

Shivaji University
Vidyanagar, Kolhapur - 416 004, Maharashtra.

Department of Technology



As per NEP2020 guidelines

MDM Featured First Year B. Tech (All Programs), Detailed Curriculum w.e.f 2025-26



Shivaji University, Kolhapur Department of Technology

First Year B.Tech (All Programs), Semester- I

Physics Group : Teaching and Evaluation Scheme

Sr. No.	Category	Course Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation Scheme	
				L	T	P			Theory	Practical
									ISE:ESE	IE:EE
1.	Basic Science Course	BSC111	Engineering Physics	03	-	02	05	04	40:60	50:00
2.	Basic Science course	BSC112A	Engineering Mathematics-I (Except Food Technology Program)	03	01	-	04	04	40:60	50:00
		BSC112B	Engineering Mathematics-I (Food Technology Program)	03	01	-	04	04	40:60	50:00
3.	Engineering Science Courses	ESC111	Elements of Mechanical and Electronics Engineering	04	-	02	06	05	40:60	50:00
4.	Engineering Science Courses	ESC112	Engineering Mechanics	04	-	02	06	05	40:60	50:00
5.	Engineering Science Course	ESC113	Computer Programming for Engineers	02	-	02	04	03	40:60	50:00
6.	Indian Knowledge System	IKS111	Yoga and Meditation	01	-	-	01	01	-	50:00
				-	-	-	-	22	500	300
7.	Humanities and Social Sciences, Management, Environment Courses	HSMEC 111	Professional Communication (English)-I	02	-	-	02	IE at Course in charge end		
8.	Vocational and Skill Enhancement Courses	VSEC111	Design Thinking and Innovation-I	01	01		02	IE at Course in charge end		
Total Hours				20	02	08	30	-	-	-

Note: After the First Semester of F.Y. B. Tech, the students will undergo 10 days Social Internship and its evaluation will be done in the Second Semester.



Shivaji University, Kolhapur Department of Technology

First Year B.Tech (All Programs), Semester- I

Chemistry Group : Teaching and Evaluation Scheme										
Sr. No.	Category	Course Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation Scheme	
				L	T	P			Theory	Practical
									ISE:ESE	IE:EE
1.	Basic Science Course	BSC111	Engineering Chemistry	03	-	02	05	04	40:60	50:00
2.	Basic Science Course	BSC112A	Engineering Mathematics-I (Except Food Technology Program)	03	01	-	04	04	40:60	50:00
		BSC112B	Engineering Mathematics-I (Food Technology Program)	03	01	-	04	04	40:60	50:00
3.	Engineering Science Course	ESC111	Elements of Civil and Electrical Engineering	04	-	02	06	05	40:60	50:00
4.	Engineering Science Course	ESC112	Engineering Graphics	04	-	02	06	05	40:60	50:00
5.	Engineering Science Course	ESC113	Electrical-Electronic Components and Devices	02	-	02	04	03	40:60	50:00
6.	Indian Knowledge System	IKS111	Yoga and Meditation	01	-	-	01	01	-	50:00
				-	-	-	-	22	500	300
7.	Humanities and Social Sciences, Management, Environment Courses	HSMEC 111	Professional Communication (English)-I	02	-	-	02	IE at Course in charge end		
8.	Vocational and Skill Enhancement Courses	VSEC111	Design Thinking and Innovation-I	01	01		02	IE at Course in charge end		
Total Hours				20	02	08	30	-	-	-

Note: After the First Semester of F.Y. B. Tech, the students will undergo 10 days Social Internship and its evaluation will be done in the Second Semester.



Shivaji University, Kolhapur Department of Technology

First Year B.Tech (All Programs), Semester- II

Chemistry Group : Teaching and Evaluation Scheme

Sr. No.	Category	Course Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation Scheme				
				L	T	P			Theory	Practical			
									ISE:ESE	IE:EE			
1.	Basic Science Course	BSC121	Engineering Chemistry	03	-	02	05	04	40:60	50:00			
2.	Basic Science Course	BSC112A	Engineering Mathematics-I (Except Food Technology Program)	03	01	-	04	04	40:60	50:00			
		BSC112B	Engineering Mathematics-I (Food Technology Program)	03	01	-	04	04	40:60	50:00			
3.	Engineering Science Course	ESC121	Elements of Civil and Electrical Engineering	04	-	02	06	05	40:60	50:00			
4.	Engineering Science Course	ESC122	Engineering Graphics	04	-	02	06	05	40:60	50:00			
5.	Engineering Science Course	ESC123	Electrical-Electronic Components and Devices	02	-	02	04	03	40:60	50:00			
6.	Indian Knowledge System	IKS121	Human Rights and Constitution	01	-	-	01	01	-	50:00			
				-	-	-	-	22	500	300			
7.	Humanities & Social Sciences, Management, Environment Courses	HSMEC121	Professional Communication (English)-II	02	-	-	02	IE at Course in charge end					
8.	Vocational and Skill Enhancement Courses	VSEC121	Design Thinking & Innovation-II	01	01	-	02	IE at Course in charge end					
9.	Project Seminar Internship	PSI121	Social Internship*	10 Days Duration*			IE at Course in charge end						
				Total Hours			20	02	08	30	-	-	-

*Note: After Semester I, 10 days' social internship completed by all students will be the evaluated in this semester.



Shivaji University, Kolhapur Department of Technology

First Year B. Tech (All Programs), Semester- II

Physics Group : Teaching and Evaluation Scheme													
Sr. No.	Category	Course Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation Scheme				
				L	T	P			Theory	Practical			
				L	T	P			ISE:ESE	IE:EE			
1.	Basic Science Course	BSC121	Engineering Physics	03	-	02	05	04	40:60	50:00			
2.	Basic Science course	BSC112A	Engineering Mathematics-I (Except Food Technology Program)	03	01	-	04	04	40:60	50:00			
		BSC112B	Engineering Mathematics-I (Food Technology Program)	03	01	-	04	04	40:60	50:00			
3.	Engineering Science Course	ESC121	Elements of Mechanical and Electronics Engineering	04	-	02	06	05	40:60	50:00			
4.	Engineering Science Course	ESC122	Engineering Mechanics	04	-	02	06	05	40:60	50:00			
5.	Engineering Science Course	ESC123	Computer Programming for Engineers	02	-	02	04	03	40:60	50:00			
6.	Indian Knowledge System	IKS121	Human Rights and Constitution	01	-	-	01	01	-	50:00			
				-	-	-	-	22	500	300			
7.	Humanities & Social Sciences, Management, Environment Course	HSMEC121	Professional Communication (English)-II	02	-	-	02	IE at Course in charge end					
8.	Vocational and Skill Enhancement Courses	VSEC121	Design Thinking and Innovation-II	01	01	-	02	IE at Course in charge end					
9.	Project Seminar Internship	PSI121	Social Internship*	10 Days Duration*			IE at Course in charge end						
				Total Hours			20	02	08	30	-	-	-

*Note: After Semester I, 10 days social internship completed by all students will be the evaluated in this semester.

Year, Program, Semester	F.Y. Part I (All Programs) Semester I and II							
Course Code	BSC111/ BSC121							
Course Category	Engineering Science Course							
Course Title	Engineering Physics (Theory)							
Teaching Scheme and Credits	L	T	P	Total Contact Hours		Total Credits		
	03	-	-	03		03		
Evaluation Scheme	ISE		ESE	IOE	IPE	EOE	EPE	Total
	40		60	-	-	-	-	100
Course Rationale	The Engineering Physics course for FY B.Tech students offers a comprehensive understanding of fundamental and advanced concepts in ultrasonics, optics, lasers, fibre optics, crystallography, material physics, and energy systems. It bridges theoretical knowledge with practical applications, preparing students for technological innovations and research. The inclusion of a study tour to a space observatory enhances real-world learning and exposure to cutting-edge satellite and radar technology.							
Course Objectives	The course is aimed at - 1. To study the basic concepts of physics and engineering applications of physics. 2. To develop an ability to identify, formulate and solve physics and engineering problems.							
Course Outcomes	Upon completion of this course, student should be able to- 1. Apply the concepts of physics in various engineering applications. 2. Use the techniques, skills, and modern tools necessary for physics and engineering careers. 3. Understand and apply the concepts of optical fibers in light wave communication systems and in holography. 4. Understand the use of lasers as light sources for low and high energy applications. 5. Understand the nature and characteristics of ultrasonic waves and its various engineering applications.							

Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	Ultrasonic Introduction, production of ultrasonic waves- piezo-electric generator, detection of ultrasonic waves, properties of ultrasonic waves, use of ultrasonic for non-destructive testing, Industrial and medical applications of ultrasonic.	07

II	Optics Interference Superposition of waves, spatial and temporal coherence, interference in thin films by reflection, Diffraction – Fresnel and Fraunhofer diffractions, Diffraction grating, Determination of wavelength using diffraction grating. Polarization– Types of polarization, polarization by reflection and polarization by scattering	07
III	Lasers Introduction, characteristics of lasers, spontaneous and stimulated emission of radiation, Einstein’s coefficients, population inversion, Ruby laser, Helium-Neon laser, Applications of lasers in Industrial, scientific and medical fields. Holography – Basic principles and applications of holography. Fibre optics: Principle of optical fibre, cross sectional view of optical fibre, acceptance angle, acceptance cone (no derivation), numerical aperture, step index fibre, graded index fibre, transmission of light in step and graded index fibre, attenuation in optical fibre, applications of optical fibre (medical, military, communication)	07
IV	Crystallography Basics of crystal structure-space lattice & point lattice, Unit cell, number of atoms per unit cell, coordination number, seven crystal systems, packing fraction for close packed systems, Miller indices. X-Ray diffraction and Bragg’s law.	07
V	Physics of Materials Superconductivity- General properties, Meissner effect, Type I and Type II superconductors, applications of superconductors Nanoscience: Nano Scale, nanostructured materials, properties of materials at Nano scale: Surface to Volume Ratio, Quantum Confinement effect.	07
VI	Nuclear and Solar energy Nuclear fission Discovery of fission, binding energy curve, chain reaction (fission of U235), essentials of nuclear reactor. Nuclear fusion – Thermonuclear reactions, p-p chain, C-N-O cycle. Introduction to particle physics. Solar energy – solar spectrum, Ways of harnessing solar energy-solar photovoltaic and solar thermal devices. In addition a study tour to space observatory at Panhala: study the operations of Indian Regional Navigation Satellite System (IRNSS) programme. (Satellite signal receiver has been installed at Panhala, space centre) or MF RADAR facility, Shivaji University campus, Kolhapur	06

Text Books

1. M. N. Avadhanulu and P. G. Kshirsagar “Engineering Physics”, S. Chand Publication.
2. R. K. Gaur and Gupta S. L, “Engineering Physics”, Dhanapat Rai and Sons Publication.
3. V. Rajendran, “Engineering Physics”, Tata McGraw Hill Company Ltd, New Delhi.
4. Malik and Singh, “Engineering Physics”, Tata McGraw Hill Company Ltd, New Delhi.
5. Naidu, “Engineering Physics”, Pearson.
6. N.K. Bajaj, The Physics of waves and Oscillations , Tata McGraw Hill Company Ltd, New Delhi.

Reference Books

1. A. Ghatak, “Optics”, S. Chand and Company Ltd.
2. Brijlal and Subramanian, “Optics”, 5006, 23rd Edition.
3. B. L. Theraja, “Modern Physics”, S. Chand & Company Ltd. Delhi.

4.	Charles Kittel, "Introduction to Solid State Physics," Wiley India Pvt. Ltd.
5.	L. Tarasov, "Laser Physics and Applications," Mir Publishers.
6.	P.K. Palanisamy, "Solid State Physics", SciTech Publications (India) Pvt. Ltd.
Useful web links	
1.	https://archive.nptel.ac.in/courses/122/107/122107035/

Year, Program, Semester	F.Y. Part I (All Programs) Semester I and II							
Course Code	BSC111/ BSC121							
Course Category	Engineering Science Course							
Course Title	Engineering Physics (Practical)							
Teaching Scheme and Credits	L	T	P	Total Contact Hours		Credits		
	-	-	02	02		01		
Evaluation Scheme	ISE		ESE	IOE	IPE	EOE	EPE	Total
	-		-	-	50	-	-	50
Course Rationale	The Laboratory Course provides hands-on experience with advanced techniques such as diffraction grating measurements, XRD pattern analysis, SEM studies, and laser beam divergence. It also explores nanofluid properties, polarimetry, dielectric constant measurement, thermal conductivity, and lattice constant calculation, bridging theoretical concepts with practical skills.							
Course Objectives	The course is aimed at - 1. To study the basic concepts of physics and engineering applications of physics. 2. To develop an ability to identify, formulate and solve physics and engineering problems.							
Course Outcomes	Upon completion of this course, student should be able to- 1. Apply the concepts of physics in various engineering applications. 2. Use the techniques, skills, and modern tools necessary for physics and engineering careers. 3. Use various scientific instruments viz. Spectrometer, polarimetry, laser, ultrasonic interferometer for various measurements. 4. Test optical components using principles of interference and diffraction of light. 5. Use ultrasonic interferometer for measuring velocity of ultrasound in various liquids.							

