties.	
Course Objective	1	To develop mathematical skills and enhance thinking power of students.
	2	To give knowledge to the students of matrices, complex numbers, differential calculus, numerical methods with an emphasis on the application of solving engineering problem.
	3	To prepare students to formulate a mathematical model using engineering skills & interpret the solution in real world.
Course Outcomes	After completion of this course Students will be able to	
	CO1	Calculate roots of complex numbers, separation into real and imaginary parts of complex numbers by using De Moivre's Theorem.
	CO2	Apply Taylor's and Maclaurin's series to find expansion of functions.
	CO3	Find partial derivatives and use it to find Maxima and minima, Jacobian.
	CO4	Solve the system of linear equations by using matrix method.
	CO5	Calculate Eigen values and eigen vectors of matrix and higher powers of matrix using Cayley Hamilton theorem.
	CO6	Solve linear simultaneous equations by using numerical methods.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	2										
CO3	3	2										
CO4	3	2										
CO5	3	2										
CO6	3	2										
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
<p><u>In Semester Evaluation/ Continuous Assessment (ISE/CA) has 10 Marks</u> Parameters for ISE/CA could be: Attendance, Assignments etc.</p> <p><u>Mid Semester Examination (MSE) has 30 Marks</u></p> <p>MSE will be based on 50% syllabus from beginning (First Three Units)</p> <p><u>End Semester Examination (ESE) has 60 Marks</u></p> <p>ESE will be 25% on syllabus covered for MSE (First Three Units) and 75% on remaining syllabus (Last Three Units)</p>

Unit No.	Content	Hours
Unit 1	Complex Numbers	07 Hrs
	De Moivre's Theorem (Without proof), Roots of complex numbers by using De Moivre's Theorem, Expansion of $\sin n\theta$ and $\cos n\theta$ in powers of $\sin\theta$ and $\cos\theta$, Circular functions of a complex variable – definitions, Hyperbolic and Inverse Hyperbolic Functions- definitions.	
Unit 2	Expansion of Functions and Indeterminate forms	07 Hrs
	Maclaurin's theorem, Standard expansions, Taylor's theorem, Indeterminate forms and L' Hospital's rule.	
Unit 3	Partial Differentiation	07 Hrs
	Partial derivatives: Introduction, Total derivatives, Differentiation of implicit function, Euler's theorem on homogeneous function of two variables, Jacobian and its Properties, Maxima and Minima of functions of two variables.	
Unit 4	Matrices and Solution of Linear System Equations	07 Hrs
	Rank of matrix: definition, normal form and echelon form, Consistency of linear system equations, System of linear homogeneous equations, System of linear non-homogeneous equations.	
Unit 5	Eigen Values and Eigen vectors	07 Hrs
	Eigen Values, Properties of Eigen Values, Eigen vectors, Properties of Eigen vectors, Cayley-Hamilton's theorem (Without proof).	
Unit 6	Numerical Solution of linear simultaneous equations	07 Hrs
	Gauss elimination method, Gauss-Jordan method, Jacobi's iteration method, Gauss-Seidel iteration method.	

Guidelines for Tutorials

1. Batchwise tutorials are to be conducted. The number of students per batch should be as per the university pattern for practical batches.
2. Minimum number of assignments should be six covering all topics.

Textbooks			
Sr. No.	Title	Author	Edition/Publication
01	A Text Book of Applied Mathematics Volume I	P. N. Wartikar J. N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune
02	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publishers, Delhi

Reference Books			
Sr. No.	Title	Author	Edition/Publication
01	Advanced Engineering Mathematics	H. K. Dass	S. Chand, New Delhi
02	Advanced Engineering Mathematics	Erwin Kreyszig	Wiley India Pvt.
03	A Text Book of Engineering Mathematics Volume I	Peter V. O'Neil and Santosh K. Sengar	Cengage Learning
04	A Text Book of Engineering Mathematics	N. P. Bali, Iyengar	Laxmi Publication (p)Ltd. New Delhi
05	Numerical Methods	Dr. B. S. Grewal	Khanna Publishers, Delhi
06	Mathematical methods of Science and Engineering	Kanti B. Datta	Cengage Learning

Basic Civil Engineering

Lectures : 2 Hrs/Week

Credit : 2

Evaluation Scheme

MSE : 30 Marks

ISE/CA : 10 Marks

ESE : 60 Marks

Desired Requisites: Physics, Mathematics

Course Outcomes (CO) with Bloom's Taxonomy Level

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Explain the role of Civil Engineers in infrastructure development.	II	Understand
CO2	Identify and explain the various building components, construction materials, and services	II	Understand
CO3	Apply the linear, angular measurement and levelling techniques.	III	Apply
CO4	Explain the components and need of water supply, drainage, and hydraulic systems	II	Understand
CO5	Describe the modes of transport, types and structure of road.	II	Understand

Unit No.	Content	Hours
Unit 1	Introduction to Civil Engineering	03 Hrs
	Scope of Civil Engineering, Disciplines of Civil Engineering, Role of Civil Engineers in infrastructure development	
Unit 2	Construction Materials and Services	05 Hrs
	Components in buildings and their functions, Load bearing and framed structures, General principles of building planning, Typical building layout, Construction materials, Properties and uses of stone, brick, tile, timber, cement, sand, lime, mortar, concrete, bitumen and steel, Building Services: Types of building services, Plumbing & sanitation, water supply & drainage system.	
Unit 3	Surveying	04 Hrs
	Introduction, Fundamental principles, Classification. Linear measurement: Instruments used, Angular measurement: Compass and Local attraction. Levelling: Instrument used, Terminology, Types of levelling, and Methods of levelling, Contour	

	Modern tools: Total Station, Introduction to GPS, GIS & RS	
Unit 4	Water Supply and Drainage	
	Water Supply: Sources of water, Need for water supply, Components of water supply scheme, Conventional water treatment plant, Package drinking water plant Drainage: Need, Sewerage system, Types of sewerage system, Sewage treatment plant, Septic tank.	04 Hrs
Unit 5	Transportation Engineering	
	Modes of Transportation, Types of Roads, Types of Pavements, Typical cross section of road, Road Patterns, Traffic control and signals Rail transport, Permanent Way: Components, functions, Metro	04 Hrs
Unit 6	Water Resource Engineering	
	Introduction to Hydraulic structures: Dam, Barrage, Weirs, Canal, Reservoir, Irrigation systems, Rain water harvesting, Water shed management	04 Hrs

References:

Reference and Text Books	
1	Surveying and leveling N. N. Basak Tata McGraw Hill Education
2	Building Construction Dr. B. C. Punmia Laxmi Pub. Delhi
3	Building planning, designing and scheduling Gurucharan Singh Standard Publisher
4	Basic Civil Engineering S. Ramamrutham Dhanpatrai Publication

Engineering Graphics

Lectures : 3 Hrs/Week

Evaluation Scheme

MSE : 30 Marks

Credit : 3

ISE/CA : 10 Marks

ESE : 60 Marks

Course Objectives: The objective of the course is to		
Project line, plane and solids by using 1st angle method of projections and also orthographic and isometric projections of various objects.		
Course Outcomes:		
COs	At the end of successful completion of the course, the student will be able to	Blooms Taxonomy
CO1	Draw the neat drawings of Engineering Curves.	Remember
CO2	Understand the Projection of Point, Straight lines, Plane.	Understand
CO3	Understand the Projection of Solids.	Understand
CO4	Construct neat Sketch of Orthographic Projection.	Apply
CO5	Construct neat Sketch of Isometric Drawings.	Apply
CO6	Develop lateral surfaces of solid cut sections and their projections	Create

Unit No.	Content	Hours
Unit 1	Introduction to Engineering Drawing & Engineering Curves	07 Hrs
	Introduction to drawing instruments and their uses, Different types of lines used in drawing practice, Lettering & Numbering, Dimensioning system as per BIS, Geometric constructions, Construction of regular polygons. Introduction to Computer Aided Drafting software, Co-ordinate system and reference planes HP, VP, and RPP& LPP of 2D/3D environment. Selection of drawing sheet size and scale. Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves. Conic sections: Construction of Ellipse –(Focus- directrix method, Rectangle method, Arcs of circle),Parabola-(Focus-directrix method, Rectangle Method), Hyperbola-(Directrix-Focus & Rectangular Method), Involute, Spiral and Cycloid only.	
Unit 2	Projections of Straight Lines & Planes	

	Principles & theory of Projections, Introduction to First angle and third angle methods of projection, symbol of first angle and third angle. Projections of points on regular reference planes. Projections of horizontal, frontal and Profile lines on regular and auxiliary reference planes. Projection of oblique lines it's True length and angle with reference planes by rotation method. Concept of grade and bearing of line. Types of planes, Projections of planes, Projections on regular and on auxiliary reference planes, Edge view and True shape of a Plane. Angles made by the plane with Principle reference planes. Projections of plane figures inclined to both the planes.	09 Hrs
Unit 3	Projections of Regular solids	
	Types of Solids, Projection of simple solids, Projections of Prisms, Pyramids, Cylinder and Cones inclined to both reference planes (Excluding frustum and sphere).	05 Hrs
Unit 4	Orthographic Projections	
	Selection of views, spacing of views, dimensioning and sections. Drawing required views (any two views) from given pictorial views (Conversion of pictorial view into orthographic view) including sectional orthographic view.	07 Hrs
Unit 5	Isometric projections	
	Principles of Isometric projection – Terminology, Isometric Scale, Isometric Views of standard shapes & standard solids, Isometric projections and Isometric views / drawings. Circles in isometric view. Isometric views of simple solids and objects.	06 Hrs
Unit 6	Development of plane and curved surfaces	
	Introduction, methods of development, parallel line development, Radial line development only. Development of plane and curved surfaces of the solids, Prisms, Pyramids, Cylinders and Cones along with cutting planes (Solids in simple position only).	07 Hrs

Note: The above syllabus is to be covered according to the first angle method of projection.

Engineering Graphics Lab

Practical : 2 Hrs/Week

Evaluation Scheme

ISE/CA : 25 Marks

Credit : 1

ESE : 25 Marks

The following six sheets are to be drawn based on the above topics. All these sheets should be drawn on half imperial (A3 size) drawing sheets only.