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1	2	3	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-
CO5	3	2	-	-	-	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Experiment No.	Experiment Title/Objective	Hours
1.	Diffraction grating - measurement of grating element.	02
2.	Diffraction grating - measurement of wavelength of LASER.	02
3.	XRD pattern of thin films and its analysis.	02
4.	Scanning Electron Microscopy (SEM) studies.	02
5.	Divergence of LASER beam.	02
6.	Study of properties of Nanofluids – effect of concentration & temperature.	02
7.	Determination of specific rotation of sugar solution using Polarimetry.	02
8.	Dielectric constant of materials.	02
9.	Thermal conductivity in Nano fluids.	02
10.	Calculation of lattice constant from the given powder XRD pattern.	02
Reference Books and web links		
1.	Arthur Beiser, "Concepts of Modern Physics," McGraw-Hill Education.	
2.	William D. Callister Jr., "Materials Science and Engineering: An Introduction," Wiley.	
3.	R.K. Gaur and S.L. Gupta, "Engineering Physics," Dhanpat Rai Publications.	
4.	https://www.digimat.in/nptel/courses/video/122104016/L26.html	
5.	https://www.digimat.in/nptel/courses/video/122107035/L15.html	

Year, Program, Semester	First Year B. Tech (Food Technology), Semester I								
Course Code	BSC112								
Course Category	Basic Science Course								
Course Title	Engineering Mathematics-I (Food Technology) (Theory)								
Teaching Scheme and Credits	L	T	P	Total Contact Hours			Total Credits		
	03	01	-	04			4		
Evaluation Scheme	ISE		ESE		IOE	IPE	EOE	EPE	Total
	40		60		50	--	--	--	150
Pre-requisites(if any)	Basic Mathematics								
Course Objectives	<p>The course is aimed at-</p> <ol style="list-style-type: none"> To familiarize the students with algebra, geometry and Calculus. To teach Mathematical methodologies and models. To develop mathematical skills and enhance logical thinking power of students. To provide students with skills in matrix, geometry and differential calculus which would enable them to devise engineering solutions for given situations they may encounter in their profession. 								
Course Outcomes	<p>Upon completion of this course, students will be able to:</p> <ol style="list-style-type: none"> Understand and Apply the knowledge of matrix algebra, to solve the mathematical problems. Understand the concept of Coordinate geometry Remember and understand trigonometry. Understand and Apply the knowledge of differential Calculus to solve the mathematical problems. Determine partial derivatives and its application in related field of engineering. 								

Course Outcome and Program Outcome Mapping

	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 2
CO 1	3	3	2									
CO 2	3	2	2									
CO 3	3	3	2									
CO 4	2	2	1									
CO 5	3	3	1									

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	Matrix Algebra- Matrices and types of matrices, Algebra of Matrices, Determinants, Inverse of a matrix, Rank of a Matrix, Normal and echelon form of a matrix, System of linear equations (conditions for unique solution, no solution and infinite number of solutions).	6
II	Coordinate Geometry- Straight line: Equations of line in different forms, Angle between two lines, perpendicular and parallel lines, Circle: Equation of a circle and its different forms, Equation of Tangent to a circle Conic sections : Equations and properties of circles, ellipses, parabolas, and hyperbolas	7
III	Trigonometry- Trigonometric Functions, Trigonometric Identities, Trigonometric Functions of compound angles, Factorization formulae, Inverse Trigonometric Functions, Applications of Trigonometry.	6
IV	Calculus- Sets, Relations, Functions, Limits, Continuity, Differentiation of functions, Derivatives of standard functions, Higher order derivatives, Rules of differentiation-derivative of sum, difference, product, and quotient.	6
V	Applications of derivatives- Mean value theorems; Maxima and minima; Determine the rate of change of various quantities	7
VI	Partial Differentiation- Partial derivatives of first and higher order, total differentials, differentiation of composite and implicit functions. Euler's Theorem on Homogeneous functions with two and three independent variables. Applications of partial differentiation-Maxima, minima and saddle points.	7
Text Books		
i)	B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi.	
ii)	B. S. Grewal, "Higher Engineering Mathematics", 43rd Edition, Khanna Publishers, Delhi.	
iii)	Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons	
Reference Books		
i)	C. R. Wylie, "Advanced Engineering Mathematics", McGraw Hill Publication, New Delhi	
ii)	H. K. Dass, "Advanced Engineering Mathematics", S. Chand Publishing.	

iii)	N. P. Bali, Iyengar "A text book of Engineering Mathematics by", Laxmi Publications (P)Ltd., New Delhi.	
iv)	M. D. Greenberg, "Advanced Engineering Mathematics", Pearson Education. Useful web links	
v)	S. S. Sastry, "Engineering Mathematics (Volume-I)", Prentice Hall Publication, New Delhi.	
vi)	Shanti Narayan, "Differential Calculus" S. Chand and company, New Delhi.	
Useful web links		
1	https://nptel.ac.in/courses/111/108/111108157/	
2	https://nptel.ac.in/courses/111105121	
3	https://nptel.ac.in/courses/111107119	
4	https://nptel.ac.in/courses/111105134	
5	https://nptel.ac.in/courses/111106100	

Year, Program, Semester	F.Y. Part I (All Programs except Food Technology) Semester I								
Course Code	BSC112								
Course Category	Basic Science Course								
Course Title	Engineering Mathematics-I (Programs other than Food Technology) (Theory)								
Teaching Scheme and Credits	L	T	P	Total Contact Hours		Total Credits			
	03	01	-	04		04			
Evaluation Scheme	ISE		ESE		IOE	IPE	EOE	EPE	Total
	40		60		50	-	-	-	150
Pre-requisites(if any)	Basics of Derivatives and Integration.								
Course Rationale	The Engineering Mathematics I course provides a strong foundation in differential calculus, partial differentiation, differential equations, and complex variable functions. It equips students with analytical techniques essential for solving engineering problems and introduces them to numerical methods and programming with Scilab for practical applications. This course bridges theoretical concepts with computational skills, preparing students for advanced studies and professional challenges in engineering.								
Course Objectives	The course is aimed at - 1. To familiarize the students with differential Calculus. 2. To teach Mathematical methodologies and models. 3. To develop mathematical skills and enhance logical thinking power of students. 4. To provide students with skills in differential calculus, complex variable which would enable them to devise engineering solutions for given situations they may encounter in their profession.								
Course Outcomes	Upon completion of this course, student should be able to- 1. Understand and apply the knowledge of differential Calculus to solve								

	the mathematical problems. 2. Determine partial derivatives and its application in related field of engineering. 3. To understand methods for solution of differential equations of first order and first degree. 4. Evaluation and analysis of analytic function. 5. Understand the features of the Scilab software and its applications.
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Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	Differential Calculus Successive differentiation, Leibnitz's Theorem and its applications, Taylor and Maclaurin series, Indeterminate forms.	07
II	Partial Differentiation Partial derivatives of first and higher order, total differentials, differentiation of composite and implicit functions. Euler's Theorem on Homogeneous functions with two and three independent variables. Deductions from Euler's Theorem, Jacobian, Properties of Jacobian.	08
III	Differential Equations of first order and first degree and its Applications Exact differential equations, Equations reducible to exact equations, Linear differential equations, Equations reducible to Linear equations, Applications to Orthogonal trajectories and to Simple Electrical Circuits	07
IV	Numerical solutions of Differential Equations of first order and first degree Taylor's series method, Picard's method, Euler's method, Modified Euler's method, Runge-Kutta fourth order formula.	06
V	Functions of Complex Variables: Differentiation Algebra of complex number, Circular and hyperbolic functions, Functions of complex variable, Cauchy-Riemann equations, Analytic functions, Harmonic functions.	06
VI	Programming with Scilab Introduction, Installation, Basic functions of Scilab, Differentiation, Solutions of differential equations of first order and first degree, Basic operations on Complex numbers, Algebra of complex number.	06
	Suggested list of Assignments- <ol style="list-style-type: none"> 1. Successive differentiation 2. Applications of Leibnitz theorem 3. Indeterminate form 	

	<ol style="list-style-type: none"> 4. Partial differentiation 5. Euler's Theorem on Homogeneous functions 6. Exact differential Equations 7. Linear differential equations 8. Applications of Differential equations 9. Numerical solutions of Differential equations 10. Analytic Functions 11. Harmonic Functions <p>General Instructions:</p> <ol style="list-style-type: none"> 1. Each Student has to write at least 6 assignments on entire syllabus and at least 4 assignments on Scilab programming (including print out). Students must be encouraged to write mathematical programs in tutorial class only. 2. Batch wise tutorials are to be conducted. The number of students per batch should be as per the practical batches. 3. Scilab assignments will be based on <ol style="list-style-type: none"> i. Differentiation ii. Partial Differentiation iii. Solutions of differential equations of first order and first degree, iv. Basic operations on Complex numbers v. Algebra of complex number. 	
Text Books		
1.	B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi.	
2.	Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons.	
3.	B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi.	
4.	B. S. Grewal, "Scilab Textbook Companion for Higher Engineering Mathematics", Khanna Publishers, New Delhi.	
Reference Books		
1.	C. R. Wylie, "Advanced Engineering Mathematics", McGraw Hill Publication, New Delhi.	
2.	Shanti Narayan, "Differential Calculus" S. Chand and company, New Delhi.	
3.	S. S. Sastry, "Engineering Mathematics (Volume-I)", Prentice Hall Publication, New Delhi.	
4.	M. K. Jain, S. R. K. Iyengar, R. K. Jain, "Numerical Methods for Scientific and Engineering Computation", New Age International (P) Ltd.	
5.	H. K. Dass, "Advanced Engineering Mathematics", S. Chand Publishing.	
6.	N. P. Bali, Iyengar "A text book of Engineering Mathematics by", Laxmi Publications (P)Ltd., New Delhi.	
7.	M. D. Greenberg, "Advanced Engineering Mathematics", Pearson Education.	
Useful web links		
1.	https://nptel.ac.in/courses/111105121	
2.	https://nptel.ac.in/courses/111106100	
3.	https://nptel.ac.in/courses/111107119	
4.	https://nptel.ac.in/courses/111105134	

Year, Program, Semester	F.Y. Part I (All Programs) Semester I and II								
Course Code	ESC111/ ESC121								
Course Category	Engineering Science Course								
Course Title	Elements of Mechanical and Electronics Engineering (Theory)								
Teaching Scheme and Credits	L	T	P	Total Contact Hours		Total Credits			
	04	-	-	04		04			
Evaluation Scheme	ISE		ESE		IOE	IPE	EOE	EPE	Total
	40		60		-	-	-	-	100
Pre-requisites(if any)	Basic Physics and Mathematics, Introduction to Engineering, Basic Mechanics, Thermodynamics.								
Course Rationale	The course offers practical knowledge and skills for understanding and applying various instruments, devices, and systems in real-world scenarios. It provides interdisciplinary perspectives, exploring fields like mechatronics, robotics, and biomedical applications. With a focus on energy sources and sustainability, the course prepares students to tackle the global energy crisis and contribute to environmentally friendly solutions. Studying this course enhances technical competence, critical thinking, problem-solving abilities, and adaptability to evolving technologies in mechanical engineering.								
Course Objectives	<p>The course is aimed at-</p> <ol style="list-style-type: none"> 1. Developing the fundamental understanding of various mechanical engineering devices and their applications. 2. Developing the awareness about energy crisis, understanding various non-conventional energy sources. 3. Informing the students about the various roles, responsibilities and job opportunities mechanical engineering graduates have in different sectors. 4. Developing the fundamental understanding of various electronics engineering devices and their applications. 5. Developing the fundamental knowledge of semiconductor devices with applications. 6. Provide fundamental knowledge about transistor and power device. 								
Course Outcomes	<p>Upon completion of this course, student should be able to -</p> <ol style="list-style-type: none"> 1. Recognise the mechanical engineering applications, machines, mechanisms in day to day life. 2. Explain different non-conventional energy sources. 3. Think critically and apply product design procedures to design product with different considerations. 4. Recognise the basics of electronic engineering and their practical use 5. Apply the concepts of diode in rectifiers, filter circuits. 6. Understand the concept and use of SCR and power devices. 								

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	3	2	2	-	-	-	-	-	-	-	-	-
CO5	2	3	-	-	-	-	-	-	-	-	-	-
CO6	3	2	1	-	-	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	Mechanical Engineering Applications a) Introduction to various instruments and devices in day to day life – Pumps, Compressors, Gears, Belt drives [types, classification, construction and working, applications] b) Introduction to IC engines (Construction, working, classification of 2 stroke, 4 stroke SI and CI engines), Refrigeration and air conditioning, Vapour compression refrigeration cycle, advantages, applications	07
II	Conventional and non-conventional energy sources a) Energy crisis, Sources of Energy and its classifications, Renewable energy sources, classification and system Power generation using - Solar energy, wind energy, tidal energy, geothermal energy, hydroelectric power plant. (Construction and working)	07
III	Horizontals and verticals of Mechanical Engineering a) Role and job profiles of Mechanical Engineer in various branches of engineering- Mechanical, Civil, Electronics, Computer and Chemical Engineering. b) Interdisciplinary branches of Mechanical Engineering – Mechatronics and Robotics, Biomedical Applications. Energy balance. Energy audit. Industry 4.0 c) Product, product design steps, tools, aesthetic, ergonomic considerations, concurrent engineering	07
IV	Semiconductors Conductivity of insulators, metals, and semiconductors in terms of energy bands, the chemical bond in Si and Ge, conductivity of intrinsic semiconductors, extrinsic semiconductors: n-type and p-type semiconductors, Hall Effect in semiconductors, Mechanism in current flow: drift and diffusion, V-I characteristics of PN-junction diode. Diode equivalent circuit, diode as a switch, diode testing.	07
V	Rectifier and Zener Diode Need of rectifier, types of rectifier-half wave rectifier voltage (no derivation), ripple, ripple factor, Need of filters, types of filters Zener diode- Breakdown mechanism, Zener versus Avalanche Break down, V-I characteristics, application, photo diode and varactor diode.	07
VI	Introduction to Transistors and Power devices Transistor construction, Types of transistor (NPN & PNP), Transistor operation and amplifying action. Transistor Characteristics for CB, CE, CC configuration and comparison. Power devices - Need of power devices, comparison between low and high power semiconductor devices, Structure, Operation, V-I Characteristics & application of SCR, Triac and diac.	06

Text Books			
1.	G. D. Rai, "Non-Conventional Energy Sources", Khanna Publisher, 4th Edition 2014.		
2.	Kalpakjian S. And Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.		
3.	Arora C P, "Refrigeration and Air Conditioning", Tata McGraw Hill.		
4.	C.M. Agrawal and Basant Agrawal, "Basic Mechanical Engineering", Wiley, 2008.		
5.	R.P.Jain,"Modern Digital Electronics", Tata McGraw Hill,4th edition 2009.		
6.	Robert Boylestad and Louis Nashelsky, "Electronic Devices and Circuits",Pearson,11th edition,2015.		
Reference Books			
1.	Arora Domkundwar , "Refrigeration and Air Conditioning", Dhanpat Rai and Sons.		
2.	Heywood, "I.C. Engines Fundamentals", McGraw Hill Publication.		
3.	Bernard Grob, Basic Electronics.		
4.	Madhuri Joshi ,Electronics materials &components.		
Alternative NPTEL/SWAYAM Course			
Sr. No.	NPTEL Course Name	Instructor	Host Institute
1.	IC Engines and Gas Turbines	Dr. Vinayak Kulkarni, Prof. Pronab K. Mondal	IIT Guwahati
2.	Product Design and Innovation	Prof. Supradip Das, Prof. Swati Pal, Prof. Debayan Dhar	IIT Guwahati
Useful web links			
1.	https://ekumbh.aicte-india.org/book.php for mechanical engineering related books by AICTE.		
2.	https://nptel.ac.in/courses/112103262		
3.	https://nptel.ac.in/courses/101104063		
4.	https://nptel.ac.in/courses/107103082		
5.	https://www.digimat.in/nptel/courses/video/108102097/L01.html		
6.	https://nptel.ac.in/courses/122106025		

Year, Program, Semester	F.Y. Part I (All Programs) Semester I and II							
Course Code	ESC111/ ESC121							
Course Category	Engineering Science Course							
Course Title	Elements of Mechanical and Electronics Engineering (Practical)							
Teaching Scheme and Credits	L	T	P	Total Contact Hours			Credits	
	-	-	02	02			01	
Evaluation Scheme	ISE	ESE		IOE	IPE	EOE	EPE	Total
	-	-		-	50	-	-	50
Pre-requisites(if any)	-							
Course Rationale	This course aims to give a practical understanding of mechanical & electronics engineering applications in day to day life.							
Course Objectives	<p>The course is aimed at-</p> <ol style="list-style-type: none"> 1. Informing students about lathe and drilling machines tools and the processes used in manufacturing. 2. Demonstrating - 2 stroke and 4 stroke IC engine, refrigerator. 3. Engaging students in hands on experience of designing and product for small problem. 4. To Impart Knowledge about basics of Semiconductor Devices and its parameters. 5. To make the students familiar with suitability of various electronics components. 							
Course Outcomes	<p>Upon completion of this course, student should be able to -</p> <ol style="list-style-type: none"> 1. Identify different parts of lathe and drilling machine. 2. Apply the design principles to offer a product design solution to small problem. 3. Identify and explain the details of IC engines and refrigerator. 4. Understand construction, V-I characteristics and application of diode. 5. Identify the applications of Diode and SCR. 							

Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

Experiment No.	Experiment Title/Objective	Hours
1.	Study of TWO stroke and FOUR stroke IC Engines.	02
2.	Study of domestic refrigerator and air conditioner.	02
3.	Study of pumps and compressors.	02
4.	Product development exercise.	02

5.	Study of lathe and drilling machine.	02
6.	Study of Characteristics of Si and Ge diodes.	02
7.	Study of performance characteristics of half wave rectifier with and without filter.	02
8.	Study of performance characteristics of full wave rectifier with and without filter.	02
9.	Study of Characteristics of Zener diode.	02
Text Books		
1.	Hajra Choudhury, Nirjhar Roy S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II 2010, Media promoters and publishers private limited, Mumbai.	
2.	Kalpakjian S. and Steven S. Schmid, "Manufacturing Engineering and Technology", 4th edition, Pearson Education India Edition, 2002.	
3.	V. Ganesan, "Internal Combustion Engines", Tata McGraw Hill, Second Edition.	
4.	P.K. Nag, "Engineering Thermodynamics", Tata McGraw-Hill Publishing Co. Ltd.	
5.	Arora C P, "Refrigeration and Air Conditioning", Tata McGraw Hill.	
6.	N.N Bharagava, D.C.Kulshreshtha & S.C Gupta(TMh)"Basic Electronics & Linear circuits "	
Reference Books		
1.	Arora Domkundwar, "Refrigeration and Air Conditioning", Dhanpat Rai and Sons	
2.	Hawkins G. A., "Engineering Thermodynamics", John Wiley and Sons	
3.	Heywood, "I.C. Engines Fundamentals", McGraw Hill Publication	
4.	V.K.Mehata, "Principles of Electronics ".(New Edn)	

Year, Program, Semester	F.Y. Part I (All Programs) Semester I and II						
Course Code	ESC112/ ESC122						
Course Category	Engineering Science Course						
Course Title	Engineering Mechanics (Theory)						
Teaching Scheme and Credits	L	T	P	Total Contact Hours			Total Credits
	04	-	-	04			04
Evaluation Scheme	ISE	ESE	IOE	IPE	EOE	EPE	Total
	40	60	-	-	-	-	100
Pre-requisites(if any)	Physics, Mathematics						
Course Rationale	Engineering mechanics applies the principle of mechanics to design, taking into account the effects of forces.						
Course Objectives	The course is aimed at- <ol style="list-style-type: none"> To learn basic concepts and system of forces. To develop skills to use the basic principles of mechanics in engineering applications. To solve problems of statics and dynamics related to engineering domain using principles of mechanics. 						

Course Outcomes	<p>Upon completion of this course, student should be able to -</p> <ol style="list-style-type: none"> 1. Calculate resultant force for coplanar concurrent and noncurrent force system. 2. Apply static conditions of equilibrium to calculate reactive forces of structures like beams, trusses etc. 3. Determine center of gravity and moment of inertia of a lamina. 4. Apply equations of motion on a body moving along straight path and circular path to determine the motion parameters. 5. Apply dynamic condition of equilibrium on a body to calculate its motion parameters and reactive forces. 6. Apply laws of collision to find energy loss and velocity distribution due to direct and indirect impact.
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Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	2	3	-	-	-	-	-	-	-	-	-	-
CO 2	2	3	-	-	-	-	-	-	-	-	-	-
CO 3	3	2	-	-	-	-	-	-	-	-	-	-
CO 4	2	3	-	-	-	-	-	-	-	-	-	-
CO 5	2	3	-	-	-	-	-	-	-	-	-	-
CO 6	2	3	-	-	-	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	Resolution and composition of force system Introduction to Mechanics, Force system, concept of Resultant, Composition and Resolution of Forces, Equivalent force system, Moment of a force, Couple, law of parallelogram, Varignon's theorem, Resultant of a concurrent and non-concurring force system	10
II	Equilibrium of rigid body Concept of Equilibrium, Free Body Diagram, Lami's theorem, analytical conditions of equilibrium, engineering application to beams and trusses. Friction, types of friction, laws of friction.	08
III	Centroid and moment of Inertia Centroid of areas, moment of inertia, radius of gyration, polar moment of inertia, theorems of moment of inertia, M.I. of a lamina.	08
IV	Linear and circular motion of a body Rectilinear motion, equations of motion, motion diagrams, motion in vertical direction. Circular motion, motion on curved path, super elevation	09
V	Kinetics of particles Newton's second law, Work-Energy principle, Impulse- momentum principle, D'Alembert's Principle.	08

VI	Collision of a body Direct and indirect impact, coefficient of restitution, impact on floor and wall, law of collision, loss of kinetic energy.	07
Text Books		
1.	S. S. Bhavikattis, "Engineering Mechanics", New Age International Pvt. Ltd	
2.	S. Timoshenko, "Engineering Mechanics", McGraw Hill Education	
Reference Books		
1.	Meriam J. L., Kraige L. G., "Engineering Mechanics – Statics, Vol.1", Wiley Student Edition, (8th Edition) 2017	
2.	Meriam J. L., Kraige L. G., "Engineering Mechanics – Dynamics, Vol.2", Wiley Student Edition, (8th Edition) 2017	
3.	R.C.Hibbeler, "Engineering Mechanics", Pearson Publication(14th edition)	
4.	Beer F. P. , Johnston E. R., "Vector Mechanics for Engineers -Dynamics", Tata McGraw Hill Publishing company Ltd., New Delhi (12th Edition, SIE)	
5.	Shames Irving H., "Engineering Mechanics", Prentice Hall, New Delhi (4th edition)	
Useful web links		
1.	https://www.youtube.com/watch?v=nGfVTNfNwnk	
2.	https://www.youtube.com/watch?v=6nguX-cEsvw	
3.	https://archive.nptel.ac.in/courses/112/106/112106286/	

Year, Program, Semester	F.Y. Part I (All Programs) Semester I and II							
Course Code	ESC112/ ESC122							
Course Category	Engineering Science Course							
Course Title	Engineering Mechanics (Practical)							
Teaching Scheme and Credits	L	T	P	Total Contact Hours		Credits		
	-	-	02	02		01		
Evaluation Scheme	ISE		ESE	IOE	IPE	EOE	EPE	Total
	-		-	-	50	-	-	50
Pre-requisites(if any)	Physics, Mathematics							
Course Rationale	Engineering mechanics applies the principle of mechanics to design, taking into account the effects of forces.							
Course Objectives	The course is aimed at- 1. To perform experiments to verify laws of mechanics and validate the experimental results with analytical results.							
Course Outcomes	Upon completion of this course, student should be able to - 1. Perform experiments to verify laws of mechanics							

	2. Construct force diagrams to find resultant forces
	3. Compare the analytical results with experimental results

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Experiment No.	Experiment Title	Hours
1.	Verify law of polygon of forces.	02
2.	Verify law of Moment using bell crank lever apparatus.	02
3.	Verify beam reactions using beam reaction apparatus.	02
4.	Verify triangle law of forces using Jib crane apparatus.	02
5.	Verify centrifugal law of forces using centrifugal apparatus.	02
6.	Graphics statics- Resultant force determination (concurrent forces system).	02
7.	Graphics statics- Resultant forces determination (non-concurrent forces. system)	02
8.	Graphics statics- Determination of beam reactions.	02
9.	Graphics statics- Determination of member forces of a truss.	02
10.	Assignments based on theory syllabus.	02
11.	Assignments based on theory syllabus.	02
12.	Assignments based on theory syllabus.	02
Text Books		
1.	S. S. Bhavikattis, "Engineering Mechanics", New Age International Pvt. Ltd	
2.	S. Timoshenko, "Engineering Mechanics", McGraw Hill Education	
Reference Books		
1.	Meriam J. L., Kraige L. G., "Engineering Mechanics – Statics, Vol.1", Wiley Student Edition, (8th Edition) 2017.	
2.	Meriam J. L., Kraige L. G., "Engineering Mechanics – Dynamics, Vol.2", Wiley Student Edition, (8th Edition) 2017.	
3.	R.C.Hibbeler, "Engineering Mechanics", Pearson Publication(14th edition)	
4.	Beer F. P. , Johnston E. R., "Vector Mechanics for Engineers -Dynamics", Tata McGraw Hill Publishing company Ltd., New Delhi (12th Edition, SIE)	
5.	Shames Irving H., "Engineering Mechanics", Prentice Hall, New Delhi (4th edition)	

Year, Program, Semester	F.Y. Part I (All Programs) Semester I and II								
Course Code	ESC113/ ESC123								
Course Category	Engineering Science Course								
Course Title	Computer Programming for Engineers (Theory)								
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits				
	02	-	-	02	02				
Evaluation Scheme	ISE		ESE		IOE	IPE	EOE	EPE	Total
	40		60		-	-	-	-	100
Pre-requisites(if any)	Physics, Mathematics								
Course Rationale	The Computer Programming for Engineers course introduces foundational concepts in programming methodology and the C language, covering problem-solving techniques, algorithm design, and flowcharting. It equips students with essential skills in control statements, functions, arrays, pointers, and file handling, fostering strong programming capabilities crucial for tackling engineering challenges through structured and efficient coding practices.								
Course Objectives	The course is aimed at- 1. Understand the basic terminology used in computer programming 2. Compile and debug programs in C and Implement data structures and algorithms in C								
Course Outcomes	Upon completion of this course, student should be able to - 1. Illustrate the flowchart and design of an algorithm for a given problem and to develop C programs using operators Develop conditional and iterative statements to write C programs. 2. Design C programs with the use of Pointers to access arrays, strings, functions and Exercise user defined data types including structures and unions to solve problems. 3. Design C programs using pointers and to allocate memory using dynamic memory management and Demonstrate files concept to show input and output of files in C.								

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	Programming Methodology Step involving in problem solving., Problem definition, Algorithm, Characteristics, Notation of Algorithm, Flowcharts- Definition, Symbol, features, Running and debugging the program.	08

	Introduction to 'C' History, Character set and keywords, Structure of 'C' programming, constant and its type, Variable and its type (Data types), Operators- Arithmetic, logical, relational, bitwise, increment, decrement, conditional	
II	Control Statements and Functions Conditional control statements- if, if else, nested if, switch, Looping – for statements, nested for, while, do-while statements, Unconditional control statements- break, continue, go to Functions Definition, declaration, prototype of function, Local and global variable, User defined function, Storage classes, Pre-processor Arrays and Pointers Array definition and declaration, Single and multidimensional array, String functions Pointers Definition and declaration, Operation on pointer, Pointer initialization, Pointer and function, Pointer and array, Pointer of pointer, Call by value and Call by reference, Dynamic memory allocation	08
III	Structures and Union Definition and declaration, Array of structures, Passing structure to function, Pointer to structure, Nested structure, self-referential structure, Size of and typedef, File Handling Standard input- getchar(), getch(), getche(), Standard output- putchar(), putch(), putche(), Formatted input- scanf(), sscanf(), fscanf(), fread(), Formatted output- printf(), sprintf(), fprintf(), fwrite(), Functions- fseek(), ftell(), fflush(), fclose(), File opening mode- open, modify, write, append, Text and binary mode.	08
Text Books		
1.	E Balguruswamy, "Programming with ANSI C", (TMH).	
2.	Kernighan and Richie, "The C Programming Language" (PHI)/Pearson Education.	
3.	Y.C. Kanetkar, "Let us C".	
Reference Books		
1.	Gottfried, "Programming in C", Shattern Series	
2.	Herbert Schildt, "Complete 'C' Reference".	