Sr. No	TITLE OF SHEET
01	Engineering Curves
02	Projections of Straight lines and planes
03	Projections of solids
04	Orthographic projections
05	Isometric projections
06	Development of surfaces
07	Commands and creation of Lines, coordinate points, axes, polylines, square, rectangle, polygons, splines, circles, ellipse, text, move, copy, off-set, mirror, rotate, trim, extend, break, chamfer, fillet and curves By using CAD Software

References:

Reference Books	
1	Engineering Drawing by N. D. Bhatt, Charotar Publication House, Bombay
2	Fundamentals of Engineering by W. J. Luzadder, Drawing, Prentice Hall of India.
3	Engineering Design and Visualization by Jon M. Duff, William A. Ross, CENGAGE Learning
4	Machine Drawing by N. D. Bhatt, Charotar Publication House, Bombay.
5	Graphic Science by French and Vierck, Mc-Graw Hill International.
6	Engineering Drawing and Graphics by K. Venugopal, New Age Publication
7	A textbook of Engineering Drawing by R. K. Dhawan, S. Chand and Co.
8	Machine Drawing by K. L. Narayana, New Age Publication
9	Engineering Drawing by N. B. Shaha and B. C. Rana, Pearson Education.
10	Engineering Drawing and Graphics Using Auto CAD by T. Jeyapoovan, Vikas Publication.
11	Engineering Drawing by Prof. Amar Pathak, WILEY India Publication

Basic Electrical Engineering

Lectures : 2 Hrs/Week

Credit : 2

Evaluation Scheme

MSE : 30 Marks

ISE/CA : 10 Marks

ESE : 60 Marks

Unit No.	Content	Hours
Unit 1	D.C. circuits:	
	Concept of E.M.F, Potential Difference, Current, Resistance, Ohm's Law Kirchhoff's laws, mesh and node analysis. Star Delta, Delta star conversion, Voltage and Current Sources, Source conversion	04 Hrs
Unit 2	Magnetic Circuits:	
	Concept of MMF, Reluctance, Magnetic flux, Magnetic Flux density, Magnetic Field Strength, BH Curve, Magnetic Leakage, Fringing, Comparison of Electric and Magnetic Circuit, Series magnetic circuits.	04 Hrs
Unit 3	Single phase AC Circuits:	
	Fundamentals of Alternating Quantities, Faraday's Law, Types of Induced, E.M.F ,Generation of Sinusoidal Voltage, Concept of R.M.S. & Average Value, Form Factor, Peak Factor, Pure Resistive, Inductive, Capacitive , R-L, R-C, R-L-C Series Circuits, Series Resonance, Power triangle, Significance of Power Factor.	04 Hrs
Unit 4	Three Phase A.C. Circuits	
	Generation of 3 Phase AC supply, Advantages of 3 Phase System, Balanced 3Phase Load, Relation between Line and Phase quantities for Star and Delta Connected Circuit, Power in three phase circuit	04 Hrs
Unit 5	Electrical Machines:	
	Single phase Transformer: Construction, Operating Principle, Types and Applications, EMFEquation, Ratios of Voltage and Current, Losses, Efficiency and Voltage Regulation Single Phase Motors: Principle of Single phase AC motors, BLDC motors.	04 Hrs
Unit 6	Earthing and Batteries:	
	Necessity of Earthing, Earthing Methods, Fuse requirement, Fuse, MCB, ELCB, LED Lamp principal and types, Types of batteries and their characteristics, Study of domestic energy bill.	04 Hrs

References:

Reference and Text Books	
1	B. L. Theraja – Electrical Technology vol.1. – S. Chand.
2	B. L. Theraja – Electrical Technology vol.2. – S. Chand.
3	Bharati Dwivedi and Anurasg Tripathi – Fundamentals of Electrical Engineering – Willey Precise
4	NagrathI. J. and D. P. Kothari – Basic Electrical Engineering – Tata McGraw Hill.
5	V.K Mehta- Principles of Power Systems – S. Chand.
6	Er. R. K. Rajput-Utilisation of Electrical Power-Laxmi Publications Pvt Limited
7	P. V. Prasad and S. Shivan Raju – Electrical Engineering concepts and Applications – Cengage learning.

Professional Communication -I

Lectures : -----

Practical : 2 Hrs/Week

Credit : 1

Evaluation Scheme

MSE : ----

ISE/CA : 25 Marks

ESE : 50 Marks

Course Objectives: The objective of the course is to

- 1) Provide a learning environment to practice listening, speaking, reading and writing skills
- 2) Adapt communication strategies based on audience, context, and cultural diversity.
- 3) Utilize digital tools effectively for professional communication.
- 4) Equip learner with Professional skills by giving training through various tasks.

Course Outcomes:

COs	At the end of successful completion of the course, the student will be able to	Blooms Taxonomy
CO1	Communicate effectively in various formal and informal situations minimizing the barriers.	Understand
CO2	Construct grammatically correct sentences and use contextual words in English.	Understand
CO3	Use phonetically transcription to pronounce words correctly.	Apply
CO4	Use different formats of formal written skills.	Apply

Description:

Communication is key to smooth and efficient functioning of any industry or business .Professional communication is the need of every organization to maintain ethics, quality and standards. The efficacy of business communication skills are essential for engineering professionals to instruct, guide and motivate peers/ subordinates to achieve desired goals at work place. Strong Communication skills are highly valued in the professional world and contribute to career growth and opportunities. Thus, this course has been designed to enhance the professional communication skills for effective presentation both in written and oral forms at workplace.

Unit No.	Content	Hours
Unit 1	Understanding Communication	
	Definition of communication • Process of communication • Types of communication -- Formal, Informal, Verbal, Nonverbal, Vertical, Horizontal, Diagonal Barriers in the communication process	
Unit 2	Grammar and Vocabulary	
	• Forms of Tenses • LSRW skills • Vocabulary Building	
Unit 3	Phonetics	
	• Understanding Phonetics and its alphabets • Transcription Practices	
Unit 4	Developing Oral Skills	
	• Importance and Techniques of spoken language • Techniques of formal speech, Meeting, Elocution , Extempore	
Unit 5	Professional Correspondence	
	• Letter Writing- Application letter, Seeking leave, Permission letter etc. • Preparation of technical events, information broacher and manuals.	

Sr. No	TITLE OF EXPERIMENT
01	Elocution
02	Extempore
03	Phonetics-Listen and Repeat
04	Active listening / Practice of listening
05	Effective Reading /Practice of reading
06	Story telling/Incident narration.
07	Employment skill-Application writing
08	Verbal Aptitude/Grammar Application
09	Manual /Broacher preparation.
10	Vocabulary Utilization/Vocabulary Building

11	Situational Conversation
12	Fluency tips

Note: Minimum Eight should be performed from the above list.

References:

Reference Books	
1	AICTE's Prescribed Textbook: English (with Lab Manual), Khanna Book Publishing Co.
2	Kul Bhushan Kumar, Effective Communication Skills, Khanna Book Publishing, 2022.
3	Practical English Usage. Michael Swan. OUP. 1995. 4. Remedial English Grammar. F. T. Wood. Macmillan.20075. On Writing Well. William Zinsser. Harper Resource Book. 20016. Study Writing. Liz Hamp-Lyons and Ben Heasley. Cambridge University Press. 2006. https://www.coursera.org/specializations/improve-english
4	International Phonetic Association (IPA) Website

Skill Enhancement Course-I

Teaching Scheme	Examination Scheme					
Credits- 01	MSE	ISE/CA	ESE	PR – ISE/CA	PR-ESE	Total
Lectures (L): 00 hrs /Week Practical: 2 hrs/week	**	**	**	25	25	50

Course Objectives: The objective of the course is	
Mechanical Engineering Group	1. To acquire skills in basic mechanical engineering practice.
	2. To provide practical experience in Smithy, Fitting, Plumbing.
Civil Engineering Group	1. To introduce students to basic civil engineering and its procedure.
	2. To develop practical skills in handling civil engineering equipments and instruments.
Electrical Engineering Group	1. To introduce students to fundamental of electrical engineering and its procedure.
	2. To develop practical skills in handling electrical engineering equipment and instruments.
Computer Science and Engineering Group	1. To introduce fundamental knowledge of basics of computer.
	2. To develop skills in using various I/O devices.
Electronics and Telecommunication Engineering Group	1. To use various commands, functions, and arrays required for programming in MATLAB.
	2. To write programs using functions and looping statements and plot graphs.

Course Outcomes

CO	After the completion of the course the student should be able to	Bloom's Cognitive
Mechanical Engineering Group		
CO-1	Describe the methods, operations and processes used in Smithy, fitting, Plumbing.	Understanding
CO-2	Use the techniques, skills, and modern engineering tools necessary in fitting, smithy and plumbing operations.	Applying
Civil Engineering Group		
CO-1	Study of different building materials and drawings.	Understanding
CO-2	Use surveying equipments to measure distance and levels.	Applying

Electrical Engineering Group		
CO-1	Understand the electrical tools and equipment's/components	Understanding
CO-2	Utilize the know-how of basic electrical concepts in wiring installation	Applying
Computer Science and Engineering Group		
CO-1	Understand Basics of Computer Engineering.	Understanding
CO-2	Apply skills to analyse I/O devices.	Applying
Electronics and Telecommunication Engineering Group		
CO-1	Use the different commands, functions, arrays required for programming in MATLAB.	Understanding
CO-2	Apply the knowledge of programming to plot graph and write program for simple applications.	Applying

List of experiments: Common to all Programmes

Sr. No.	Details
Mechanical Engineering Group (Any TWO)	
1	Tin Smithy One job in smithy involving upsetting, Drawing, bending such as Rectangular Tray, Cylinder, Square box without lid, funnel
2	Black Smithy One job in black smithy such as Round rod to Square, S-Hook, Round Rod to Flat Ring Round Rod to Square headed bolt
3	Fitting One job Male/Female fitting with operations- Marking, cutting, drilling, tapping filing etc.
4	Plumbing One job on Joining GI pipes by threading, PVC pipes by gluing and cementing.
Civil Engineering Group (Any TWO)	
1	Measurement of horizontal distances by using tape and pedometer
2	Measurement of horizontal angles by using prismatic compass
3	Measurement of area by tape and planimeter for regular and irregular shapes.
4	Study of Field test of Civil engineering materials like Cement, Brick, Sand and Aggregate
Electrical Engineering Group (Any TWO)	
1	Introduction to electrical tools, their uses, and safety

2	Study of wiring components (Wires, Switches, Fuses, Sockets, Plug, Lamps and Lamp holders etc.)
3	Study of electrical equipment's/components such as Resistor, Inductor, Capacitor, Transformer, Motor, Variac / Auto-Transformer etc.
4	Study of House Wiring (Batten, Cleat, Casing-Caping And Conduit Wirings)
Computer Science and Engineering Group (Any TWO)	
1	Computer Basics: Algorithms, Simple Model of a Computer, Characteristics of Computers, Problem Solving Using Computers, Flowchart, Working of a Computer, Stored Program Concept, Hardware and Software
2	Data Representation: Representation of Characters in Computers, Representation of Integers, Representation of fractions, Hexadecimal Representation of Numbers, Decimal to Binary Conversion
3	Input Output Units: Traditional Computer Input/Output Units: Keyboard, Display Unit, Computer Mouse Other Input Technologies: Touch Pad, Touch Screen, Bar Code Computer Output Devices: CRT, Flat Panel Display Technology
4	Printers: Inkjet Printers, Laser Printers, Dot Matrix Printers, Line Printers, Plotters
Electronics and Telecommunication Engineering Group (Any TWO)	
1	MATLAB/SCILAB brief introduction, installation, and basics of variables and arrays Multidimensional sub-arrays, special values, displaying output data, data files, and scalar array operations.
2	MATLAB/SCILAB branching, statements and logical data types, branches, while and for loop, logical arrays, and vectorization.
3	User-defined and I/O functions, introduction to MATLAB/ SCILAB functions, Variable passing, sharing data using global memory, preserving data between calls to a function or sub-function in MATLAB/ SCILAB.
4	Plotting simple graphs; Basic 2D plots, Style Options - labels, title, and legend- axis control, zoom in and zoom out; – using a plot editor - overlay plots: specialized 2D using MATLAB/SCILAB.

Reference/Text Books	
Mechanical Engineering Group	
1	Workshop Technology by V. S. Raghuwanshi by Dhanpat Rai & Co.

2	Elements of Workshop Technology, Vol. I and II by Hajara Choudhari, Media Promoters
3	Workshop Technology, Vol – I by Gupta and Kaushik, New Heights
4	Workshop Technology, Vol – I by Chapman, The English Language Book Society.
Civil Engineering Group	
1	Hirasakar G. K., “Basic Civil Engineering”, Dhanpat Rai publications, 1st Edition, 2007
2	Gole L.G., “Introduction to Civil Engineering”, Mahu Publisher House, 4th Edition, 2005
3	Bhavikatti S.S., “Basic Civil Engineering”, New Age Publications, 2010
4	Duggal S. K., “Surveying (Vol I)”, Tata McGraw Hill, 4th edition 2013
5	Bindra S. P., Arora S. P. , “Building Construction”, Dhanpat Rai publication, 5th edition, 2012
Electrical Engineering Group	
1	B. L. Theraja – Electrical Technology vol.1. – S. Chand
2	B. L. Theraja – Electrical Technology vol.2. – S. Chand
3	Nagrath I. J. and D. P. Kothari – Basic Electrical Engineering (2001) – McGraw Hill.
4	P. V. Prasad and S. Shivan Raju – Electrical Engineering concepts and Applications – Cengage learning
5	Bharati Dwivedi and Anurasg Tripathi – Fundamentals of Electrical Engineering – Willey Precise
Computer Science and Engineering Group	
1	Computer Fundamentals Architecture and Organization by B.Ram New Age International Publishers.
2	Fundamentals of Computers by V. Rajaram, PHI Publications.
3	Introduction to Information Technology, ITL Education Solutions LTD. Pearson Education
4	UNIX concepts and applications by Sunitabha Das, TMGH.
Electronics and Telecommunication Engineering Group	
1	Introduction To Digital Signal Processing Using MATLAB and SCILAB By Mohammad Atique & Amol Prakash Bhagat
2	Introduction To MATLAB by Rudra Pratap Singh
3	Handbook on MATLAB and SCILAB

Yoga and NSS

Lectures : -----
Practicals : 4 Hrs/Week
Credit : 2

Evaluation Scheme
MSE : ----
ISE/CA : 50 Marks
ESE : -----

Yoga:

Unit	Content	Hours
Unit 1	Practice warming up for Yoga.	
	<ul style="list-style-type: none">• Introduction to Yoga.• History of Yogabhyas.	
Unit 2	Practice Surya Namaskar	
	<ul style="list-style-type: none">• All the postures of Surya Namaskar with mantra• Shavasana for self-relaxation	
Unit 3	Practice basic Asanas	
	<ul style="list-style-type: none">• Sarvangasna, Halasana, Kandharasana (setu bandhasana)• hujangasana, Naukasana, Mandukasana• Paschimottasana, Baddhakonasana, Bharadwajasana• Veera Bhadrasana, Vrukshasana, Trikonasana.	
Unit 4	Practice basic pranayama and meditation	
	<ul style="list-style-type: none">• Bhastrika, Anulom Vilom Pranayam Kriya• Kapalbhati (Shuddhikriya) Pranayam Kriya• Bhramary Pranayam.• Explain the benefits of Meditation• Dhyana Mudra and meditation	

Sr. No	TITLE OF EXPERIMENT
01	Perform warming up exercises to prepare the body from head to toe for Yoga.
02	Perform all the postures of Surya Namaskar one by one in a very slow pace, after warm up.
03	Perform multiple Surya Namaskar (Starting with three and gradually increasing it to twelve) in one go.
04	Perform Sarvangasna, Halasana, Kandharasana (setubandhasana)
05	Perform Bhujangasana, Naukasana, Mandukasana
06	Perform Paschimottasana, Baddhakonasana, Bharadwajasana.
07	Perform Veera Bhadrasana, Vrukshasana, Trikonasana.
08	Perform Bhastrika, Anulom Vilom Pranayam Kriya

09	Practice Kapalbhathi Pranayam Kriya
10	Practice Bhramary Pranayam.
11	Perform sitting in Dhyana Mudra and meditating. Start with five minute and slowly increasing to higher durations.

References:

Reference Books	
1	Swami Vivekananda -Patanjalis Yoga Sutras Fingerprint Publishing (2023) Prakash Books India Pvt Ltd, New Delhi ISBN-13?: ? 978-9354407017
2	Swami Saradananda - Mudras for Modern Living: 49 inspiring cards to boost your health, enhance your yoga and deepen your Watkins Publishing (2019) ISBN-13?: ? 978-1786782786
3	Luisa Ray, Angus Sutherland Yoga for Every Body: A beginner's guide to the practice of yoga postures, breathing exercises and me Vital Life Books (2022) ISBN-13?: ? 978-1739737009
4	Ann Swanson Science of Yoga: Understand the Anatomy and Physiology to Perfect Your Practice ISBN-13?: ? 978-1465479358
5	B.K.S. Iyengar, Light On Yoga.

National Service Scheme (NSS):

Course Outcomes (CO): Students will be able to	
1.	Understand the community in which they work and relation to Community.
2.	Identify the needs & problems of the Community and involve them in problem solving process.
3.	Develop capacity to meet emergencies and natural disasters
4.	Acquire leadership qualities and democratic attitude.
5.	Practice national integration and social harmony.
6.	Utilize their knowledge in finding practical solutions to individual and community problems.

Course Contents	CO	Hrs
National Service Scheme: The NSS activities and allotted hours are mentioned below: 1. Blood donation Camp 4Hrs. 2. Tree Plantation 4Hrs. 3. Internal Cleanliness Drive 4Hrs. 4. External Cleanliness Drive 4Hrs 5. Arranging Lectures on Social Issues in schools or villages 4Hrs. 6. NSS Foundation Day Celebration 2Hrs. 7. Gandhi jayanti & Communal Harmony Day 4Hrs. 8. Arranging Rally on Social issues 4Hrs (Anti-Tobacco, Vysan Mukti etc.). 9. Celebration of National Days (As per NSS list) 8Hrs. 10. Arrangement of free medical checkup camp in villages 4Hrs. 11. Arrangement of National Integration Day. 2Hrs. 12. Arrangement of veterinary awareness camp 4 Hrs. 13. Participation in disaster management training 8 Hrs. 14. Arrangement of water conservations awareness camp 8Hrs. 15. Arrangement of rain water harvesting awareness camp 8Hrs. 16. Arrangement of National Youth week 2Hrs. 17. Any other activity as decided by Hon. Principal/Program Officer 8Hrs From time to time.	CO1 CO2 CO3 CO4 CO5 CO6	30
Instructions: 1. The Students will have to complete for a total period of 30 hours activities (in one Semester) OR Participation in seven days residential camp with completion certificate of NSS camp. 2. NSS Volunteer has to complete 30 hours NSS activities mentioned in above curriculum. NSS volunteer has to prepare and submit NSS activity report of		

30 hours to NSS Coordinator.		
3. The In Sem Term work Evaluation will be conducted by NSS Coordinator based on the attendance, overall performance and the report.		

Reference Books:

1	National Service Scheme Manual, Government of India.
2	Training Programme on National Programme scheme, TISS.
3	Orientation Courses for N.S.S. Programme officers, TISS.
4	Case material as Training Aid for field workers, Gurmeet Hans.
5	Social service opportunities in Hospitals, Kapil K. Krishan, TISS.
6	Social Problems in India, Ram Ahuja.
7	National Service Scheme Manual (Revised), 2006 Government of India, Ministry of Youth Affairs and Sports, New Delhi.
8	University of Mumbai National Service Scheme Manual, 2009
9	Avhan Chancellor's Brigade-NSS Wing, Training Campon Disaster Preparedness Guidelines, March, 2012.
10	Rashtriya SevaYojana Sankalpana - Prof. Dr. Sankey Chakane, Dr. Pramod / Pabrekar, Diamond Publication, Pune.
11	National Service Scheme Manual for NSS District Coordinators, National Service Scheme Cell, Dept. of Higher and Technical Education, Mantralaya.
12	Annual Report of National Service Scheme (NSS) published by Dept. of Higher and Technical Education, Mantralaya.
13	NSS Cell, Dept. of Higher and Technical Education, Mantralaya, UTKARSHA-Socio and Cultural Guidelines.
14	Purushottam Sheth, Dr. Shailaja Mane, National Service Scheme

Useful Links

1	https://www.youtube.com/watch?v=3o40NbNLoWQ
2	https://www.youtube.com/watch?v=paJK5X6zqI8&list=PLp4YWOW_lIESHogw-coZo7PQdYliF-msj
3	https://www.youtube.com/watch?v=paJK5X6zqI8&list=PLp4YWOW_lIESHogw-coZo7PQdYliF-msj&index=1

Year and Semester	First Year B. Tech (All Programme) Semester I				
Course Category	Engineering Science (ESC)				
Title of Course	Programming Languages-I			Course Code	
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	01	--	02	03	02
Examination	MSE	ISE/CA	ESE	Total	
Scheme	--	25	25	50	

Course Pre-Requisite	Basics of Operating System, Basic Math Skills, Basic Problem-Solving Skills.	
Course Objective	1	Mastering Fundamentals of C Programming
	2	Understanding Program Flow
	3	Effective Problem-Solving Skills to develop programming logic in C
	4	Debugging and Error Handling in C
Course Outcomes	After competition of this course Students will be able to	
	CO1	Understand basic Programming concepts.
	CO2	Design C Programs using various Operators.
	CO3	Apply programming logic using Conditional and Looping statements in C.
	CO4	Understand fundamentals of Arrays and Strings in C.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2	2	3										
CO3	2	3										
CO4	2	3										
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
<p><u>In Semester Evaluation/ Continuous Assessment has 25 Marks</u></p> <p>Parameters for In Semester Evaluation could be: Attendance, Assignments, Unit Tests, Presentation, Online Activities like (Virtual Labs, NPTEL) etc.</p> <p>Lab File should be prepared and should be assessed continuously during academic.</p> <p><u>End Semester Evaluation has 25 Marks</u></p> <p>External Practical Examination with Performance and Oral Examination</p>

Unit No.	Title and Content of Unit	Hours
Unit 1	Overview and fundamentals of Programming	5 Hrs
	Basic Structure of C Program, Executing a C Program, Character Set, C Tokens, Keywords and Identifiers, Constants, Data Types, Variable Declaration and Initialization.	
	Formatted Input and Output statements in C (getchar(), putchar(), scanf(), printf())	
Unit 2	Operators and Expressions	5 Hrs
	Operators in C Arithmetic Operators, Relational Operators, Logical Operators, Assignment Operator, Increment and Decrement Operator, Conditional Operator (? :), Bitwise Operators, Special Operators	
	Type Conversion in Expression, Mathematical Functions.	
Unit 3	Decision Making: Branching and Looping	5 Hrs
	Decision Making Statements: Simple if, The if... else Statement, Nesting of if... else statements, The else if ladder, The Switch Statement.	
	Loping Statements: The While Statement, The Do Statement, The FOR Statement. Jumps in Loop (break and continue statement)	
Unit 4	Arrays and Strings in C	5 Hrs
	Introduction to Array, One Dimensional Array – Declaration and Initialization, Two-Dimensional Array – Declaration and Initialization.	
	Introduction to String in C, Reading and Writing String (gets(), puts(), scanf(), printf()), String Functions: strlen(), strcmp(), strcpy(), strcat(),	

Unit 5	User Defined Functions	4 Hrs
	Introduction, Multifunction Program, Elements of User Defined Function (Function Declaration, Function Call, Function Definition), Categories of Functions (Function with and Without Return value, Function with and Without Arguments), Recursion, Passing array to Functions.	

Guidelines for Practical Performance	
Faculty can create Experiment list based on following listed topics. Minimum 12 to 15 Experiments should get performed along with flow chart and Execution.	
Topic No.	Title of Experiment/ Problem Statement
1	Formulate areas of different Geometric shapes and design C program for same.
2	Illustration various Mathematical functions in C
3	Demonstration of Operators in C
4	Using Decision Making Statements in Programming Logic
5	Using Looping Statements in Programming Logic
6	Implementation of One-Dimensional Array.
7	Implementation of Two-Dimensional Array
8	Performing various String Operations in C
9	Implementation of function with all categories.
10	Demonstrate Recursive Function

Textbooks			
Sr. No.	Title	Author	Edition/Publication
01	Programming with ANSI C	E Balguruswamy	Mc Graw Hill
02	Let Us C	Yashwant Kanitkar	BPB Publication

Reference Books			
Sr. No.	Title	Author	Edition/Publication
01	The C Programming Language	Kernighan and Richie	(PHI)/Pearson Education
02	Complete 'C' Reference	--	Herbert Schildt

Engineering Chemistry

Lectures : 3 Hrs/Week

Credit : 3

Evaluation Scheme

MSE : 30 Marks

ISE/CA : 10 Marks

ESE : 60 Marks

Course Objectives: The objective of the course is to

1. To provide the useful fundamental concepts of Chemistry to Engineering discipline.
2. To impart knowledge on the principle of chemistry involving the different application oriented topics required for relevant to engineering.