Year, Program, Semester	F.Y. Part I (All Programs) Semester I and II								
Course Code	ESC113/ ESC123								
Course Category	Engineering Science Course								
Course Title	Computer Programming for Engineers (Practical)								
Teaching Scheme and Credits	L	T	P	Total Contact Hours		Credits			
	-	-	02	02		01			
Evaluation Scheme	ISE		ESE		IOE	IPE	EOE	EPE	Total
	-		-		-	50	-	-	50
Pre-requisites(if any)	Physics, Mathematics								
Course Rationale	This laboratory course in Computer Programming for Engineers equips students with hands-on experience in essential programming techniques and concepts crucial for engineering applications. Through practical exercises in creation, editing, compilation, and debugging of programs, students will master control statements, functions, pointers, and file handling, thereby building a solid foundation for problem-								

	solving and computational thinking in engineering contexts.
Course Objectives	The course is aimed at- 1. Understand the basic terminology used in computer programming 2. Compile and debug programs in C and Implement data structures and algorithms in C
Course Outcomes	Upon completion of this course, student should be able to - 1. Illustrate the flowchart and design of an algorithm for a given problem and to develop C programs using operators Develop conditional and iterative statements to write C programs 2. Design C programs with the use of Pointers to access arrays, strings , functions and Exercise user defined data types including structures and unions to solve problems 3. Design C programs using pointers and to allocate memory using dynamic memory management and Demonstrate files concept to show input and output of files in C

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Experiment No.	Experiment Title/Objective	Hours
1.	Creation editing, compilation, extension, debugging demonstration with some small program	02
2.	Constants, variables and data types declaration with the use of storage classes.	02
3.	Use of operators and expressions	02
4.	Control statements: if, if-else nested if.	02
5.	Control statement: for statement, while statement, do while statement, Use of break, continue, goto statements.	02
6.	Use of functions: Prototyping, - Concept of local/ global variables	02
7.	Use of pointers: Simple pointers, Operations on pointers, Pointer to arrays, Pointer to Functions	02
8.	I/O functions and files handling	02
Text Books		
1.	E Balguruswamy, "Programming with ANSI C", (TMH)	
2.	Kernighan and Richie, "The C Programming Language" (PHI)/Pearson Education	
3.	Y.C. Kanetkar, "Let us C"	
Reference Books		
1.	Gottfried, "Programming in C", Shattern Series	
2.	Herbert Schildt, "Complete 'C' Reference".	

Year, Program, Semester	F.Y. Part I (All Programs) Semester I				
Course Code	IKS 111				
Course Category	Indian Knowledge System				
Course Title	Yoga and Meditation				
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits
	01	-	-	01	01
Evaluation Scheme	IE at the course in charge end: (Preferred to have 4 assignments and conduct of an MCQ Test based on the course work. However, the course teacher will declare whether the students have passed it or not. Passing is mandatory to earn the credit.				
Pre-requisites`if any)	Basic physical fitness and flexibility for yoga postures (asanas) and meditation practices. Open-mindedness, willingness to learn, and a commitment to regular practice and self-reflection are essential.				
Course Rationale	This course on yoga and meditation is designed to provide you with a deep understanding and practical experience of these ancient practices. Throughout the course, you will explore various aspects of yoga and meditation, including their history, philosophy, techniques, benefits, and practical applications in everyday life. Each lecture will cover a specific topic, building upon the previous ones to create a comprehensive and well-rounded learning experience.				
Course Objectives	<p>The course is aimed at-</p> <ol style="list-style-type: none"> 1. Gain a comprehensive understanding of yoga and meditation principles and practices for holistic well-being. 2. Develop practical skills to incorporate yoga and meditation into daily life for stress reduction and emotional balance. 3. Explore the scientific basis and applications of yoga and meditation in diverse contexts. 4. Foster personal growth and self-awareness through regular practice, integrating yoga and meditation as a lifelong journey. 				
Course Outcomes	<p>Upon completion of this course, student should be able to -</p> <ol style="list-style-type: none"> 1. Develop a strong foundation in yoga and meditation techniques and principles. 2. Cultivate mindfulness and self-awareness through regular practice. 3. Enhance physical flexibility, strength, and overall well-being. 4. Apply yoga and meditation practices to reduce stress and promote mental and emotional balance. 				

Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	Introduction to Yoga and Meditation: a) Overview of yoga and its origins b) Introduction to meditation techniques and benefits	02
II.	Foundations of Yoga Practice: a) Understanding yoga asanas (poses) and their alignment b) Pranayama techniques for breath control and energy regulation	02
III.	Exploring Meditation Techniques: a) Mindfulness meditation and its practice b) Guided visualization and relaxation techniques	02
IV.	Yoga for Physical Health and Well-being: a) Yoga for flexibility and strength b) Yoga for stress reduction and relaxation	02
V.	Yoga Philosophy and Lifestyle: a) Introduction to the philosophy of yoga b) Applying yoga principles to daily life and relationships	02
VI.	Advanced Practices and Integration: a) Advanced yoga asanas and sequences b) Integrating yoga and meditation into a holistic lifestyle	02
Reference Books		
1.	Iyengar, B.K.S. Light on Yoga: The Bible of Modern Yoga. HarperCollins, 2001.	
2.	Khalsa, Gurucharan Singh. Kundalini Yoga: The Flow of Eternal Power. TarcherPerigee, 1999.	
3.	Lasater, Judith Hanson. Relax and Renew: Restful Yoga for Stressful Times. Rodmell Press, 2011.	
4.	Saraswati, Swami Satyananda. Asana, Pranayama, Mudra, Bandha. Bihar School of Yoga, 2008.	
5.	Satchidananda, Swami. The Yoga Sutras of Patanjali. Integral Yoga Publications, 2012.	
6.	Zinn, Jon Kabat. Wherever You Go, There You Are: Mindfulness Meditation in Everyday Life. Hyperion, 2005.	
Important web links		
1.	Yoga Journal: www.yogajournal.com	
2.	Headspace: www.headspace.com	
3.	The International Sivananda Yoga Vedanta Centers: www.sivananda.org	
4.	Insight Timer: www.insighttimer.com	

Year, Program, Semester	F.Y. Part I (All Programs) Semester I								
Course Code	HSMEC 111								
Course Category	Humanities and Social Sciences , Management, Environment Courses								
Course Title	Professional Communication (English)- I								
Teaching Scheme and Credits	L	T	P	Total Contact Hours			Total Credits		
	02	-	-	02			00		
Evaluation Scheme	ISE		ESE		IE	IPE	EOE	EPE	Total
	-		-		50	-	-	-	50
	IE at the course in charge end: (Preferred to have 3-5 assignments and conduct of an MCQ Test/Viva Voce based on the course work. Passing is mandatory.								
Pre-requisites(if any)	Students must have the knowledge of basic English grammar, writing and reading skill.								
Course Rationale	Professional Communication (English)-I is designed to enhance engineering students' proficiency in technical and professional communication. The course covers essential topics such as the communication process, phonetics, grammar, and vocabulary building, while also addressing common errors in English usage. Through practical exercises in oral and written communication, students will develop the skills necessary for effective interpersonal, organizational, and mass communication in professional settings.								
Course Objectives	The course is aimed at- <ol style="list-style-type: none"> 1. To help the students to understand the fundamental concepts of Technical communication. 2. To acquire the skill of effective use of grammar and vocabulary rules to enhance communication skill. 3. To learn fluency in speech and correct pronunciation. 4. To learn various techniques of technical writing. 								
Course Outcomes	Upon completion of this course: <ol style="list-style-type: none"> 1. The students will understand Basic concepts of communication and Technical communication. 2. The students will understand the nuance of phonetics, accent, intonation for improving pronunciation. 3. The students will Improve the language proficiency of students in English with an emphasis on Vocabulary, Grammar and to identify the common errors in writing and speaking. 4. The students will adopt various techniques of oral communication. 5. The students will acquires better technical writing techniques. 								

Course Outcome and Program Outcome Mapping

CO/PO	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

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	Technical Communication: communication basics, communication process, verbal and non-verbal Communication, Technical Communication: Features, element of style, distinction between general and technical Communication, Level of communication: Interpersonal, organisation, Mass communication.	04
II	Introduction to phonetics: Introduction, phonetic transcription, English pronunciation, guideline to consonant and vowel, word accent, silent and non-silent letter, Common errors in pronunciation, spelling rules words often misspelled.	04
III	Communicative Grammar and Vocabulary building: parts of speech, sentence structure, tense, change the voice, Direct and Indirect speech, framing questions Vocabulary: word formation, synonyms and antonyms, Idioms and abbreviation. Identifying Common Error in writing and speaking English: Common Errors: Subject-verb agreement, Noun –pronoun agreement, misplaced modifier, Article, prepositions, sequence of tense and identification of tense, word confused, misused.	06
IV	Oral communication: Importance of effective oral communication, introducing oneself and others, oral expressions in various professional contexts, role play, Just A Minute (JAM) activity, speech.	06
V	Nature and style of Sensible writing: Importance of effective writing, paragraph writing techniques, document writing, writing introduction and conclusion, proper punctuation, summarization, precise writing, common errors due to Indianism in English communication.	06
Text Books		
1.	Meenakshi Raman and Sangita Sharma, "Technical Communication: Principles and Practice", 2 nd by Oxford University Press, 2011	
2.	J.D.O Connor, "Better English Pronunciation", 2 nd by Cambridge University Press, 1980	
3.	Wren and Martin, "High School English Grammar and Composition", S Chand and Company Ltd – 2015.	
4.	Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press	
5.	Meenakshi Raman and Sangita Sharma, "Technical Communication: Principles and Practice", 2 nd by Oxford University Press, 2011.	
Reference Books		
1.	Gajendra Singh Chauhan and Et al, "Technical Communication", Cengage learning India Pvt Limited, 2019.	
2.	M Ashraf Rizvi, "Effective Technical Communication", Second Edition by McGraw Hill Education (India) Private	
3.	Randolph Quirk and S Greenbaum, "A University Grammar of English Latest", Pearson 2007	
4.	Sanjay Kumar and Pushplata Communication Skills", Oxford University Press India Pvt Ltd - 2019	
5.	Practical English Usage by Michael Swan, Oxford University Press – 2016	
6.	D Praveen Sam, KN Shoba, "A Course in Technical English", Cambridge University Press – 2020.	
Useful web links		
1.	https://learnenglish.britishcouncil.org	
2.	https://www.fluentu.com	

Year, Program, Semester	F.Y. Part I (All Programs), Semester I							
Course Code	VSEC111							
Course Category	Vocational and Skill Enhancement Courses							
Course Title	Design Thinking and Innovation-I							
Teaching Scheme and Credits	L	T	P	Total Contact Hours			Total Credits	
	01	01	-	02			00	
Evaluation Scheme	ISE	ESE	IE	IPE	EOE	EPE	Total	
	-	-	50	-	-	-	50	
	IE at the course in charge end: (Preferred to have 3-5 assignments and conduct of an MCQ Test based on the course work. Passing is mandatory.							
Pre-requisites(if any)	Prerequisites for this course include a basic knowledge of design thinking principles to engage with the course content effectively. Familiarity with social issues and community engagement is beneficial, as the course focuses on applying design thinking to address social challenges. Strong communication and collaboration skills are essential for successful interdisciplinary teamwork and engaging with diverse stakeholders							
Course Rationale	The purpose of engineering education has to be to transform these graduates who can design. The concept of design or design thinking though complex, it is the robust and it must be developed among the budding graduates so as to make them not alone job seekers but the providers too. Therefore, the particular course is towards preparing engineering graduates as intended to be versatile of all other professionals.							
Course Objectives	<p>The course is aimed at</p> <ol style="list-style-type: none"> 1. Develop a solid foundation in design thinking for user-centered problem-solving and engineering innovation. 2. Enhance ideation, prototyping, and iteration skills to generate creative solutions that effectively address user needs and preferences. 3. Analyze and optimize design alternatives based on user feedback, ensuring continuous improvement and alignment with engineering requirements. 4. Incorporate systems thinking, human factors, sustainability, and ethics into engineering design for socially responsible and user-centric solutions. 							
Course Outcomes	<p>Upon completion of this course, student should be able to-</p> <ol style="list-style-type: none"> 1. Apply design thinking principles to identify user needs, analyze engineering challenges, and generate innovative solutions. 2. Demonstrate proficiency in ideation, prototyping, and iterative design techniques to develop user-centered engineering solutions. 3. Evaluate and enhance design alternatives based on user feedback, ensuring alignment with engineering requirements. 4. Integrate systems thinking, human factors, sustainability, and ethics into engineering design for responsible and user-centric solutions. 							

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	-	-	1	2	-	3	-	-	-	-	-	-
CO 2	-	-	2	2	-	-	-	-	2	-	-	3
CO 3	-	3	2	-	-	-	-	-	2	-	-	-
CO 4	-	-	-	-	-	3	3	2	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours L+T
I.	Introduction to Design Thinking: a) Principles and process of design thinking, user-centered design, and ideation techniques. b) User research skills, rapid prototyping, and testing for iterative design. c) Cultivating a culture of innovation, applying design thinking to engineering problems, and teamwork.	06+06
II.	Design Thinking in Engineering Practice: a) Applying design thinking to engineering challenges, empathy-driven design, and systems thinking. b) Analyzing and evaluating design alternatives, iterative design, and continuous improvement. c) Human factors and ergonomics, sustainability and ethics in design, and effective communication.	06+06

During the tutorial session itself for first 6 sessions, the course facilitator will complete these three sub units interactively while remaining 6 sessions will be free for the students to have the activities for which the following general guidelines to be followed:

General Instructions for course facilitators:

The facilitators may use different student centric teaching learning methods to make the course content more and interesting and meaningful. Some of the following activities may be planned

- a) Brain teasers (aka Puzzle Busters, to be solved individually)
- b) Cartoon captions (small teams)
- c) TRIZ, a systematic ideation method, reading (individual)
- d) Book readings and discussions (small teams)
- e) Small teams' presentations on innovation:(1) innovative individual, (2) innovative company, (3) innovative movie / game, (4) sustainable innovation, (5) innovation in business, (6) innovation in art, (7) innovation in architecture, (8) innovative nation, (9) innovation in science, and (10) innovation in engineering.
- f) Large groups hands-on projects
- g) Eight-dimensional (8D) ideation method examples
- h) Large teams' videos.
- i) Students also will be taken to the **workshop** to experience some kind of hands on training to make carpentry, metal or smithy job.