Course Outcomes:

COs	At the end of successful completion of the course, the student will be able to	Blooms Taxonomy
CO1	Select the properties of metallic and advanced material.	Understand
CO2	Explain the basic principles of instrumental methods for chemical Analysis	Understand
CO3	Select water treatment process to solve engineering problem.	Apply
CO4	Make use of relevant fuel in engineering application.	Apply
CO5	Make use of corrosion preventive method	Apply
CO6	Use various types of polymers in engineering field.	Apply

Unit No.	Content	Hours
Unit 1	Chemistry of Metallic And Composite Materials	07 Hrs
	A) Metallic materials: Introduction, Alloy- definition and classification, purposes of making alloys. Ferrous alloys: Plain carbon steels (mild, medium and high), stainless steels. Nonferrous alloys: Copper alloy (Brass), Nickel alloy (Nichrome), Aluminum alloy (Duralumin and Alnico).	
	B) Composite materials: Introduction, Composition, properties and uses of fiber reinforced plastics (FRP) and glass reinforced plastic (GRP).	
Unit 2	Instrumental methods of chemical analysis	07 Hrs
	Introduction, advantages and disadvantages of instrumental methods	
	A) Spectrometry: Introduction, Laws of spectrometry (Lamberts and Beer-Lambert's law), Single beam spectrophotometer (schematic, working and applications). B) Chromatography: Introduction, types, gas-liquid chromatography (GLC), basic principle, instrumentation and applications	

Unit 3	Water	07 Hrs
	Introduction, impurities in natural water, water quality parameters total solids, acidity, alkalinity, chlorides, and dissolved oxygen (definition, causes, significance), hardness of water types of hardness, units of hardness, ill effects of hard water in steam generation in boilers (scale & sludge formation), numerical on hardness, treatment of hard water (ion exchange and reverse osmosis).	
Unit 4	Fuels	07 Hrs
	Introduction, classification, calorific value, definition, units (calorie, kcal, joules, kilojoules), characteristics of good fuels, comparison between solid, liquid and gaseous fuels, types of calorific value (higher and lower), Bomb calorimeter and Boy's calorimeter. Numerical problems on Bomb and Boy's calorimeter.	
Unit 5	Corrosion	07 Hrs
	Introduction, causes, classification, atmospheric corrosion (oxidation corrosion), electrochemical corrosion (hydrogen evolution and oxygen absorption mechanism), factors affecting rate of corrosion. Prevention of corrosion by proper design and material selection, cathodic protection, Protective coatings-hot dipping (galvanizing and tinning,), electroplating.	
Unit 6	Chemistry of Polymers	07 Hrs
	Polymers and Polymerization. Types of polymerization (addition and condensation). Plastics, types (thermo softening and thermosetting plastics), properties and applications of polythene, polystyrene, Bakelite, urea formaldehyde plastics, epoxy resin.	

References:

Reference Books	
1	Engineering Chemistry by Jain and Jain, Dhanpat Rai Publishing Company Ltd., New Delhi.
2	A Textbook of Engineering Chemistry by S. S. Dara and S. S. Umare, S. Chand & Company Ltd., New Delhi.
3	A Textbook of Engineering Chemistry by C. P. Murthy, C. V. Agarwal and A. Naidu, BS Publications, Hyderabad.
4	Chatwal and Anand, Instrumental Methods of Chemical Analysis, Himalaya Publishing House, New Delhi.
5	Engineering Chemistry by Dr. A. K. Pahari and Dr. B. S. Chauhan, Laxmi Publications (P) Ltd, New Delhi.
6	A text Book of Engineering Chemistry by Shashi Chawla, Dhanpat Rai & Co. (Pvt.) Ltd, Delhi.
7	Engineering Chemistry by Wiley India.
8	Engineering Chemistry by Renu Bapna and Renu Gupta, MacMillan Publishers (India) Ltd, Delhi.

Engineering Chemistry Lab

Practical : 2 Hrs/Week
Credit : 1

Evaluation Scheme
ISE/CA : 25 Marks

Sr. No	TITLE OF EXPERIMENT
01	Determination of acidity of water.
02	Determination of alkalinity of water.
03	Determination of chloride content of water by Mohr's method.
04	Determination of total hardness of water by EDTA method.
05	Determination of moisture, volatile and ash content in a given coal sample by proximate analysis.
06	Preparation of urea-formaldehyde resin.
07	Preparation of phenol-formaldehyde resin.
08	Determination of percentage of copper in brass.
09	Estimation of zinc in brass solution.
10	Determination of rate of corrosion of aluminium in acidic and basic medium.
11	Demonstration of pH meter.
12	Demonstration of photo-colorimeter / spectrophotometer.
13	Demonstration of paper chromatography.

Note: - Out of the above, minimum of 8 experiments are to be performed

Basic Mechanical Engineering

Lectures : 2 Hrs/Week

Credit : 2

Evaluation Scheme

MSE : 30 Marks

ISE/CA : 10 Marks

ESE : 60 Marks

Course Objectives: The objective of the course is to		
Make students familiar with the basic concepts of Mechanical system and engineering and enable them to carry out elementary analysis of mechanical systems.		
Course Outcomes:		
COs	At the end of successful completion of the course, the student will be able to	Blooms Taxonomy
CO1	Understand the basic concepts of thermodynamics and I.C. Engine.	Understand
CO2	Understand principle of energy conversion system and power plants	Understand
CO3	Understand and identify power transmission devices with their functions	Understand
CO4	Identify and elaborate different mechanisms and mobility systems	Understand
CO5	Identify and elaborate different manufacturing process	Understand
CO6	Describe the scope of mechanical engineering in multidisciplinary industries	Understand

Unit No.	Content	Hours
Unit 1	Introduction to Thermodynamics and I. C. Engine	
	A: Introduction to Thermodynamics, Laws of thermodynamics, B: Introduction to IC Engines, Construction and Working of C.I. and S.I. Engines.	05 Hrs
Unit 2	Energy Sources and power plants	
	A: Introduction and applications of Energy sources like Fossil fuels, Nuclear fuels, Hydro, Solar, Wind, and Bio-fuels B: Environmental issues like Global warming and Ozone depletion	05 Hrs
Unit 3	Mechanical Power Transmission and Energy conversion devices	
	A: Type of Belt and belt drives, chain drive, Types of gears and gear Trains B: Introduction to Pumps, Compressors and Turbines	05 Hrs
Unit 4	Introduction to Mechanism and Mobility System	
	A: Introduction to Links, kinematic pair, Kinematic chain, Mechanism, inversion. B: Introduction to Automobile, Introduction to Electric and hybrid vehicles	05 Hrs
Unit 5	Manufacturing Processes	
	A: Introduction to manufacturing processes - Casting Process, Metal removing processes,	05 Hrs

	Metal Joining Processes – Arc welding, soldering and brazing and their applications B: Introduction to Advanced Manufacturing Systems, Introduction and components of CNC, advantages and applications of CNC, 3D printing.	
Unit 6	Introduction to Mechatronics and Robotics	05 Hrs
	A: Introduction to Mechatronics, Mechatronics systems, Sensor and its types and its applications B: Introduction to Robotics, Joints & links, Robot anatomy, Applications of Robots in material handling, processing and assembly and inspection.	

References:

Reference Books	
1	Solar Energy by Dr. S. P. Sukathame, Tata Mc-Graw Hill Publication
2	Non-Conventional Sources of Energy by G.D. Rai, Khanna Publication
3	Engineering Thermodynamics by R. Joel, The English Language Book Society
4	Automobile Engineering by Dr. Kripal Singh, standard publish distributors
5	Thermal Engineering by R. K. Rajput, Laxmi Publication, Delhi
6	Elements of Heat Engine Vol. I, II, III by Patel and Karamchandani, Acharya Book Depot
7	Power Plant Engineering by Arora and Domkunwar, Dhanpat Rai and Sons
8	Manufacturing Technology Volume I and II by P. N. Rao, Tata Mc-Graw Hill Publication
9	Elements of Workshop Technology, Vol.I and II by Hajara Choudhari, Media Promoters
10	Basic Mechanical Engineering by Basant Agrawal & C. M. Agrwal, Wiley India Pvt. Ltd.
11	Energy Technology by S. Rao and Dr. B. B. Parulekar, Khanna Publication.
12	Mechatronics – W. Bolton, Pearson education
13	“Robotics for Engineers”, Koren, Yoram, Tata McGraw Hill.,(2003)
14	“Theory of Machines”, Ratan S.S, Tata McGraw Hill New Delhi, 2nd Edition.

Engineering Mechanics**Lectures** : 3 Hrs/Week**Tutorial** : ---**Credit** : 3**Evaluation Scheme****MSE** : 30 Marks**ISE/CA** : 10 Marks**ESE** : 60 Marks**Desired Requisites:** Physics, Mathematics**Course Outcomes (CO) with Bloom's Taxonomy Level**

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

CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Identify and explain different types of force systems and laws of forces.	II	Understand
CO2	Analyze and draw the Free body diagram of objects and determine the support reactions of determinate beams using conditions of Equilibrium.	III, IV	Apply and Analyse
CO3	Analyze the motion of particle or object to solve the problems of rectilinear and projectile motions in kinematics	III	Apply and Analyse
CO4	Apply the concepts of Newton's laws of motion, D'Alembert's principles to solve problems related in dynamics	III	Analyse
CO5	Explain the concepts of stress-strain and engineering properties of materials.	II	Understand

Unit No.	Content	Hours
Unit 1	Forces	
	Fundamentals, Systems, Types of force systems, Composition and Resolution, Resultant of planar force systems. Free Body Diagram, Lami's Theorem, Laws of Forces, Moment of force, Varignon's Theorem	08 Hrs
Unit 2	Equilibrium	
	Equilibrium conditions, Definition of equilibrium, Support reaction, Types of loads, Types of supports, Types of beams, Concept of determinacy and indeterminacy, Principle of Virtual Work, Determination of reaction of determinate beams using VW principle	07 Hrs
Unit 3	Centroid and Moment of Inertia	
	Centre of gravity and Centroid, Moment of Inertia of Plane figure, Composite	04 Hrs

	Sections, Radius of gyration, Mass-Moment of Inertia	
Unit 4	Kinematics of Particles	
	Rectilinear motion of particle, Equations of motion, Motion under gravity, Relative Motion, Projectile Motion,	06 Hrs
Unit 5	Kinetics of Particles	
	Friction: Laws of friction, Wedge friction, Newton's laws of motion, D'Alembert's principle, Applications to rough inclined plane, lift, and connected bodies, Work Energy principle, Impulse Momentum principle, Collisions: Impact, Collision of bodies, Coefficient of Restitution, Loss of Kinetic Energy due to Impact	08 Hrs
Unit 6	Introduction to stress and strains	
	Engineering properties of materials, Homogenous and isotropic materials, Stress and its types, Strain and its types, Stress strain curve, Hooke's law, Elastic Constants,	05 Hrs

References:

Textbooks

1	Ramamrutham., S. "Textbook of Applied Mechanics", Dhanpat Rai Publishing Company Limited, 2008.
2	Bhavikatti., S. S. and Rajashekarappa., K. G. "Engineering Mechanics", New Age International Publishers, 2015, 5 th Edition.
3	Beer, F. P. and Johnston, E. R. "Vector Mechanics for Engineers Vol. I and II", McGraw Hill Company Publication, 2011, 9 th Edition.

Reference Books

1	Singer, F. L. "Engineering Mechanics Statics & Dynamics", B. S. Publications, 2011.
2	Timoshenko, S. and Young, D. H. "Engineering Mechanics", McGraw Hill Companies, 2008, 4 th Edition.
3	Meriam, L. and L.G. Kraige, "Engineering Mechanics – Dynamics", John Wiley & Sons, 2002, 6 th Edition.
4	F. P. Beer and E. R. Johnston, Mechanics of materials, McGraw-Hill International

Useful Links

1	https://nptel.ac.in/courses/112106286
2	https://www.youtube.com/watch?v=9Yt3I4bP-90

Engineering Mechanics Lab**Practical** : 2 Hrs/Week**Evaluation Scheme****ISE/CA** : 25 Marks**Credit** : 1**ESE** : 25 Marks

Desired Requisites: Engineering Mechanics			
Course Outcomes (CO) with Bloom's Taxonomy Level			
At the end of the course, the students will be able to,			
CO	Course Outcome Statement/s	Bloom's Taxonomy Level	Bloom's Taxonomy Description
CO1	Demonstrate the verification of different laws of forces and moments.	III	Applying
CO2	Apply graphical method to analyse determinate beams and trusses.	III	Applying
CO3	Determine the values of coefficients of friction and restitution.	III	Applying
List of Experiments / Lab Activities/Topics			
List of Experiments : 1. Verification of Triangle law of forces (Lami's theorem) using Jib Crane 2. Verification of Law of polygon of forces 3. Determination support reactions in Simply Supported Beam 4. Verification of Principle of moments using Bell crank lever apparatus 5. Determination of Coefficient of static friction for motion on horizontal 6. Determination of Coefficient of kinetic friction for motion on horizontal and inclined plane 7. Determination of Support reaction of statically determinate beams by graphical method 8. Determination of coefficient of restitution. 9. Determination of Mass moment of Inertia (Fly wheel) 10. Determination of centroid of various shapes of plates.			
Textbooks			
1	Lab Manual Link - https://atifmohd077.files.wordpress.com/2019/03/em-lab-manual-1.pdf		
2	Lab Manual Links - https://jecassam.ac.in/wp-content/uploads/2018/10/1_Engineering-Mechanics-Laboratory-2nd-SEM-DU-Old-Course.pdf		

3	Bhavikatti., S. S. and Rajashekarappa., K. G. “Engineering Mechanics”, New Age International Publishers, 2015, 5 th Edition.
References	
1	Ramamrutham., S. “Textbook of Applied Mechanics”, Dhanpat Rai Publishing Company Limited, 2008.
2	Beer, F. P. and Johnston, E. R. “Vector Mechanics for Engineers Vol. I and II”, McGraw Hill Company Publication, 2011, 9 th Edition.
3	R. K. Bansal “Engineering Mechanics” Laxmi Publications,ltd.
Useful Links	
1	https://nptel.ac.in/courses/112106286
2	https://www.youtube.com/watch?v=9Yt3I4bP-90
3	https://www.vlab.co.in/broad-area-civil-engineering
4	Virtual Lab link by IIT Mumbai - http://vlabs.iitb.ac.in/vlab/labsme.html

Basic Electronics Engineering

Lectures : 2 Hrs/Week

Credit : 2

Evaluation Scheme

MSE : 30 Marks

ISE/CA : 10 Marks

ESE : 60 Marks

Prerequisite Course: Physics, Mathematics, Basic Science and Fundamentals of Electronics		
	Course Outcomes:	
CO	After the completion of the course the student should be able to	Bloom's Cognitive
CO-1	Understand passive semiconductor devices applications	Understand
CO-2	Understand active semiconductor devices applications	Understand
CO-3	Analyze different biasing circuits and low frequency response of an amplifier	Analyze
CO-4	Gain knowledge about fundamentals of Operational amplifiers and various applications.	Remember
CO-5	Apply fundamental techniques of digital design	Apply

Unit No.	Content	Hours
Unit 1	Semiconductor Diode	05 Hrs
	Intrinsic & extrinsic semiconductors, Construction of PN Junction diode, working and V-I characteristics of diode. Special purpose diodes- characteristics, construction and advantages, disadvantages and applications of Zener diode LED	
Unit 2	Rectifiers & Filters	05 Hrs
	Need of rectifiers, definition, types of rectifiers- half wave rectifiers, full wave rectifiers (bridge and center tapped), circuit operation, input and output waveforms for voltage & current, comparison of three rectifiers. Need of filters and definition, types of filters-shunt capacitor, series inductor, π filter, circuit operation, input and output waveforms, limitations and advantages.	
Unit 3	Transistor	05 Hrs
	Bipolar junction transistor- symbol, types and working principle of NPN and PNP transistors, Transistor configuration-CB,CE & CC, Input & output characteristic, biasing of transistor of transistors- fixed bias, voltage divider bias, emitter bias, DC load line and thermal runaway.	

Unit 4	Amplifiers	
	Concept of amplification, small signal amplifier using BJT, single stage CE amplifier, working and frequency response, multistage amplifier- need and types of amplifier coupling- RC coupling, transformer coupling, direct coupling, merits and demerits of each and applications.	05 Hrs
Unit 5	Operational Amplifier (IC-741)	
	Introduction to op-amp, block diagram of op-amp, ideal and practical specifications of op-amp, Applications of op-amp as inverting amplifier, non- inverting amplifier, integrator, differentiator and comparator.	04 Hrs
Unit 6	Digital Electronics	
	Logic gates and Boolean algebra, combinational logic circuits- adder, subtractor and its types, Multiplexer and de-multiplexer, Number system and its types- binary, octal, decimal, hexadecimal, conversions in number system.	04 Hrs

References:

Text Books	
1	A Text Book of Applied Electronics by R. S. Sedha
2	Basic Electronics Engineering by Vijay Baru
3	Digital Principles & Applications by Albert Malvino
4	Principle of Electronics by V.K. Mehata
Reference Books	
1	Fundamental of Digital Circuits by A. Anand Kumar (PHI-Publication).
2	Fundamental of Electronics Engineering by R. Prasad (CENGAGE- Learning).
3	Electronics Circuits And Systems by Owen Bishop.
4	Integrated Electronics Analog And Digital & System by Jacob Millman. Christos C. Halkias.
5	Electronics Devices and Circuit theory by Robert Boylestad, Louis Mashlsky (Peerson-Publication).

Engineering Mathematics-II

Lectures : 3 Hrs/Week

Tutorial : 1

Credit : 4

Evaluation Scheme

MSE : 30 Marks

ISE/CA : 10 Marks

ESE : 60 Marks

Course Pre-Requisite	Basics of differential equations, Integration and its properties.	
Course Objective	1	To develop mathematical skills and enhance thinking power of students.
	2	To give knowledge to the students of differential equation, integral calculus, numerical methods with an emphasis on the application of solving engineering problem.
	3	To prepare students to formulate a mathematical model using engineering skills & interpret the solution in real world.
Course Outcomes	After completion of this course Students will be able to	
	CO1	Solve ordinary differential equations of first order and first degree.
	CO2	Apply Ordinary differential equation of first order and first degree to solve simple electric circuit problems, Newton's law of cooling and find orthogonal trajectories of given curves.
	CO3	Solve ordinary differential equations of first order and first degree numerically.
	CO4	Find Numerical Solutions of Algebraic and Transcendental Equations.
	CO5	Evaluate definite integrals by using special functions.
	CO6	Evaluate double integral and use it to find area enclosed by plane curves, mass of plane lamina.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										
CO2	3	2										
CO3	3	2										
CO4	3	2										
CO5	3	2										
CO6	3	2										
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
<p><u>In Semester Evaluation/ Continuous Assessment (ISE/CA) has 10 Marks</u> Parameters for ISE/CA could be: Attendance, Assignments etc.</p> <p><u>Mid Semester Examination (MSE) has 30 Marks</u></p> <p>MSE will be based on 50% syllabus from beginning (First Three Units)</p> <p><u>End Semester Examination (ESE) has 60 Marks</u></p> <p>ESE will be 25% on syllabus covered for MSE (First Three Units) and 75% on remaining syllabus (Last Three Units)</p>

Unit No.	Content	Hours
Unit 1	Ordinary Differential Equations of First Order and First Degree	
	Linear differential equations, Reducible to Linear differential equations, Exact differential equations, Reducible to Exact differential equations.	07 Hrs
Unit 2	Applications of Ordinary Differential Equations of First Order and First Degree	
	Applications to Orthogonal trajectories (Cartesian and Polar equations), Applications to Simple Electrical Circuits, Newton's law of cooling.	07 Hrs
Unit 3	Numerical Solution of Ordinary Differential Equations of First Order and First Degree	
	Taylor's series method, Euler's method, Modified Euler's method, Runge- Kutta fourth order formula.	07 Hrs
Unit 4	Numerical Solutions of Algebraic and Transcendental Equations	
	Bisection Method, Secant Method, Newton Raphson Method.	07 Hrs
Unit 5	Special Functions	
	Gamma function and its properties, Beta function and its properties, Error function and its properties.	07 Hrs
Unit 6	Multiple Integration and its applications	
	Double Integrals and evaluation, Change of order of integration, Change into Polar Coordinates, Area enclosed by plane curves, Mass of a plane lamina.	07 Hrs

Guidelines for Tutorials

1. Batchwise tutorials are to be conducted. The number of students per batch should be as per the university pattern for practical batches.
2. Minimum number of assignments should be six covering all topics.

References:

Textbooks			
Sr. No.	Title	Author	Edition/Publication
01	A Text Book of Applied Mathematics Volume I and Volume II	P. N. Wartikar J. N. Wartikar	Pune Vidyarthi Griha Prakashan, Pune
02	Higher Engineering Mathematics	Dr. B. S. Grewal	Khanna Publishers, Delhi

Reference Books			
Sr. No.	Title	Author	Edition/Publication
01	Advanced Engineering Mathematics	H. K. Dass	S.Chand ,New Delhi
02	Advanced Engineering Mathematics	Erwin Kreyszig	Wiley India Pvt.
03	A Text Book of Engineering Mathematics Volume I	Peter V. O'Neil and Santosh K. Sengar	Cengage Learning
04	A Text Book of Engineering Mathematics	N. P. Bali, Iyengar	Laxmi Publication (P) Ltd. New Delhi
05	Numerical Methods	Dr. B. S. Grewal	Khanna Publishers, Delhi
06	Mathematical methods of Science and Engineering	Kanti B. Datta	Cengage Learning

Professional Communication –II

Lectures : -----
Practical : 2 Hrs/Week
Credit : 1

Evaluation Scheme
MSE : ----
ISE/CA : 25 Marks
ESE : 50 Marks

Course Objectives: The objective of the course is to

- 1) Inculcate Technical writing skill to enhance professional efficiency.
- 2) To familiarize the various behavioral skills for personality development.
- 3) Utilize digital tools effectively for professional communication.
- 4) Equip learner with Professional skills by giving training through various tasks.

Course Outcomes:

COs	At the end of successful completion of the course, the student will be able to	Blooms Taxonomy
CO1	Construct Technical paragraph writing.	Apply
CO2	Understand the role of behavioral skills in career building.	Understand
CO3	Deliver presentation effectively.	Apply
CO4	Develop expected career skills.	Apply

Description:

This course explores the fundamentals of professional communication, emphasizing clear, concise written and oral skills, effective listening, and digital literacy. Designed for emerging professionals, it covers important behavioral skills, interpersonal communication skills, presentation skills, Leadership skills, E-mail etiquette, and cross-cultural communication strategies for a diverse workplace.

Unit No.	Content	Hours
Unit 1	Developing Writing Skills	
	<ul style="list-style-type: none">• Importance of Technical writing• Report Writing:<ol style="list-style-type: none">a. Techniques of Report Writingb. Methods of data collectionc. Types of Report Writing- Survey, Inspection and Investigation• Techniques of Note taking and summarizing.	

Unit 2	Behavioral Skills	
	<ul style="list-style-type: none"> • Understanding self(SWOT analysis) • Attitude building / developing positive attitude. • Decision making skills. • Leadership Skills. • Stress Management. • Time Management. • Team work. 	
Unit 3	Presentation Skills	
	<ul style="list-style-type: none"> • Importance and Techniques. • Presenting yourself professionally 	
Unit 4	Career Skills	
	<ul style="list-style-type: none"> • Corporate Manners and Etiquettes • Planning and Managing career. • Job application and Resume building. • Interview: Techniques and Skills • Group Discussion 	
Unit 5	Professional Correspondence	
	<ul style="list-style-type: none"> • Letter Writing- Application letter, Seeking leave, Permission letter etc. • Preparation of technical events, information broacher and manuals. 	