Reference Books

1.	Lockwood, T., & Papke, E. (2010). Design Thinking: Integrating Innovation, Customer Experience, and Brand Value. Allworth Press.
2.	Lewrick, M., Link, P., & Leifer, L. (2018). The Design Thinking Playbook: Mindful Digital Transformation of Teams, Products, Services, Businesses and Ecosystems. Wiley.
3.	Plattner, H., Meinel, C., & Leifer, L. (Eds.). (2014). Design Thinking Research: Building Innovation Eco-Systems (Understanding Innovation). Springer.
4.	Brown, T. (2009). Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation. Harper Business.
Important web links	
1.	Stanford d.school - https://dschool.stanford.edu/
2.	IDEO U - https://www.ideo.com/

Social Internship: After the First Semester of FY B. Tech the students will undergo social rural internship of 10 days, the evaluation of which will be in the Second Semester

The class teacher jointly with the Program Head and First Year Coordinator will plan for this activity. The following tasks to be thought of before the students proceed for the said social internship and accordingly the students will be guided to complete this internship preferably in a rural part of the state.

- a) Introduction to social internship projects and objectives.
- b) Assignment of social internship teams and project topics.
- c) Guidance on project planning and community engagement strategies.

Year, Program, Semester	F.Y. Part I (All Programs), Semester I and II								
Course Code	BSC111/ BSC121								
Course Category	Basic Science Course								
Course Title	Engineering Chemistry (Theory)								
Teaching Scheme and Credits	L	T	P	Total Contact Hours		Total Credits			
	03	-	-	03		03			
Evaluation Scheme	ISE		ESE		IOE	IPE	EOE	EPE	Total
	40		60		-	-	-	-	100
Pre-requisites(if any)	Knowledge about basic chemistry related to periodic table, properties of elements, physical and chemical properties, etc.								
Course Rationale	Engineering Chemistry imparts essential chemical principles for engineering applications, covering water technology, corrosion control, materials, green chemistry, nanomaterials, analytical techniques, and energy sources. This course equips students with the knowledge to tackle practical engineering challenges and fosters a foundation for innovative solutions.								
Course Objectives	<p>The course is aimed at-</p> <ol style="list-style-type: none"> To enable the students to understand and apply detailed concepts of water source, water impurities, hardness of water and boiler troubles. To enable the students to analyze engineering problems related to metal corrosion and achieving practical solutions for corrosion control. To enrich students with the concepts related to engineering materials like cement, polymers and composites, and meet out the fuel crises in the present scenario for sustainable development. To enable the students to apply principles of green chemistry in chemical synthesis and understand the concepts of synthesis of nanomaterials. To impart the knowledge of basic principles and applications of spectroscopic and other techniques to analyse the compounds. 								
Course Outcomes	<p>Upon completion of this course, student should be able to-</p> <ol style="list-style-type: none"> Develop understanding of water quality parameters and incorporate methods to produce soft water for industrial and domestic use. Analyze engineering problems associated with corrosion and develop suitable preventive measures. Select the appropriate materials for engineering applications. Recognize the current developments in the fields of energy, green chemistry and nanotechnology for sustainable development. Apply and demonstrate the instrumental techniques for analysis of the materials. 								

Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	<p>Water Technology Introduction, Impurities in water, Water Quality Parameters (Definition, Causes and Estimation) like Hardness, Chlorides, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD), Specifications for drinking water, Boiler feed water, Problems associated with use of hard water in boiler, Treatment of water: Ion Exchange Process and Reverse Osmosis.</p>	06
II	<p>Corrosion and Corrosion Control Introduction, Types of corrosion, Atmospheric corrosion, Corrosion due to oxygen and other gases, Electrochemical corrosion, Mechanism of electrochemical corrosion (Hydrogen Evolution and Oxygen Absorption), Galvanic Series, Factors influencing rate of corrosion, Corrosion control methods- Proper selection of material, Cathodic protection (sacrificial anode and impressed current methods), Metallic coating like Hot dipping (Galvanizing and Tinning), Metal cladding, Spraying and Electroplating.</p>	06
III	<p>Engineering Materials Cement: Introduction, Types, Composition of Portland Cement, Setting and Hardening of Cement Polymers: Introduction, Classification, Commercially important polymers with synthesis and applications: PE, PVC, Teflon, Nylon, Bakelite and Silicon Polymers, Biodegradable polymers. Conducting polymers: Introduction, Mechanism of conduction in poly acetylene and its applications. Composites: Introduction, Constitution, Types: Fiber reinforced composites and Particulate composites, applications.</p>	06
IV	<p>Green Chemistry Introduction, 12 principles of green chemistry, Various green chemical approaches Microwave synthesis, Phase transfer catalysis, Synthesis of Adipic acid by conventional and Green route. Nanomaterials Introduction, Synthesis of nanomaterials: Top down and bottom up approaches, characteristics of nanomaterials and applications of nanomaterials, Carbon Nano tubes (properties and applications).</p>	08
V	<p>Modern Analytical Techniques Chemical Analysis, Qualitative and quantitative analysis, Conventional methods of analysis, An overview of modern analytical techniques: Chromatography, Scanning Electron Microscopy (SEM), X-ray Diffraction (XRD), Spectroscopy: Principle, Basic Instrumentation and Applications of Ultraviolet-Visible Spectroscopy and IR spectroscopy.</p>	07
VI	<p>Fuels and Batteries Chemical Fuels: Introduction, Calorific value, Determination of calorific value by Bomb and Boy's Calorimeters, Combustion. Batteries: Introduction, Classification, characteristics, construction, working and applications of Li-ion battery. Fuel Cells: Components of fuel cell, Types of Fuel cells-alkaline fuel cells, Methanol-oxygen fuel cell and Hydrogen-oxygen fuel cell. Bioenergy: Introduction, Classification of biofuel, Biodiesel- production of biodiesel by alkali catalyzed trans-esterification method, Advantages and disadvantages of biodiesel.</p>	06

Text Books	
1.	Satyaprakash & Manisha Agrawal, "Engineering Chemistry", Khanna Book Publishing, Delhi
2.	Shashi Chawla, "A Text Book of Engineering Chemistry", Dhanpat Rai and Co. (P) Ltd.
3.	Bahl and Tuli, "Essentials of Physical Chemistry", S. Chand Publishing
4.	Baskar, "Engineering Chemistry", Wiley
5.	Jain and Jain, "A textbook of Engineering Chemistry", Dhanpatrai Publication.
6.	S. S. Dara, S. "A textbook of Engineering", Chemistry: Chand Publication
Reference Books	
1.	V.R. Gowariker, "Polymer Science", New Age International Publication
2.	K. J. Sundars, "Organic Polymer Chemistry", Springer Publication.
3.	Willard Dean, Merrittee, "Instrumental Methods of Chemical Analysis", Tata McGraw Hill Limited.
4.	Chatwal and Anand, "Instrumental Methods of Chemical Analysis", Himalaya Publishing House, New Delhi.

Year, Program, Semester	F.Y. Part I (All Programs) Semester I and II							
Course Code	BSC111/ BSC121							
Course Category	Basic Science Course							
Course Title	Engineering Chemistry (Practical)							
Teaching Scheme and Credits	L	T	P	Total Contact Hours			Credits	
	-	-	02	02			01	
Evaluation Scheme	ISE		ESE	IOE	IPE	EOE	EPE	Total
	-		-	-	50	-	-	50
Pre-requisites (if any)	Knowledge about basic chemistry related to periodic table, properties of elements and handling of glass wares and chemicals, etc.							
Course Rationale	The Engineering Chemistry Laboratory course offers hands-on experience in essential chemical analysis and synthesis techniques, fostering practical skills in water quality testing, material preparation, and analytical methods. This practical knowledge is crucial for solving real-world engineering problems and enhancing students' proficiency in laboratory practices.							
Course Objectives	The course is aimed at- 1. To impart the knowledge of independent experimental skills and to develop analytical skills for applications in engineering. 2. To provide hands on practice of titrimetric analysis. 3. To analyze various samples by using instrumental methods.							

Course Outcomes	Upon completion of this course, student should be able to- <ol style="list-style-type: none"> 1. Apply basic concepts of chemistry and select the appropriate method for chemical analysis. 2. Analyze the quality of water by determining its quality parameters. 3. Acquire the skill for the preparation of engineering materials like polymers, nanomaterials. 4. Select instrumental techniques for chemical analysis.
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Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	-	-	-	-	-	-	-	-	-
CO2	3	3	-	-	-	2	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	3	3	-	-	-	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Experiment No.	Experiment Title/Objective	Hours
1.	Preparation of standard solution and standardization of a given solution.	02
2.	Determination of total hardness of a water sample using disodium salt.	02
3.	Determination of chloride content of water sample.	02
4.	Determination of alkalinity of water sample by dual indicator method.	02
5.	Determination of viscosity of a given liquid by Ostwald's viscometer	02
6.	Preparation of Polymers (phenol formaldehyde resin/ urea formaldehyde resin)	02
7.	Preparation of chemical compounds using green route.	02
8.	Preparation of nanomaterials.	02
9.	Estimation of rate of corrosion of aluminium in acidic and alkaline medium.	02
10.	Estimation of copper in the given brass solution.	02
11.	Spectrometric/colorimetric determination of concentration of given inorganic sample.	02
12.	Calibration of pH meter and determination of pH of a solution.	02
13.	Demonstration of TLC/paper chromatography.	02

* Instructor may choose any 8-10 experiments from above.

Text Books

1.	Vogel's Text Book of Quantitative Chemical Analysis revised by G. H. Jeffery, J. Bassett, J. Mendham and R.C. Denny, 4 th Edition.
2.	Willard, Merit, Dean and Settle, A text book of Instrumental analysis, 10 th edition 2020.

Reference Books

1.	A. I. Vogel, Quantitative Chemical Analysis, Longman Publication
2.	B. K. Sharma, Instrumental Methods of Chemical Analysis, Goel Publication, Meerut.
3.	Renu Bapna and Renu Gupta, Engineering Chemistry, MacMillan Publishers (India) Ltd,

	Delhi
4.	D. A. Skoog, D. M. West, Fundamentals of Analytical Chemistry, Cengage Learning.

Year, Program, Semester	F.Y. Part I (All Programs) Semester I and II								
Course Code	ESC111/ ESC121								
Course Category	Engineering Science Course								
Course Title	Elements of Civil and Electrical Engineering (Theory)								
Teaching Scheme and Credits	L	T	P	Total Contact Hours			Total Credits		
	04	-	-	04			04		
Evaluation Scheme	ISE		ESE		IOE	IPE	EOE	EPE	Total
	40		60		-	-	-	-	100
Course Rationale	This course is to provide students with a strong foundation in the fundamental principles and concepts of civil and electrical engineering. This foundational knowledge is essential for understanding and applying advanced concepts in specialized areas of engineering.								
Course Objectives	<p>The course is aimed at-</p> <ol style="list-style-type: none"> 1. To inculcate essentials of civil engineering field to the students of all branches of Engineering. 2. To provide the students an illustration of the significance of Civil Engineering profession in satisfying societal need. 3. To introduce fundamental laws, various concepts and theorems related with electrical Engineering. 4. To provide fundamental knowledge about AC, DC and magnetic circuits. 								
Course Outcomes	<p>Upon completion of this course, student should be able to-</p> <ol style="list-style-type: none"> 1. Understand fundamental aspects of civil engineering. 2. Determine the plan and set out a building. 3. Apply types of traversing for calculations of the included angle. 4. Apply methods of levelling for calculation of reduce levels of different points on the surface of the earth. 5. Understand use of various building materials and explain the method of construction of different components of building and building services. 6. Understand the basic concepts of Electrical and Magnetic circuits. 7. Apply and analyze the resistive circuits using star-delta conversion, KVL and KCL under DC supply. 8. Understand the basics of single phase and three phase circuit. 								