Sr. No	TITLE OF EXPERIMENT
01	Technical paragraph writing.
02	Group Discussion- Do's and Don'ts
03	Watch Ted Talk and summarize it.
04	Interview Techniques and skills(Lab Session)
05	Report writing.
06	Case study- Practice of Case study
07	Resume writing Techniques -Do's and Don'ts
08	Computer aided presentation of Project report.
09	Smart use of modern communication techniques/tools.
10	Developing professional telephonic skills- Do's & Don'ts.
11	Computer assisted language learning e.g. Effective E – mail writing
12	SWOT analysis

Note: Minimum Eight should be performed from the above list.

References:

Reference Books	
1	Menasha Raman, Sangeeta Sharma Technical Communication, Principles and Practice Oxford University Press -ISBN 978-13-16640-08-1
2	K. K. Sinha Business Communication Galgotiya Publishing company, New Delhi -ISBN 9789356227064
3	Technical Communication -Fourth Edition -Meenakshi Raman and Sangeeta Sharma -OUP Publication 2013
4	Communication Skills for Professionals -First Edition –Nira Konar -PHI Learning Publication 2011

Skill Enhancement Course-II

Teaching Scheme	Examination Scheme					
Credits- 01	MSE	ISE/CA	ESE	PR – ISE/CA	PR-ESE	Total
Lectures (L): 00 hrs /Week	**	**	**	25	25	50
Practical: 2 hrs/week						

Course Objectives: The objective of the course is	
Mechanical Engineering Group	1. To impart training to help the students develop mechanical engineering skills.
	2. To carry out the various operations to make a finished product in welding, carpentry, sheet metal works.
Civil Engineering Group	1. To develop practical skills in handling civil engineering equipment and instruments.
	2. To promote teamwork, problem-solving, and analytical skills while conducting experiments and interpreting results.
Electrical Engineering Group	1. To introduce students to fundamental of electrical engineering experiments and procedures.
	2. To develop practical skills in handling electrical engineering equipment and instruments.
Computer Science and Engineering Group	1. To introduce fundamentals of logic circuits.
	2. To introduce basics of memory and programming languages.
Electronics and Telecommunication Engineering Group	1. To select of soldering technique, fault finding and use of simulation software.
	2. To create a printed circuit board and make use of simulation tools.

Course Outcomes

CO	After the completion of the course the student should be able to	Bloom's Cognitive
Mechanical Engineering Group		
CO-1	Understand report of procedures followed for a given task in welding, carpentry, and sheet metal work.	Understanding
CO-2	Learn the techniques, skills, and modern engineering tools necessary for welding, carpentry and sheet metal work	Applying
Civil Engineering Group		

CO-1	Demonstrate identification and reading ability of elements in building drawing.	Understanding
CO-2	Use surveying equipment to measure distance and levels.	Applying
Electrical Engineering Group		
CO-1	Demonstrate the knowledge of theorems/laws to analyze the simple electrical circuits.	Understanding
CO-2	Apply the knowledge of RL and RLC circuits for the measurement of active and reactive power.	Applying
Computer Science and Engineering Group		
CO-1	Understand Basics of Computer Engineering.	Understanding
CO-2	Apply skills to analyse memory hierarchy and compilers.	Applying
Electronics and Telecommunication Engineering Group		
CO-1	Use proper soldering technique, fault finding in circuit board components connection.	Understanding
CO-2	Apply skills to simulate a simple electronics circuit and design a printed circuit board.	Applying

List of experiments: Common to all Programmes

Sr. No.	Details
Mechanical Engineering Group (Any TWO)	
1	Welding: One job on Arc welding- Stool, Small Table, Bench etc
2	Carpentry: One composite job involving Birdhouses, Pooja Chowk, Table Stand etc
3	Sheet metal Work: One job on commercial items such as Dust bin, funnel, tray etc.
4	House wiring One job on One lamp controlled by one switch, Parallel and Series connections, Fluorescent lamp fitting, etc
Civil Engineering Group (Any TWO)	
1	Site visit to study various construction processes, building components, building materials and principles of planning
2	Study and identify basic elements in

	(i) Site plan, (ii) Plan, elevation and section of a residential building
3	Study water supply and sanitation plan of a residential building
4	Drawing sheet showing 1. various sign conventions 2. various building elements
Electrical Engineering Group (Any TWO)	
1	Verification of Kirchhoff's Voltage Law and Kirchhoff's Current Law.
2	Measurement of various characteristic values of a sinusoidal waveform with the help of CRO.
3	Measurement of voltage, current and power in RL and RLC circuits and verification of phase angle and power factor concept.
4	Determine the efficiency of single phase transformer by direct loading test.
Computer Science and Engineering Group (Any TWO)	
1	Computer Memory: Memory Cell, Memory Organization, Read Only Memory, Magnetic Hard Disk, Solid State Disks, Memory Hierarchy.
2	Binary Arithmetic: Binary Addition, Binary Subtraction, Signed Numbers, Two's Complement Representation of Numbers, Addition/Subtraction of Numbers in 2's Complement Notation
3	Logic Circuits: Switching Circuits, OR, NOT Operation, Boolean Functions, Precedence of Operators, Venn Diagram, Truth Table, Logic Circuits.
4	Programming Languages: Why Programming Language, Assembly Language, Higher Level Programming Languages, Compiling A High-Level Language Program, Tools to Build Compilers.
Electronics and Telecommunication Engineering Group (Any TWO)	
1	Inter-connection methods on the breadboard for any electronic circuit. [Bread board, wrapping, crimping].
2	Soldering practice on electronics circuit using general-purpose PCBs.
3	Testing of electronics circuit using simulation tools (such as Multisim, Proteus, etc.)
4	Printed circuit boards (PCB) [Types, Single-sided, Double-sided, and Processing Methods]: testing and fabrication of a single-sided PCB for a simple electronics circuit with manual etching [Ferric chloride and drilling].

Reference/Text Books	
Mechanical Engineering Group	
1	Manufacturing Technology Volume I and II by P. N. Rao, Tata Mc-Graw Hill Publication
2	Elements of Workshop Technology, Vol. I and II by Hajara Choudhari, Media Promoters
3	Workshop technology, Vol.-I by H.S. Bawa, TMH Publications, New Delhi.
4	Workshop Technology, Vol – I by Chapman, The English Language Book Society
Civil Engineering Group	
1	Hirasakar G. K., “Basic Civil Engineering”, Dhanpat Rai publications, 1st Edition, 2007
2	Gole L.G., “Introduction to Civil Engineering”, Mahu Publisher House, 4th Edition, 2005
3	Bhavikatti S. S., “Basic Civil Engineering”, New Age Publications, 2010
4	Duggal S. K., “Surveying (Vol I)”, Tata McGraw Hill, 4th edition 2013
5	Bindra S. P., Arora S. P. , “Building Construction”, Dhanpat Rai publication, 5th edition, 2012
Electrical Engineering Group	
1	B. L. Theraja – Electrical Technology vol.1. – S. Chand
2	B. L. Theraja – Electrical Technology vol.2. – S. Chand
3	Nagrath I. J. and D. P. Kothari – Basic Electrical Engineering (2001) – McGraw Hill.
4	P. V. Prasad and S. Shivan Raju – Electrical Engineering Concepts and Applications – Cengage learning
5	Bharati Dwivedi and Anurasg Tripathi – Fundamentals of Electrical Engineering – Willey Precise
Computer Science and Engineering Group	
1	Electronics Devices and Circuit Theory by Robert L. Boylestad and Louis Nashelsky (Pearson Education Publication)
2	Fundamental of Digital Circuits by A. Anand Kumar (PHI- Publication)
3	Fundamental of Electronics Engineering by R. Prasad (CENGAGE- Learning)
4	Digital Principles & Applications by Albert Malvino, Donald Leach, TMGH Publication.
Electronics and Telecommunication Engineering Group	
1	Principle of Electronics by V.K. Mehata, S. Chand
2	Electronic Instrumentation by H. S. Kalasi, Tata McGraw Hills Publication

3	A Text Book of Applied Electronics by R S Sedha, S. Chand
4	Basic Electronics Engineering by Vijay Baru, Rajendra Kaduskar, S T Gaikwad (Wiley/DREAMTECH)
5	Digital Principles & Applications by Albert Malvino, Donald Leach, TMGH Publication.

Indian Knowledge Systems (IKS)

Lectures : 2 Hrs/Week

Evaluation Scheme

MSE :

Credit : 2

ISE/CA : 50 Marks

ESE :

Course Objectives: The students will be able to		
1. Understand concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.		
2. Understand the traditional knowledge and analyse it and apply it to their day-to-day life.		
	Course Outcomes:	
CO	After the completion of the course the student should be able to	Bloom's Cognitive
CO-1	Understand the concept of the Indian Knowledge System and its importance.	Understand
CO-2	Understand the relevance of Traditional knowledge in different domains.	Understand

Unit No	Title and Content	Hours
Unit 1	Indian Knowledge System: An Introduction	4 Hrs
	Overview: What is IKS? , Why do we need IKS?, Organization of IKS, Historicity of IKS, Some salient aspects of IKS	
	The Vedic Corpus: Introduction to Vedas, A synopsis of the four Vedas, Sub-classification of Vedas, Messages in Vedas, Introduction to Vedāṅgas, Prologue on Śikṣā and Vyākaraṇa, Basics of Nirukta and Chandas, Introduction to Kalpa and Jyotiṣa, Vedic Life: A Distinctive Features. Traditional knowledge vs. western knowledge	
Unit 2	Traditional Knowledge in Humanities and Āyurveda	5 Hrs
	[A] Linguistics: Introduction to Linguistics, Aṣṭādhyāyī, Phonetics, Word generation, Computational aspects, Mnemonics, Recursive operations, Rule based operations, Sentence formation, Verbs and prefixes, Role of Sanskrit in natural language processing [B] Āyurveda: Introduction to health, Āyurveda: approach to health, Sapta-dhātavaḥ: seven-tissues, Role of agni in health, Tri-doṣas, Āyurveda: definition of health, Psychological aspects of health, Disease management elements, Dinacaryā: daily regimen for health & wellness, Importance of sleep, Food intake methods and drugs, Approach to lead a healthy life.	
Unit 3	Traditional Knowledge in Sciences	4 Hrs
	[A] Number Systems and Units of Measurement: Number systems in India - Historical evidence, Salient aspects of Indian Mathematics, Bhūta-Saṃkhyā system, Kaṭapayādi system, Measurements for time, distance, and weight, Piṅgala and the Binary system	

	[B] Astronomy: Introduction to Indian astronomy, Indian contributions in astronomy, The celestial coordinate system, Elements of the Indian calendar, Notion of years and months, Pañcāṅga – The Indian calendar system, Astronomical Instruments (Yantras), Jantar Mantar of Rājā Jai Singh Sawai	
Unit 4	Traditional Knowledge in Indian Mathematics	
	<p>Introduction to Indian Mathematics, Salient features of the Indian numeral system - Importance of decimal representation - The discovery of zero and its importance - Unique approaches to represent numbers.</p> <p>Unique aspects of Indian Mathematics, Indian Mathematicians and their Contributions in the area of Algebra, Geometry, Trigonometry, Binary mathematics and combinatorial problems in Chandaḥ Śāstra, Magic squares in India</p>	4 Hrs
	Traditional Knowledge in Engineering and Technology	
Unit 5	<p>[A] Metals and Metalworking: Wootz Steel: The rise and fall of a great Indian technology, The Indian S & T heritage, Mining and ore extraction, Metals and metalworking technology, Iron and steel in India, Lost wax casting of idols and artefacts, Apparatuses used for extraction of metallic components.</p> <p>[B] Town Planning and Architecture: Perspective of Arthaśāstra on town planning, Vāstu-śāstra – The science of architecture, Eight limbs of Vāstu, Town planning, Temples in India: marvelous stone architecture for eternity, Temple architecture in India, Iconography.</p>	5 Hrs
	Traditional Applications in Science and Technology	
Unit 6	Irrigation systems and practices in South India, Literary sources for science and technology, Physical structures in India, Irrigation and water management, Dyes and painting technology, The art of making perfumes, Surgical techniques, Shipbuilding, Sixty-four art forms (64 Kalās), Status of Indigenous S & T.	4 Hrs

Evaluation Pattern	In the form of Quizzes, Tests, Group Discussion, Presentations, Seminars, Assignments, Attendance
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References:

Books and References:	
1	Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavana R.N. (2022), “Introduction to Indian Knowledge System: Concepts and Applications”, PHI Learning Private Ltd. Delhi.
2	Pride of India: A Glimpse into India’s Scientific Heritage, Samskrita Bharati, New Delhi.
3	Sampad and Vijay (2011). “The Wonder that is Sanskrit”, Sri Aurobindo Society, Puducherry.
4	Bag, A.K. (1979). Mathematics in Ancient and Medieval India, Chaukhamba Orientalia, New Delhi.

5	Datta, B. and Singh, A.N. (1962). History of Hindu Mathematics: Parts I and II, Asia Publishing House, Mumbai.
6	Kak, S.C. (1987). "On Astronomy in Ancient India", Indian Journal of History of Science, 22(3), pp. 205–221.
7	Subbarayappa, B. V. and Sarma, K. V. (1985). Indian Astronomy: A Source Book, Nehru Centre, Mumbai.
8	Bag, A.K. (1997). History of Technology in India, Vol. I, Indian National Science Academy, New Delhi.
9	Acarya, P.K. (1996). Indian Architecture, Munshiram Manoharlal Publishers, New Delhi.
10	Lad, V., & Frawley, D. (1986). The Yoga of Herbs: An Ayurvedic Guide to Herbal Medicine. Lotus Press.
11	Kapoor Kapil, Singh Avadhesh (2021). "Indian Knowledge Systems Vol – I & II", Indian Institute of Advanced Study, Shimla, H. P.
12	Traditional Knowledge System in India, Amit Jha, 2009, Atlantic Publishers and Distributors (P) Ltd., ISBN-13: 978-8126912230.
13	Knowledge Traditions and Practices of India, Kapil Kapoor, Avadesh Kumar Singh, Vol. 1, 2005, DK Print World (P) Ltd., ISBN 81-246-0334,
14	Frawley, D., & Ranade, S. (2001). Ayurveda, Nature's Medicine. Lotus Press.
	Web Links
1	https://www.youtube.com/watch?v=LZP1StpYEPM
2	http://nptel.ac.in/courses/121106003/
3	http://www.iitkgp.ac.in/department/KS;jsessionid=C5042785F727F6EB46CBF432D7683B63 (Centre of Excellence for Indian Knowledge System, IIT Kharagpur)
4	https://www.wipo.int/pressroom/en/briefs/tk_ip.html
5	https://unctad.org/system/files/official-document/ditcted10_en.pdf
6	http://nbaindia.org/uploaded/docs/traditionalknowledge_190707.pdf
7	https://unfoundation.org/what-we-do/issues/sustainable-development-goals/?gclid=EAiaIQobChMIInp-Jtb_p8gIVTeN3Ch27LAmPEAAAYASAAEgIm1vD_BwE
8	https://onlinecourses.swayam2.ac.in/imb23_mg53/preview
9	https://onlinecourses.swayam2.ac.in/imb23_mg54/preview
10	https://onlinecourses.swayam2.ac.in/imb23_mg55/preview

Year and Semester	First Year B. Tech (All Programme) Semester II				
Course Category	Engineering Science (ESC)				
Title of Course	Programming Languages-II			Course Code	
Teaching Scheme	L	T	P	Contact Hrs/Week	Credits
	01	--	02	03	02
Examination Scheme	MSE	ISE/CA	ESE	Total	
	--	25	25	50	

Course Pre-Requisite	Basics of Operating System, Basic Math Skills, Basic Problem-Solving Skills.	
Course Objective	1	Effective Problem-Solving Skills to develop programming logic in Python
	2	Understanding and Implementing Programming concepts of Python
	3	Develop simulations using python SimPy package
Course Outcomes	After competition of this course Students will be able to	
	CO1	Understand the python programming basics
	CO2	Solve programs on decision making & looping statements in python
	CO3	Understand python list, tuple, and dictionary collection concepts
	CO4	Understand simulation programs using SimPy Library
	CO5	Design & Apply Simpy library functions to model real time problems.

CO PO Mapping												
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2	2	3										
CO3	2	3										
CO4	2	3										
Level of Mapping as: Low 1, Moderate 2, High 3												

Marking Scheme
<p><u>In Semester Evaluation/ Continuous Assessment has 25 Marks</u></p> <p>Parameters for In Semester Evaluation could be: Attendance, Assignments, Unit Tests, Presentation, Online Activities like (Virtual Labs, NPTEL) etc.</p> <p>Lab File should be prepared and should be assessed continuously during academic.</p> <p><u>End Semester Evaluation has 25 Marks</u></p> <p>External Practical Examination with Performance and Oral Examination</p>

Unit No.	Title and Content of Unit	Hours
Unit 1	Introduction to Python	4 Hrs
	Why high-level language, Scope of python, interactive mode and script mode. Variables, Operators and Operands in Python. Arithmetic, relational and logical operators, Operator precedence, Taking input using raw input() and input() method and displaying output - print statement, Comments in Python.	
Unit 2	Conditional and Looping	4 Hrs
	if - else statement and nested if – else while, for, use of range function in for, Nested loops, break, continue, pass statement Use of compound expression in conditional constructs, Nested conditional statements, Nested Looping structures	
Unit 3	Functions	4 Hrs
	Built-In Function, Functions from math, random, time & date module. Composition User Define Function: Defining, invoking functions, passing parameters, Intra-package References, Packages in Multiple Directories	
Unit 4	List	4 Hrs
	Lists Concept of mutable lists, creating, initializing and accessing the elements of list, List operations, Concatenation, Membership, list slices, List comprehensions List functions & methods: len, insert, append, extend, sort, remove, reverse, pop functions	
Unit 5	Tuples & sets	4 Hrs
	Immutable concept, creating, initializing and accessing the elements in a tuple; Tuple functions: cmp(), len(), max(), min(), tuple() Sets Concept of Sets, creating, initializing and accessing the elements of Sets operation Membership, union, intersection, difference, and symmetric difference Dictionaries Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, Traversing, appending, updating and deleting elements	

Unit 6	Simulations using Simpy	4 Hrs
	Basic Concepts, understanding of SimPy's capabilities, Process Interaction, waiting for a Process, Interrupting Another Process, Real-time simulations.	

Guidelines for Practical Performance	
Faculty can create Experiment list based on following listed topics. Minimum 12 to 15 Experiments should get performed along with flow chart and Execution.	
Topic No.	Title of Experiment/ Problem Statement
1	Write python programs to demonstrate basic data types in python
2	Write python program to study Arithmetic, relational and logical operators and Operands in Python.
3	Write python programs to study if, if else, if else if statements
4	Write python programs to study looping statements while & for
5	Write python programs to study built in functions of string and math packages
6	Write python programs to study list access using membership operators.
7	Write python programs to study tuple using inbuilt functions
8	Write python programs to study set operations and dictionary traversing
9	Write python programs to study Discrete event simulation using SimPy

Textbooks			
Sr. No.	Title	Author	Edition/Publication
01	Python: The Complete Reference	Martin C. Brown	Tata McGraw Hill Publication
02	Learning Python	Mark Lutz	O'Reilly Publication
03	Python Programming for Absolute Beginner	Michael Dawson	Cengage Learning

Reference Books			
Sr. No.	Title	Author	Edition/Publication
01	Python Essential Reference	David Beazley	4th edition, Developers library.
02	SimPy: https://simpy.readthedocs.io/	Web reference	

Exit Course for Computer Science and Engineering (Data Science) After 1st Year

Exit option: Award of UG Diploma in Major with 44 credits and an additional 8 credits from following Exit Courses				
Sr. No	Course Code	Course Title	Mode	Credits
1	DS-EC-01	Basics of Computer Graphics	Online/offline certification Course or project of total 8 credits	8
		OR		
2	DS-EC-02	Computer Animation		8

Earning of additional 2 mandatory credits for direct second year admitted students to Computer Science and Engineering (Data Science) branch

Sr. No.	Semester	Subject	Credit
1	III	Computer Programming	2

SCHEME OF INSTRUCTION & SYLLABI

Name of Programme: Computer Science and Engineering (Data Science)

Scheme of Instructions: Second Year B. Tech. Computer Science and Engineering (Data Science)

Semester – III

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	PCC	DS2101	Statistic for Data Science	3	1	--	4	4	30	10	60	100
2	PCC	DS2102	Software Engineering	3	--	--	3	3	30	10	60	100
3	PCC	DS2103	Operating System	3	--	--	3	3	30	10	60	100
4	EL	DS2104	Object Oriented Programming	--	--	2	2	1	--	50	25	75
5	MDM	DS2105	Multi-disciplinary Minor-01	2	--	--	2	2	30	10	60	100
6	OE	DS2106	Open Elective -01	3	--	--	3	3	30	10	60	100
7	HSSM	DS2107	Employability Enhancement Skills-I	2	--	--	2	2	--	50	--	50
8	EL	DS2108	Data Structures Using C	--	--	2	2	1	--	50	25	75
9	HSSM	DS2109	Cyber Laws	2	--	--	2	2	--	50	--	50
10	OE	DS2110	Open Elective-01 Lab	--	--	2	2	1	--	25	25	50
			Total	18	1	6	25	22	150	275	375	800

L-Lecture

T-Tutorial

P-Practical

MSE-Mid Semester Examination ISE/CA In Semester Evaluation/Continuous Assessment ESE-End Semester Examination (For Laboratory End Semester performance)

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective other than particular programme (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular and Extracurricular Activities (CCA)
Last Sem. Cumulative Sum	16	16	--	--	--	06	04	--	02
Semester Credits	--	--	10	--	06	--	04	02	--
Cumulative Sum	16	16	10	--	06	06	08	02	02

PROGRESSIVE TOTAL CREDITS: 44 + 22 = 66

SCHEME OF INSTRUCTION & SYLLABI

Name of Programme: Computer Science and Engineering (Data Science)

Scheme of Instructions: Second Year B. Tech. Computer Science and Engineering (Data Science)

Semester– IV

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	PCC	DS2201	Fundamentals of Data Science	3	--	--	3	3	30	10	60	100
2	PCC	DS2202	Discrete Mathematics & Structures	3	--	--	3	3	30	10	60	100
3	PCC	DS2203	Computer Networks	3	1	--	4	4	30	10	60	100
4	MDM	DS2204	Multi-disciplinary Minor – 02	2	--	--	2	2	30	10	60	100
5	OE	DS2205	Open Elective -02	2	--	--	2	2	30	10	60	100
6	HSSM	DS2206	Soft Skills	2	--	--	2	2	--	50	--	50
7	HSSM	DS2207	Employability Enhancement Skills-II	2	--	--	2	2	--	25	--	25
8	VEC	DS2208	Fundamentals of Data Science Lab	--	--	2	2	1	--	50	25	75
9	VSEC	DS2209	Python for Data Science Lab	--	--	2	2	1	--	25	25	50
10	VEC	DS2210	Mini Project Lab	--	--	2	2	1	--	25	25	50
11	BSC	DS2211	Environmental Science	2	--	--	2	Audit	30	10	60	100
12	VSEC	DS2212	Computer Maintenance Technology	--	--	2	2	1	--	50	--	50
			Total	19	1	8	28	22	180	285	435	800+100(Audit)