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	3	2	-	-	-	-	-	-	-	-	-	-
CO4	2	3	-	-	-	-	-	-	-	-	-	-
CO5	2	3	-	-	-	-	-	-	-	-	-	-
CO6	3	3	-	-	-	-	-	-	-	-	-	-
CO7	3	3	-	-	-	-	-	-	-	-	-	-
CO8	2	3	-	-	-	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	<p>Introduction to Civil engineering and Modern surveying</p> <p>Introduction to civil engineering, various disciplines of civil engineering, relevance of civil engineering in overall infrastructural development of the country, Introduction to types of buildings as per National Building Code, Components of residential building and their functions</p> <p>Surveying: Principle and objectives of surveying.</p> <p>Linear measurement: Instrument used, tapes, types of tapes.</p> <p>Angular measurement: Instrument used, meridian, bearing. Problems based on open and closed traversing.</p> <p>Levelling: Instrument used, Terminology, Types of leveling, and Methods of leveling, Introduction to contour.</p> <p>Modern surveying: Introduction to total station and electronic distance meter.</p>	10
II	<p>Building planning and services</p> <p>Introduction to planning of residential building, site plan, orientation of building, open space requirement, FSI, position of doors and windows, size of room, building bye laws. Introduction to various building area terms: Computation of plinth area/built up area, floor area/carpet area for a single storey building.</p> <p>Basic infrastructure and services - Elevators, escalators, ramps, air conditioning, towers, chimney and water tank, concept of intelligent buildings.</p>	05
III	<p>Building construction materials</p> <p>Brick and cement block – properties and specifications.</p> <p>Cement – OPC properties, grades and others types of cement and its uses.</p> <p>Cement mortar – constituents and preparations.</p> <p>Concrete – PCC and RCC.</p> <p>Steel – Uses of steel in building construction, types and market forms.</p>	05
IV	<p>DC Networks</p> <p>Concepts of linear, nonlinear, active, passive, unilateral and bilateral elements; Ideal and practical voltage & current sources, conversion from one from the other; Kirchhoff's laws, statements; Mesh Analysis; Nodal Analysis; Delta-Star & Star-Delta conversion; and its application.</p> <p>Magnetic circuits: Magnetic effect of an electric current, Concept of mmf, flux, flux density, reluctance, permeability and field strength, their units and relationships. Simple series magnetic circuit , comparison of electric and magnetic circuit, force on current carrying conductor placed in magnetic field, Fleming's left hand rule. Faradays laws of electromagnetic induction.</p>	07
V	<p>AC Fundamentals</p> <p>Sinusoidal voltages and currents, their mathematical and graphical representation, Concept of cycle, Period, frequency, instantaneous, peak(maximum), average and r.m.s. values, peak factor and form factor. Phase difference, lagging, leading and in phase quantities.</p>	06
VI	<p>Single Phase AC Circuits</p> <p>Study of AC circuits consisting of pure resistance, pure inductance, pure capacitance,</p>	07

	series R-L, R-C and R-L-C circuits, phasor diagrams, voltage, current and power waveforms, concept of impedance, concept of active, reactive, apparent power and power factor.	
Text Books		
1.	S. S. Bhavikattis, "Basic Civil Engineering", New Age International Pvt. Ltd	
2.	G.K.Hiraskar, "Basic Civil Engineering", Dhanapat Rai Publications	
3.	V. N. Mittal and Arvind Mittal "Basic Electrical Engineering" Tata McGraw Hill, (Revised Edition)	
4.	B.L. Theraja, "Electrical Engineering " Vol-I and II	
5.	V.K.Mehta, " Fundamentals of Electrical Technology", S.Chand Publications	
Reference Books		
1.	Gopi. S., Basic civil engineering Person publishers	
2.	Kandya A. A., Elements of civil engineering, Charotar publishing house	
3.	McKay, W. B. and McKay J. K. Building construction Volume I to IV, Person India education services	
4.	Rangwala S. C., Essentials of civil engineering, Charotar publishing house	
	Rangwala S. C. and Dalal K. B. Building construction, Charotar publishing house	
5.	L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011.	
6.	D. C. Kulshreshtha, Basic Electrical Engineering, McGraw Hill, 2009.	
Useful web links		
1.	https://www.youtube.com/watch?v=SvE3NGflrJ4&list=PLEtCpM3x4BD8iVQLMyXNCTcXP6dl-SDBz&index=1	
2.	https://www.youtube.com/watch?v=2eKR8b7q8K4&list=PLkEhIYDhJ6xN7lsr6rc7d5awH5WTmpxG	
3.	http://nptel.ac.in/courses/105107122/	
4.	https://nptel.ac.in/courses/105104100	
5.	https://www.digimat.in/nptel/courses/video/108105112/L01.html	
6.	https://nptel.ac.in/courses/108105053	

Year, Program, Semester	F.Y. Part I (All Programs) Semester I and II							
Course Code	ESC111/ ESC121							
Course Category	Engineering Science Course							
Course Title	Elements of Civil and Electrical Engineering (Practical)							
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Credits			
	-	-	02	02	01			
Evaluation Scheme	ISE		ESE	IOE	IPE	EOE	EPE	Total
	-		-	-	50	-	-	50
Course Rationale	This course is to provide students with a strong foundation in the fundamental principles and concepts of civil and Electrical engineering. This foundational knowledge is essential for understanding and applying advanced concepts in specialized areas of engineering.							
Course Objectives	<p>The course is aimed at-</p> <ol style="list-style-type: none"> To learn methods of surveying for the preparation of plan. To identify components of buildings, materials used in the construction. To expose the students for practical training through experiments to understand about fundamental parameters such as resistance, inductance, capacitance and magnetic, AC and DC circuits. To make them understand electrical safety precautions. 							
Course Outcomes	<p>Upon completion of this course, student should be able to-</p> <ol style="list-style-type: none"> Experiment to plot the outline of building. Establish surveying and levelling instruments for finding included angles and reduce levels. Explain the components of different types of construction. To conduct experiments on D.C. circuits and AC circuits. To understand the basics laws of magnetic circuit. 							

Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

Experiment No.	Experiment Title/Objective	Hours
1.	Plotting the outline of building by measuring tape.	02
2.	Plotting of closed traverse by Prismatic compass and Surveyor Compass.	02
3.	Determination of Reduced Levels by using dumpy level (Use of Collimation Plane and Rise and Fall method).	02
4.	Use of Total Station to measure angle, R.L., elevation.(Demonstration)	02
5.	Field visit showing various types of construction and prepare field visit report.	02
6.	Study the verification of Kirchhoff's law and Ohm's Law.	02
7.	Transient analysis of series RL and RC circuit.	02
8.	Study of BH curve for magnetic material.	02
9.	Study of series RLC circuit.	02
10.	Study of various power factor improving methods.	02
Text Books		
1.	S. S. Bhavikattis, "Basic Civil Engineering", New Age International Pvt. Ltd	

2.	G.K.Hiraskar, "Basic Civil Engineering", Dhanapat Rai Publications
3.	Fundamentals of Electrical Engineering by Ashfaq Husain, Dhanpat Rai Company
Reference Books	
1.	B.C. Punmia, "Surveying", Vol.- I, Vol.-II, Vol.-III, Laxmi Publication
2.	K.R.Arora, " Surveying Vol.I", Standard Book House
3.	L. S. Bobrow, —Fundamentals of Electrical Engineering, Oxford University Press, 2011

Year, Program, Semester	F.Y. Part I (All Programs) Semester I and II								
Course Code	ESC112/ ESC122								
Course Category	Engineering Science Course								
Course Title	Engineering Graphics (Theory)								
Teaching Scheme and Credits	L	T	P	Total Contact Hours		Total Credits			
	04	-	-	04		04			
Evaluation Scheme	ISE		ESE		IOE	IFE	EOE	EPE	Total
	40		60		-	-	-	-	100
Pre-requisites(if any)	Knowledge of plane geometry and solid geometry								
Course Rationale	Engineering Graphics introduces students to the essential principles and practices of technical drawing, including orthographic and isometric projections, and computer-aided design (CAD). This course equips students with the skills to create precise graphical representations of engineering objects, which are crucial for effective communication and design in engineering.								
Course Objectives	The course is aimed at- <ol style="list-style-type: none"> 1. The course is aimed at developing Basic Graphic skills. 2. To learn the engineering graphics standards. 3. To develop Skills in Reading and Interpretation of Engineering Drawings. 4. To introduce Computer-Aided Drafting tools. 								
Course Outcomes	Upon completion of this course, student should be able to- <ol style="list-style-type: none"> 1. Identify basic concepts of BIS conventions and their application. 2. Interpret first angle and third angle projection system. 3. Construct orthographic projections of points, lines and planes. 4. Apply principles of projection and construct orthographic and isometric views of an object. 5. Develop a skill of visualization to understand and read the drawing. 								

Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	Introduction to Engineering Drawing Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections, Cycloid, Involutes.	08
II	Orthographic Projections of Points, lines & Planes Principles of Orthographic Projection - Conventions; Projection of Points and lines inclined to both planes (line in first quadrant only). Projection of planes – inclined Planes and auxiliary Planes.	09
III	Projections of Regular Solids. Projection of Prisms, Pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes, solids in first quadrant and resting on HP only.	08
IV	Orthographic Projections Different types of lines, Selection of views, spacing of views, dimensioning and sections, Conversion of pictorial view into orthographic view including sectional orthographic view.	09
V	Isometric projections Principles of Isometric Projection, Isometric scale, Isometric projections and Isometric views / drawings. Circles in isometric view. Isometric views of simple solids and objects.	08
VI	Introduction to Computer Aided Sketching Introduction to CAD software, Graphical User interface of CAD software, Selection of Drawing size and scale, Standard Toolbars, Menus, Tabs, navigational tools, Basic Commands to draw 2D objects, Co-ordinate system and planes, Viewing Commands.	08

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

Text Books

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing House.
2. Engineering Drawing and Graphics by K. Venugopal, New Age Publication.
3. P. S. Gill, Engineering Drawing, S. K. Katariya & sons Publication.

Reference Books

1. Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education
2. Narayana, K.L. & P Kannaiah (2008), Text book on Engineering Drawing, SciTech Publishers
3. Agrawal B. & Agrawal C. M. (2012), Engineering Graphics, TMH Publication
4. Jain, Maheshwari, Gautam (2021), Engineering Graphics & Design, Khanna Book Publishing.

Alternative NPTEL/SWAYAM Course

Sr. No.	NPTEL Course Name	Instructor	Host Institute
1.	Prof. Rajaram Lakkaraju	IIT Kharagpur	Engineering Drawing And Computer Graphics
2.	Prof. Nihar Ranjan Patra	IIT Kanpur	Engineering Graphics

Useful web links

1.	https://nptel.ac.in/courses/112103019/ National Programme on Technology Enhanced Learning (NPTEL) - Phase II Course Name : Engineering Drawing
2.	https://nptel.ac.in/courses/112/104/112104172/
3.	http://moodle.unishivaji.ac.in/course/search.php?search=engineering+graphics

	Moodle Services, Shivaji University, Kolhapur
4.	http://web.iitd.ac.in/~achawla/public_html/201/lectures/sp46.pdf

Year, Program, Semester	F.Y. Part I (All Programs) Semester I and II								
Course Code	ESC112/ ESC122								
Course Category	Engineering Science Course								
Course Title	Engineering Graphics (Practical)								
Teaching Scheme and Credits	L	T	P	Total Contact Hours			Credits		
	-	-	02	02			01		
Evaluation Scheme	ISE		ESE		IOE	IPE	EOE	EPE	Total
	-		-		-	50	-	-	50
Pre-requisites(if any)	Knowledge of plane geometry and solid geometry								
Course Rationale	Engineering Graphics Laboratory provides hands-on experience in technical drawing, covering lettering, projections, surface development, and CAD software. This course enhances students' practical skills in creating accurate engineering drawings, essential for effective design and communication in engineering projects.								
Course Objectives	The course is aimed at- <ol style="list-style-type: none"> 1. Fundamental Engineering Graphics standards. 2. Dimensioning and preparation of neat drawings. 3. Reading and Interpretation of Engineering Drawings. 4. Exposure to Computer-Aided Drafting tools. 								
Course Outcomes	Upon completion of this course, student should be able to- <ol style="list-style-type: none"> 1. Identify and implement B.I.S. code of practice for Engineering Drawing. 2. Create geometrical constructions with hand tools. 3. Construct orthographic projection and sectional view of a machine part. 4. Create isometric projection from multiview drawings of an object. 5. Sketch projection of solids and development of lateral surfaces of solids. 								

Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

Experiment No.	Experiment Title/Objective	Hours
1.	Lettering and geometrical constructions	02
2.	Engineering curves	02
3.	Projections of Points and lines	02
4.	Projections of planes	02
5.	Projections of solids	02

6.	Development of lateral surfaces of solids	02
7.	Orthographic projections	02
8.	Isometric projections	02
9.	Demonstration of drafting software with commands	02
All these sheets should be drawn on half imperial (A2 size) drawing sheets only		
Text Books		
1.	Bhatt N. D., Panchal V. M. & Ingle P. R., (2014), Engineering Drawing, Charotar Publishing House	
2.	Engineering Drawing and Graphics by K. Venugopal, New Age Publication	
3.	P. S. Gill, Engineering Drawing, S. K. Katariya & sons Publication.	
Reference Books Or Web links		
1.	Engineering Drawing Practice for Schools and Colleges- BUREAU OF INDIAN STANDARDS	
2.	Shah, M.B. & Rana B.C. (2008), Engineering Drawing and Computer Graphics, Pearson Education	
3.	CAD Software Theory and User Manuals	
4.	http://web.iitd.ac.in/~achawla/public_html/201/lectures/sp46.pdf	
5.	https://nptel.ac.in/courses/112/104/112104172/	

Year, Program, Semester	F.Y, Part I (All Programs) Semester I and II								
Course Code	ESC113/ ESC123								
Course Category	Engineering Science Course								
Course Title	Electrical-Electronic Components and Devices (Theory)								
Teaching Scheme and Credits	L	T	P	Total Contact Hours			Total Credits		
	02	-	-	02			02		
Evaluation Scheme	ISE		ESE		IOE	IPE	EOE	EPE	Total
	40		60		-	-	-	-	100
Pre-requisites(if any)	Knowledge of Basic Physics and Mathematics ,electron theory, electricity, potential and kinetic energy								
Course Rationale	The course offers practical knowledge and skills for understanding and applying various instruments, devices, and systems in real-world scenarios. Studying this course enhances technical competence, critical thinking, problem-solving abilities, and adaptability to evolving technologies in electrical engineering.								
Course Objectives	The course is aimed at- <ol style="list-style-type: none"> 1. Developing the fundamental understanding of DC and AC Machine. 2. Developing the awareness about Green energy & Power system. 3. Developing the fundamental understanding of various electronics components. 4. Developing the fundamental understanding of Number systems and logic gates. 								
Course Outcomes	Upon completion of this course, student should be able to- <ol style="list-style-type: none"> 1. Recognise the concept of DC machine and AC machines. 2. Understand the basics of power systems. 3. Understand the basics of electrical safety rules. 4. Recognise the basics of electronic components and their practical use. 5. Understand the basics of logic gates and number systems. 								

Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	DC Machine DC Generator: Working principle of DC machine as generator and motor, constructional features, EMF equation of generator, types of DC generators DC Motor: Back EMF and its significance, types of DC motors, numerical problems, Applications of DC Motors	04
II	AC Machines Induction motors: Concept of rotating magnetic field, principle of operation, types and constructional features, Slip and its significance, Illustrative examples Transformers: Principle of operation and construction of single phase transformers (core and shell type), EMF equation, power losses, efficiency, illustrative problems on EMF equation.	04
III	Basics of Power systems Introduction, Single Line Diagram of AC Power Transmission System Safety & Protection: Electric shock & Precautions, HRC Fuse, circuit breaker & its types Earthling: necessity.	04
IV	Resistors Concept of resistors, classification, specification: - maximum power rating, tolerance. Construction of carbon film, wire wound resistors, potentiometer, LDR. Color coding.	04
V	Capacitors and Inductors Classification of capacitors, specification, Fixed capacitor - construction, specification and application of disc, ceramic capacitor, aluminium electrolytic capacitor. Variable capacitor- Trimmer capacitor. Inductor : construction and application of air core, iron core, ferrite core inductor	04
VI	Number Systems: Binary Number System, Hexadecimal Number System, octal number system , inert conversion of number systems Logic gates: NOT Gate, AND Gate, OR Gate, XOR Gate, NAND Gate, NOR Gate, X-NOR Gate	04
Text Books		
1.	V. N. Mittal and Arvind Mittal "Basic Electrical Engineering" Tata McGraw Hill,(Revised Edition)	
2.	D P Kothari and I J Nagrath "Theory and Problems of Basic Electrical Engineering", PHI 13th edition 2011.	
3.	Robert Boylestad ,Louis Nashelsky, Electronic Devices and Circuits,Pearson,11 th edition,2015	
4.	R.P.Jain,"Modern Digital Electronics", Tata McGraw Hill,4th edition 2009	
Reference Books		
1.	Edward Hughes: Electrical and Electrical Technology, Pearson Education (Tenth edition)	
2.	Electrical Technology By H.Cotton.	

3.	Allen Mottershead. (PHI)"Electronics Devices & Circuits".		
4.	Thomas L. Floyd "Electronics Devices".		
Alternative NPTEL/SWAYAM Course			
Sr. No.	NPTEL Course Name	Instructor	Host Institute
1.	Basic Electrical Technology	Prof. N.K.De, Prof. G.D.Roy	IIT Khargpur
2.	Fundamentals of Electrical Engineering	Prof. Debapriya Das	IIT Khargpur
Useful web links			
1.	https://archive.nptel.ac.in/courses/108/105/108105112/		
2.	https://nptel.ac.in/courses/108105112		
3.	https://www.digimat.in/nptel/courses/video/108108076/L01.html		
4.	https://www.digimat.in/nptel/courses/video/108108076/L34.html		

Year, Program, Semester	F.Y, Part I (All Programs) Semester I and II							
Course Code	ESC113/ ESC123							
Course Category	Engineering Science Course							
Course Title	Electrical-Electronic Components and Devices (Practical)							
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Credits			
	-	-	02	02	01			
Evaluation Scheme	ISE		ESE	IOE	IPE	EOE	EPE	Total
	-		-	-	50	-	-	50
Pre-requisites(if any)	-							
Course Rationale	This course aims to give a practical understanding of electrical engineering applications in day to day life.							
Course Objectives	<p>The course is aimed at-</p> <ol style="list-style-type: none"> 1. To make the students familiar with suitability of various electronics components and transducers for different application. 2. To Impart Knowledge about basics of Semiconductor Devices and its parameters. 3. To impart knowledge of the concepts of transformer, different energy conversions machines. 4. To make them understand electrical safety precautions. 							
Course Outcomes	<p>Upon completion of this course, student should be able to-</p> <ol style="list-style-type: none"> 1. Understand the basics of Electronics component. 2. Identify and explain the Basic gates. 3. Understand the applications of various rotating machines. 4. Study the speed control methods for DC motor. 							

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	-	-	-	-	-	-	-	-	-	-
CO2	2	3	-	-	-	-	-	-	-	-	-	-
CO3	2	3	-	-	-	-	-	-	-	-	-	-
CO4	3	2	-	-	-	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Experiment No.	Experiment Title/Objective	Hours
1.	To study of speed control methods of DC Shunt motors	02
2.	To study of speed control methods of DC Series motors	02
3.	To study of DC and AC motor Starters	02
4.	Study of various wiring systems and switchgear	02
5.	To demonstrate different types of electrical protection equipment such as fuses, MCB, MCCB, ELCB.	02
6.	Testing of electronics components- Resister, capacitor, inductor diode ,Transistor ,LED and switch using multi-meter and CRO	02
7.	Logic gates and truth table verification.	02
8.	To study safety precautions while working on electrical systems, handling of various equipment's such as multimeter, ammeters, voltmeters, wattmeter's, real life resistors, inductors and capacitors	02
All these sheets should be drawn on half imperial (A2 size) drawing sheets only		
Text Books		
1.	Ashfaq Husain, "Fundamentals of Electrical Engineering", Dhanpat Rai Company	
Reference Books		
1.	L. S. Bobrow, Fundamentals of Electrical Engineering, Oxford University Press, 2011	
2.	D.C. Kulshreshtha, Basic Electrical Engineering, McGraw Hill, 2009	

Year, Program, Semester	First Year B.Tech (Food Technology), Semester II							
Course Code	BSC122							
Course Category	Basic Science Course							
Course Title	Engineering Mathematics-II (Food Technology) (Theory)							
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits			
	03	01	-	04	4			
Evaluation Scheme	ISE		ESE	IOE	IPE	EOE	EPE	Total
	40		60	50	-	-	-	150
Pre-requisites(if any)	Engineering Mathematics-I							
Course Objectives	<p>The course is aimed at-</p> <ol style="list-style-type: none"> To familiarize the students with Integral calculus. To teach Mathematical methodologies and models. To familiarize the students with differential calculus. The course teacher will explain Vector Differentiation and Vector Integration. The course teacher will introduce probability and its application. The Course is aimed at familiarizing with correlation and regression 							

Course Outcomes	<p>Upon course completion, students will be able to:</p> <ol style="list-style-type: none"> 1. Understand and Apply the knowledge of Integral calculus, to solve the mathematical problems. 2. Understand how to solve double and triple integrals. 3. Understand and Apply the knowledge of differential calculus, to solve the mathematical problems. 4. Analyze and solve engineering problems using vector differentiation. 5. Solve engineering problems using Probability. 6. Gain the basic knowledge of correlation and regression
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Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	2										
CO 2	3	2										
CO 3	3	2										
CO 4	1	2	3									
CO 5	3	3		2	2	1						
CO 6	3	2			2							

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	Integration: Definition of Integration as antiderivative, Indefinite integrals, Definite integrals, Algebra of integrals, Integrals of some standard functions, Rules of integration, Double integral, Triple Integral.	6
II	Applications of Integrals: Applications of Integrals to Area under the curve, Area enclosed by plane curves, Mass of a Plane Lamina, Moment of Inertia of a plane lamina and Volume of solid of revolution.	6
III	Differential Equations of first order and first degree and its Applications Exact differential equations, Equations reducible to exact equations, Linear differential equations, Equations reducible to Linear equations, Applications to Orthogonal trajectories and to Simple Electrical Circuits	7
IV	Vector Calculus: Vectors and their types, Algebra of Vectors, Dot Product of Vectors, Cross Product of Vectors, Triple Product of Vectors, Vector functions, Gradient, Divergence, Directional derivative and curl.	7
V	Probability: Random variable, Mean, Variance, Standard deviation, Probability mass function and probability density function, Binomial distribution, Poisson distribution and Normal distribution.	6
VI	Curve Fitting: Fitting of Curves by method of Least-squares for linear, parabolic, and exponential, Coefficient of correlation, Spearman's rank correlation, coefficient and lines of regression of bivariate data.	7

Text Books		
1.	B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi.	
2.	Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons	
3.	B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi.	
Reference Books		
1.	C. R. Wylie, "Advanced Engineering Mathematics", McGraw Hill Publication, New Delhi	
2.	H. K. Dass, "Advanced Engineering Mathematics", S. Chand Publishing.	
3.	N. P. Bali, Iyengar "A text book of Engineering Mathematics by", Laxmi Publications (P)Ltd., New Delhi.	
4.	M. D. Greenberg, "Advanced Engineering Mathematics", Pearson Education. Useful web links	
5.	S. S. Sastry, "Engineering Mathematics (Volume-I)", Prentice Hall Publication, New Delhi.	
6.	Shanti Narayan, "Differential Calculus" S. Chand and company, New Delhi.	
Useful web links		
1.	https://nptel.ac.in/courses/111105121	
2.	https://nptel.ac.in/courses/111106100	
3.	https://nptel.ac.in/courses/111107119	
4.	https://nptel.ac.in/courses/111105134	

Year, Program, Semester	F.Y, Part I ((All Programs except Food Technology)) Semester II								
Course Code	BSC122								
Course Category	Basic Science Course								
Course Title	Engineering Mathematics-II (Programs other than Food Technology) (Theory)								
Teaching Scheme and Credits	L	T	P	Total Contact Hours		Total Credits			
	03	01	-	04		04			
Evaluation Scheme	ISE		ESE		IOE	IPE	EOE	EPE	Total
	40		60		50	-	-	-	150
Pre-requisites(if any)	Differential Calculus, Basics of Integration								
Course Rationale	This course equips students with advanced mathematical techniques essential for engineering analysis. Covering special functions, curve tracing, multiple integrals, complex variable integration, and MATLAB programming, this course provides the analytical tools necessary for solving complex engineering problems and conducting sophisticated mathematical modeling.								
Course Objectives	The course is aimed at- <ol style="list-style-type: none"> To familiarize the students with integral calculus. To teach Mathematical methodologies and models. To develop mathematical skills and enhance logical thinking power of students. To provide students with skills in special functions, integral calculus, complex integration which would enable them to devise engineering solutions for given situations they may encounter in their profession. 								

Course Outcomes	<p>Upon completion of this course, student should be able to-</p> <ol style="list-style-type: none"> 1. To understand the concept of special functions and curve tracing related to multiple integral and various branches of engineering. 2. To understand how to solve double and triple integrals 3. Apply the knowledge of evaluation of multiple integral to various engineering problems. 4. Evaluation and analysis of complex integration. 5. Understand the features of the Matlab software and its applications.
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Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	Special Functions Gamma functions and their properties, Beta functions and their properties, Differentiation under integral sign.	07
II	Curve Tracing Tracing of curves in Cartesian coordinate system (Simple curves, Semi cubical parabola, Cissoid of Diocles, Strophoid, Astroid, Witch of Agnesi and Common Catenary), Tracing of curves in Polar coordinate system (Simple curves, Cardioid, Pascal's Limacon, Lemniscate of Bernoulli and Rose curves)	06
III	Multiple Integrals Introduction of Double Integrals, Evaluation of Double Integrals, Change of order of Integration, Change of variables using Jacobians, Change into Polar coordinates, Evaluation of Triple Integral with given limits.	07
IV	Applications of Multiple Integrals Applications of Multiple Integrals to Area enclosed by plane curves, Mass of a Plane Lamina, Moment of Inertia of a plane lamina and Volume of solid of revolution.	07
V	Functions of Complex Variables: Integration Complex line integrals, Cauchy's integral theorem (without proof), Cauchy's integral formula (without proof), Taylor series, Laurent series, zeros of analytic functions, singularities, and Cauchy's Residue theorem (without proof).	07
VI	Programming with Matlab Introduction, Installation, Basic functions of Matlab, Plotting of 2D and 3D Curves, Finding Indefinite Integral, Finding Definite Integral, Plotting of Complex function, Complex Line Integrals.	06
	Suggested list of Tutorials and Assignments- <ol style="list-style-type: none"> 1. Gamma function 2. Beta function 3. Curve tracing 4. Double and Triple Integration 5. Change of order of Integration 6. Change of variables using Jacobians 7. Applications of Multiple integrals 8. Cauchy's Integral theorem and Cauchy's integral formula 	

	<p>9. Taylor series and Laurent series</p> <p>10. Cauchy's Residue theorem</p> <p>General Instructions:</p> <ol style="list-style-type: none"> 1. Each Student has to write at least 6 assignments on entire syllabus and at least 4 assignments on Matlab programming (including print out). Students must be encouraged to write mathematical programs in tutorial class only. 2. Batch wise tutorials are to be conducted. The number of students per batch should be as per the practical batches. 3. Matlab assignments will be based on <ol style="list-style-type: none"> i. Tracing of 2D and 3D Curves ii. Finding Indefinite and Definite Integrals iii. Double and triple integral iv. Plotting of Complex function v. Complex line integrals 	
Text Books		
1.	B. S. Grewal, "Higher Engineering Mathematics", Khanna Publishers, New Delhi.	
2.	Erwin Kreyszig, "Advanced Engineering Mathematics", John Wiley & Sons.	
3.	B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill, New Delhi.	
4.	William J. Palm III, Introduction to MATLAB for Engineers, McGraw-Hill.	
Reference Books		
1.	H. K. Dass, "Advanced Engineering Mathematics", S. Chand Publishing.	
2.	Dr. B. S. Grewal, "Numerical Methods", Khanna Publishers, Delhi.	
3.	Merle C. Potter, "Advanced Engineering Mathematics", OXFORD University Press, 3rd Edition.	
4.	C. R. Wylie, "Advanced Engineering Mathematics", McGraw Hill Publication, New Delhi.	
5.	S. S. Sastry, "Engineering Mathematics (Volume-I)", Prentice Hall Publication, New Delhi.	
6.	M. D. Greenberg, "Advanced Engineering Mathematics", Pearson Education.	
Useful web links		
1.	https://nptel.ac.in/courses/111105121	
2.	https://nptel.ac.in/courses/111107119	
3.	https://nptel.ac.in/courses/111105134	
4.	https://nptel.ac.in/courses/111105167	

Year, Program, Semester	F.Y. Part I (All Programs) Semester II				
Course Code	IKS121				
Course Category	Indian Knowledge System				
Course Title	Human Rights and Constitution				
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits
	01	-	-	01	01
Evaluation Scheme	ISE	ESE	IE	IOE	Total
	-	-	50	-	50
	IE at the course in charge end: (Preferred to have 3-5 assignments and conduct of an MCQ Test based on the course work. Passing is mandatory to earn the credit.				
Pre-requisites(if any)	Prerequisite for first-year engineering students is the interest in social justice issues and the ability to think critically and analytically is important.				