L-Lecture

T-Tutorial

P-Practical

MSE-Mid Semester Examination ISE/CA-In Semester Evaluation/Continuous Assessment ESE-End Semester Examination (For Laboratory End Semester performance)

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective Other than Particular programme (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular and Extracurricular Activities (CCA)
Last Sem. Cumulative Sum	16	16	10	--	06	06	08	02	02
Semester Credits	--	--	10	--	04	02	06	--	--
Cumulative Sum	16	16	20	--	10	08	14	02	02

PROGRESSIVE TOTAL CREDITS: 66 + 22 = 88

Exit Course for Computer Science and Engineering (Data Science) After 2nd Year

Exit option: Award of UG Diploma in Major with 88 credits and an additional 8 credits from Following Exit Courses				
Sr. No	Course Code	Course Title	Mode	Credits
1	DS-EC-03	UI/UX Design	Online/offline certification Course or project of total 8credits	8
		OR		
2	DS-EC-04	DevOps Engineering		8

SCHEME OF INSTRUCTION & SYLLABI

Name of Programme: Computer Science and Engineering (Data Science)

Scheme of Instructions: Third Year B. Tech. Computer Science and Engineering (Data Science)

Semester–V

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	PCC	DS3101	Artificial Intelligence	3	--	--	3	3	30	10	60	100
2	PCC	DS3102	Database Engineering	3	--	--	3	3	30	10	60	100
3	PCC	DS3103	Information Security	3	--	--	3	3	30	10	60	100
4	PEC	DS3104	Elective-I	3	--	--	3	3	30	10	60	100
5	MDM	DS3105	Multi-disciplinary Minor-03	3	--	--	3	3	30	10	60	100
6	OE	DS3106	OpenElective-03	2	--	--	2	2	30	10	60	100
7	PCC	DS3107	Database Engineering Lab	--	--	2	2	1	--	25	25	50
8	PCC	DS3108	Java Programming Lab	--	--	2	2	1	--	25	25	50
9	PEC	DS3109	Elective-I Lab	--	--	2	2	1	--	25	--	25
10	MDM	DS3110	Multi-disciplinary Minor-03Lab	--	--	2	2	1	--	50	--	50
11	EL	DS3111	Business English	--	--	2	2	1	--	25	--	25
			Total	17	--	10	27	22	180	210	410	800

L-Lecture

T-Tutorial

P-Practical

MSE-Mid Semester Examination ISE/CA-In Semester Evaluation/Continuous Assessment ESE-End Semester Examination (For Laboratory End Semester performance)

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective other than Particular programme (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular and Extracurricular Activities (CCA)
Last Sem. Cumulative Sum	16	16	20	--	10	08	14	02	02
Semester Credits	--	--	11	04	06	--	--	01	--
Cumulative Sum	16	16	31	04	16	08	14	03	02

PROGRESSIVE TOTAL CREDITS : 88 + 22 = 110

SCHEME OF INSTRUCTION & SYLLABI

Name of Programme: Computer Science and Engineering (Data Science)

Scheme of Instructions: Third Year B. Tech. Computer Science and Engineering (Data Science)

Semester–VI

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAMSCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	PCC	DS3201	Advanced Database Systems	3	--	--	3	3	30	10	60	100
2	PCC	DS3202	Data Mining & Data Warehousing	3	1	--	4	4	30	10	60	100
3	PCC	DS3203	Feature Engineering	3	--	--	3	3	30	10	60	100
4	PEC	DS3204	Elective-II	3	--	--	3	3	30	10	60	100
5	PEC	DS3205	Elective-III	3	--	--	3	3	30	10	60	100
6	MDM	DS3206	Multi-disciplinary Minor–04	2	--	--	2	2	30	10	60	100
7	PCC	DS3207	Advanced Database Systems Lab	--	--	2	2	1	--	50	25	75
8	PCC	DS3208	R Programming Lab	--	--	2	2	1	--	50	25	75
9	EL	DS3209	Software Testing Tools	--	--	4	4	2	--	50	--	50
			Total	17	1	8	26	22	180	210	410	800

L-Lecture

T-Tutorial

P-Practical

MSE-Mid Semester Examination ISE/CA In Semester Evaluation/Continuous Assessment ESE-End Semester Examination (For Laboratory End Semester performance)

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective other than particular programme (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular and Extracurricular Activities (CCA)
Last Sem. Cumulative Sum	16	16	31	04	16	08	14	03	02
Semester Credits	--	--	12	06	02	--	--	02	--
Cumulative Sum	16	16	43	10	18	08	14	05	02

PROGRESSIVE TOTAL CREDITS: 110 + 22 = 132

Exit Course for Computer Science and Engineering (Data Science) After 3rd Year

Exit option: Award of B. Vocational in Major with 132 credits and an additional 8 credits from following Exit Courses				
Sr. No	CourseCode	Course Title	Mode	Credits
1	DS-EC-05	Database Security	Online/offline certification Course or project of total 8 credits	8
OR				
2	DS-EC-06	Financial markets risk management using data analysis and time series analysis		8

SCHEME OF INSTRUCTION & SYLLABI

Name of Programme: Computer Science and Engineering (Data Science)

Scheme of Instructions: Final Year B. Tech. Computer Science and Engineering (Data Science)

Semester–VII

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	PCC	DS4101	Cloud Computing	3	--	--	3	3	30	10	60	100
2	PCC	DS4102	Big Data Analytics	3	--	--	3	3	30	10	60	100
3	PEC	DS4103	Elective-IV	3	--	--	3	3	30	10	60	100
4	MDM	DS4104	Multi-disciplinary Minor–05	2	--	--	2	2	30	10	60	100
5	PCC	DS4105	Web Technology Lab	--	--	2	2	1	--	50	50	100
6	PCC	DS4106	Data Visualization Lab	--	--	2	2	1	--	50	50	100
7	EL	DS4107	Internship	--	--	12	12	6	--	50	--	50
8	EL	DS4108	Project-I	--	--	06	06	3	--	75	75	150
			Total	11	--	22	33	22	120	265	415	800

L-Lecture

T-Tutorial

P-Practical

MSE-Mid Semester Examination ISE/CA-In Semester Evaluation/Continuous Assessment ESE-End Semester Examination (For Laboratory End Semester performance)

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective other than Particular programme (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management (HSSM)	Experiential Learning (EL)	Co-curricular and Extracurricular Activities (CCA)
Last Sem. CumulativeSum	16	16	43	10	18	08	14	05	02
Semester Credits	--	---	08	03	02	--	--	09	--
Cumulative Sum	16	16	51	13	20	08	14	14	02

PROGRESSIVE TOTAL CREDITS : 132 + 22 = 154

SCHEME OF INSTRUCTION & SYLLABI

Name of Programme: Computer Science and Engineering (Data Science)

Scheme of Instructions: Final Year B. Tech. Computer Science and Engineering (Data Science)

Semester–VIII

Sr. No.	Course Category	Course Code	Course Title	L	T	P	Contact Hrs/Wk	Course Credits	EXAM SCHEME			
									MSE	ISE/CA	ESE	TOTAL
1	PCC	DS4201	Deep Learning	3	--	--	3	3	30	10	60	100
2	PCC	DS4202	Business Intelligence	3	--	--	3	3	30	10	60	100
3	PEC	DS4203	Elective-V	3	--	--	3	3	30	10	60	100
4	PEC	DS4204	Elective-VI	3	--	--	3	3	30	10	60	100
5	MDM	DS4205	Multi-disciplinaryMinor-06	2	--	--	2	2	30	10	60	100
6	PCC	DS4206	Mobile Application Development Lab	--	--	2	2	1	--	25	50	75
7	EL	DS4207	Research Methodology	2	1	--	3	3	--	25	50	75
8	EL	DS4208	Project-II	--	--	8	8	4	--	75	75	150
			Total	16	1	10	27	22	150	175	475	800

L-Lecture

T-Tutorial

P-Practical

MSE-Mid Semester Examination ISE/CA-In Semester Evaluation/Continuous Assessment ESE-End Semester Examination (For Laboratory End Semester performance)

Course Category	Basic Science Courses (BSC)	Engineering Science Courses (ESC)	Programme Core Course (PCC)	Programme Elective Course (PEC)	Open Elective other than Particular programme (OE/MDM)	Vocational and Skill Enhancement Course (VSEC)	Humanities Social Science and Management(HSSM)	Experiential Learning (EL)	Co-curricular and Extracurricular Activities (CCA)
Last Sem. CumulativeSum	16	16	51	13	20	08	14	14	02
Semester Credits	--	--	07	06	02	--	--	07	--
Cumulative Sum	16	16	58	19	22	08	14	21	02

PROGRESSIVE TOTAL CREDITS: 154 + 22 = 176

Following Degrees will begin with effect from Academic Year 2026-27.

- A) Bachelor's Engg. /Tech. Honours Degree in chosen Major Engg. /Tech. Discipline with Multidisciplinary Minor (194 credits)
- B) Bachelor's Engg. /Tech. Honours with Research Degree in chosen Major Engg. /Tech. Discipline with Multidisciplinary Minor (194 credits)
- C) Bachelor's Engg. /Tech. Degree in chosen Major Engg. /Tech. Discipline with Double Minor (Multidisciplinary and Specialisation Minor (194 credits)

[I] List of Electives: Verticals

Specialization				
Elective-I	Machine Learning	Advanced Computer Networks	Internet of Things	Automata Theory
Elective-II	Research Methodology	Soft Computing	Cyber Security	Computer Algorithms
Elective-III	Data Acquisition	Object-Oriented Modeling & Design	Image Processing	Exploratory Data Analysis
Elective-IV	Natural Language Processing	High Performance Computing	Adhoc Wireless Sensor Networks	Data Ethics and Privacy
Elective-V	Blockchain Technology	Project Management	Human Computer Interaction	Wireless Sensors Networks
Elective-VI	Entrepreneur in Data Science	Research in Data Science	Monetizing Data Analytics for Entrepreneurship	Cloud integration with AWS

[II] List of Open Electives

Open Elective-I	
Open Elective-II	
Open Elective-III	

[III] Minor in Emerging Areas basket of additional 18-20 credits starting from Sem-III

**Basket No -01
(Artificial Intelligence)**

Sr. No.	Semester	Subject	Credit
1	III	Fundamentals of AI	3
2	IV	Search Methods for Problem Solving	3
3	V	AI For Economics	3
4	VI	AI Using Prolog Language	3
5	VII	Responsible & Safe AI System	3
6	VIII	Robotics Using AI Applications	3

**Basket No -02
(Cyber security)**

Sr. No.	Semester	Subject	Credit
1	III	Introduction to Cyber security	3
2	IV	Zero Trust Architecture	3
3	V	Cyber security Governance, Risk, and Compliance (GRC)	3
4	VI	Privacy-Enhancing Technologies	3
5	VII	IoT Security	3
6	VIII	Cloud Security	3

[IV] Basket of Multidisciplinary minor of 14 credits starting from Sem-III

Semester	Course Offered	L	P	Hrs.	Credits
III	C Programming	02	--	02	02
IV	Python Programming	02	--	02	02
V	Programming Using Java	03	02	05	04
VI	Database Concepts & Design	02	--	02	02
VII	R Programming	02	--	02	02
VIII	Software Testing	02	--	02	02

Instructions regarding Examinations:

1. Compulsory passing with 40% marks is mandatory in ESE examinations and combined passing marks (MSE+ISE/CA+ESE) for theory course is 40 %
2. Mid sem. examination will be based on 50 % syllabus from beginning (First Three Units).
3. No compulsory passing for **MSE**.
4. ESE paper setting weightage will be, **25 % on syllabus covered for MSE (First Three Units) and 75 % on remaining syllabus (Last Three Units)**.
5. Passing percentage for ESE practical examination 40%.