Course Rationale	The course provides engineering students with a multidisciplinary perspective, allowing them to apply their technical knowledge to contribute to human rights promotion and protection in engineering contexts. Ultimately, students gain the knowledge, skills, and values necessary to navigate the complexities of human rights issues and contribute to their promotion and protection in various aspects of life.
Course Objectives	The course is aimed at- <ol style="list-style-type: none"> 1. Develop a comprehensive understanding of the fundamental principles of human rights and their relevance to the Indian Constitution. 2. Cultivate critical thinking and analytical skills for analyzing and addressing human rights issues within engineering contexts. 3. Foster awareness of the legal framework and mechanisms for protecting human rights, enabling students to become advocates for social justice. 4. Promote ethical and inclusive citizenship among engineering students, emphasizing the importance of upholding human rights in their professional and personal lives.
Course Outcomes	Upon completion of this course, student should be able to- <ol style="list-style-type: none"> 1. Understand the fundamental principles of human rights and their application in engineering contexts. 2. Apply critical thinking skills to analyze and address human rights issues within engineering projects. 3. Evaluate the legal framework and mechanisms for protecting human rights and propose strategies for advocacy in engineering practice. 4. Demonstrate ethical and inclusive citizenship by integrating human rights principles into professional conduct in engineering settings.

Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	Introduction to Human Rights and Indian Constitution: a) Overview of human rights principles and concepts b) Introduction to the Indian Constitution and its significance in protecting human rights	02
II.	Fundamental Rights and Citizenship: a) Understanding fundamental rights in the Indian Constitution b) Citizenship rights and their implications on human rights	02
III.	Social Justice and Equality: Equality before the law and anti-discrimination provisions Rights of marginalized communities and affirmative action policies	02
IV.	Rights of Women and Children: a) Gender equality and women's rights under the Indian Constitution b) Child rights, protection, and welfare laws in India	02
V.	Freedom of Expression and Media Rights:	02

	a) Freedom of speech and expression in the Indian context b) Media rights, press freedom, and challenges in the digital age	
VI.	Human Rights Institutions and Enforcement: a) National and international human rights institutions b) Human rights enforcement mechanisms and legal remedies	02
Reference Books		
Sr. No.	Reference Books	
1.	Baxi, Upendra. The Future of Human Rights. Oxford University Press, 2008.	
2.	Basu, Durga Das. Introduction to the Constitution of India. LexisNexis, 2019.	
3.	Bhagwati, P. N., & Desai, S. M. Human Rights: International Challenges. Eastern Book Company, 2012.	
4.	Mookherjee, Monika, & Shiva Rao, B. R. Perspectives on Human Rights. Oxford University Press, 2018.	
5.	Murthy, S. N. Human Rights in India: Historical, Social, and Political Perspectives. Oxford University Press, 2006.	
6.	Shah, A. G. The Constitution of India: Select Issues in Historical Perspective. Oxford University Press, 2014.	
Important web links		
Sr. No.	Important web links	
1.	Human Rights Watch: https://www.hrw.org/	
2.	National Human Rights Commission (NHRC): https://nhrc.nic.in/	
3.	Ministry of Law and Justice, Government of India: https://www.molaw.gov.in/	
4.	United Nations Human Rights: https://www.ohchr.org/	

Year, Program, Semester	F.Y. Part I (All Programs) Semester II								
Course Code	HSMEC121								
Course Category	Humanities and Social Sciences , Management, Environment Courses								
Course Title	Professional Communication (English)-II								
Teaching Scheme and Credits	L	T	P	Total Contact Hours			Total Credits		
	02	-	-	02			00		
Evaluation Scheme	ISE		ESE		IE	IPE	EOE	EPE	Total
	-		-		50	-	-	-	50
	IE at the course in charge end: (Preferred to have 3-5 assignments and conduct of an MCQ Test/Viva Voce based on the course work. Passing is mandatory.								
Pre-requisites(if any)	Students must have the knowledge of basic English grammar, writing and reading skill.								
Course Rationale	Professional Communication (English) II enhances essential communication skills for professional success, covering business correspondence, job application techniques, and workplace communication. This course focuses on developing listening, reading, and interpersonal skills, as well as corporate communication strategies, equipping students to excel in various professional contexts.								
Course Objectives	The course is aimed at- 1. To acquire the techniques of letter, E-Mail writing.								

	<ol style="list-style-type: none"> 2. To learn drafting CV, cover letter, report and proposal writing. 3. To learn interview techniques and group discussion skill. 4. To develop reading and listening skill for better communication. 5. To be acquaint workplace communication and etiquettes.
Course Outcomes	<p>Upon completion of this course, student should be able to-</p> <ol style="list-style-type: none"> 1. Write various types of business letters and official correspondences and to make students familiar with E-communication. 2. Learn the essentials of communication skill for the employment. 3. Get ample practice of listening and reading skill. 4. Acquaint with various soft skills and etiquettes at work place.

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	-	-	3	-	2
CO2	-	-	-	-	-	-	-	-	-	3	-	2
CO3	-	-	-	-	-	-	-	-	-	3	-	2
CO4	-	-	-	-	-	-	-	-	-	3	-	2

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	Professional Correspondence: Principles, Features, Types, Format and layout of Business letter. Types of Business Correspondence – letters of Enquiry, Quotation, Order, Instructions, Sales, Credit, Complaint, Collection etc. E-mail writing	06
II.	Communication skill for Employment: Job Application letters -- Covering letter, Resume, C.V. Interview skill, Group Discussion skills - Features and Importance, presentation skills - Features, Types, Structure, Aids and Importance, Technical Proposal- Writing technical proposals. Technical Report -- Writing Technical Reports.	06
III.	Developing listening skill: difference between Hearing and Listening, listening process, Traits of good listener, Techniques to improve listening skills with audio/video sample.	04
IV.	Reading skill: Importance of effective reading, types of reading, (Skimming; Scanning, Intensive reading, Extensive reading) Overcoming common obstacles, reading comprehension, tips and strategies to improve reading skill.	04
V.	Professional Communication at workplace: Soft skills. Kinesics, Para language, Interpersonal communication skills – Role of Personality and its various attributes like EQ, attitude, motivation, stress management and accepting criticism in determining efficacy of interpersonal communication, oral expressions in various professional contexts, Telephonic Etiquette. Corporate communication skills – Role of business etiquette, conducting meetings, managing conflict, negotiation, team spirit, decision-making, time management and problem solving skills.	06
Text Books		
1.	A Textbook of English Language Communication Skills, (ISBN-978-81-955465-2-7), Published by Infinite Learning Solutions, Bengaluru - 2022.	
2.	Technical Communication – Principles and Practice, Third Edition by Meenakshi Raman and Sangeetha Sharma, Oxford University Press 2017.	
3.	David Irwin, "Effective Business Communications" Viva- Thorogood.	
4.	Dhanavel. S P, "English and Soft Skills", Orient BlackSwan. India 2018.	

Reference Books	
1.	Rajendra Pal and J S Korlaha, "Essentials of Business Communication" HI Sultan Chand and Sons, New Delhi
2.	Goldsmith, "Soft Skills: Enhancing Employability", Marshall and M.S. Rao Dreamtech Press. India, 2020
3.	Technical Communication by Gajendra Singh Chauhan and Et al, (ISBN-978-93- 5350-050-4), Cengage learning India Pvt Limited [Latest Revised Edition] - 2019.
4.	Practical English Usage by Michael Swan, Oxford University Press – 2016.
5.	Functional English (As per AICTE 2018 Model Curriculum) (ISBN-978-93-5350-047-4) Cengage learning India Pvt Limited [Latest Edition 2019].
Useful web links	
1.	https://learnenglish.britishcouncil.org
2.	https://www.fluentu.com

Year, Program, Semester	F.Y. Part I (All Programs) Semester II							
Course Code	VSEC121							
Course Category	Vocational and Skill Enhancement Courses							
Course Title	Design Thinking and Innovation-II							
Teaching Scheme and Credits	L	T	P	Total Contact Hours			Total Credits	
	01	01	-	02			00	
Evaluation Scheme	ISE	ESE	IE	IPE	EOE	EPE	Total	
	-	-	50	-	-	-	50	
	IE at the course in charge end: (Preferred to have 3-5 assignments and conduct of an MCQ Test based on the course work. Passing is mandatory.							
Pre-requisites(if any)	Design Thinking & Innovation - I							
Course Rationale	The purpose of engineering education has to be to transform these graduates who can design. The concept of design or design thinking though complex, it is the robust and it must be developed among the budding graduates so as to make them not alone job seekers but the providers too. Therefore, the particular course is towards preparing engineering graduates as intended to be versatile of all other professionals.							
Course Objectives	The course is aimed at- <ol style="list-style-type: none"> 1. Foster entrepreneurial mindset and innovative problem-solving. 2. Develop practical entrepreneurial skills for successful implementation. 3. Apply design thinking principles to solve real-world problems through hands-on activities. 4. Foster creativity, collaboration, and iterative problem-solving skills in a practical design thinking session. 							
Course Outcomes	Upon completion of this course, student should be able to- <ol style="list-style-type: none"> 1. Identify and evaluate entrepreneurial opportunities, and develop innovative solutions. 2. Apply critical thinking, refine business models, and effectively communicate entrepreneurial ideas. 3. Demonstrate proficiency in utilizing design thinking tools and methods to generate innovative solutions. 							

	4. Collaborate effectively in multidisciplinary teams to prototype and iterate on design concepts.
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Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	2	-	-	-	-	-	3	-	-	2
CO2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	-	2	2	2	-	-	-	-	-	-	-	-
CO4	-	-	-	-	-	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	<p>Innovation and Entrepreneurship:</p> <p>a) Introduction to innovation and entrepreneurship, market analysis, and creative confidence.</p> <p>b) Business model development, prototyping, and customer validation.</p> <p>c) Pitching and presentation skills, entrepreneurial skills, and mind-set development</p>	12 (L)
	<p>During the tutorial session itself for first 6 sessions, the course facilitator will complete these three sub units interactively while remaining 6 sessions will be free for the students to have the activities for which the following general guidelines to be followed:</p> <p>General Instructions for course facilitators:</p> <p>The facilitators may use different student centric teaching learning methods to make the course content more and interesting and meaningful. Some of the following activities may be planned</p> <p>a. Brain teasers (aka Puzzle Busters, to be solved individually)</p> <p>b. Cartoon captions (small teams)</p> <p>c. TRIZ, a systematic ideation method, reading (individual)</p> <p>d. Book readings and discussions (small teams)</p> <p>e. Small teams' presentations on innovation:(1) innovative individual, (2) innovative company, (3) innovative movie / game, (4) sustainable innovation, (5) innovation in business, (6) innovation in art, (7) innovation in architecture, (8) innovative nation, (9) innovation in science, and (10) innovation in engineering.</p> <p>f. Large groups hands-on projects</p> <p>g. Eight-dimensional (8D) ideation method examples</p> <p>h. Large teams' videos.</p> <p>i. Students also will be taken to the workshop to experience some kind of hands on training to make carpentry, metal or smithy job.</p> <p>(Care to be taken to make the students aware of Design Thinking & Customer Centricity Practical Examples of Customer Challenges, Use of Design Thinking to Enhance Customer Experience, Parameters of Product experience, Alignment of Customer Expectations with Product Design)</p>	12 (T)
	Reference Books	
1.	Drucker, P. F. (2007). Innovation and Entrepreneurship: Practice and Principles. Harper Business.	
2.	Blank, S. G. (2012). The Start-up Owner's Manual: The Step-by-Step Guide for Building a Great Company. K&S Ranch.	
3.	Christensen, C. M. (2013). The Innovator's Dilemma: When New Technologies Cause Great Firms to Fail. Harvard Business Review Press.	

4.	Bagchi, S., (2011). The Professional: Defining the New Standard of Excellence at Work. Portfolio/Penguin, India.
Important web links	
1.	YourStory (https://yourstory.com/)
2.	Inc42 (https://inc42.com/)

Year, Program, Semester	F.Y. Part I (All Programs) Semester II				
Course Code	PSI 121				
Course Category	Project Seminar Internship				
Course Title	Social Internship				
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits
	10 Days Social Internship				00
Evaluation Scheme	IE: 50				Total =50
	IE at the course in charge end: (A brief report on the internship activity is mandatory to be submitted. Report evaluation will be for 30 marks while there will be 20 marks for viva voce based on the activity. Passing is mandatory.)				
Pre-requisites(if any)	Design Thinking and Innovation-I and orientation by the program before proceeding on to this internship.				
Course Objectives	The course is aimed at- 1. Cultivate rural awareness and empathy among students. 2. Enable students to apply engineering skills effectively in underserved areas.				
Course Outcomes	Upon completion of this course, student should be able to- 1. Increased recognition of rural challenges and dynamics. 2. Demonstrated ability to devise and implement relevant solutions.				

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	-	2	-	3	3	-	3	-	-	2
CO2	-	-	2	2	-	3	-	-	-	-	-	3

Level of Mapping as: Low 1, Moderate 2, High 3

Social Internship Course Description

After the First Semester of FY B. Tech, the students will undergo social internship of 10 days preferably in rural part of the country.

Here are some of the potential activities that students could engage in during their 10-day social internship:

1. Community Needs Assessment:

- Conduct surveys and interviews to understand the specific needs and challenges of the community.
- Identify priority areas for potential engineering interventions.

2. Interactive Workshops:

- Organize workshops to share basic engineering concepts with community members, fostering mutual learning.
- Collaborate on simple projects, like building low-cost solar cookers or water purification systems.

3. Design Thinking Sessions:

- Facilitate brainstorming sessions with locals to generate innovative ideas for solving local problems.
- Prototype and refine potential solutions based on community input.

4. Infrastructure Evaluation:

- Assess existing infrastructure (water supply, sanitation, roads, etc.) for maintenance needs or improvements.
- Propose feasible upgrades using engineering principles.

5. Environmental Initiatives:

- Participate in tree planting drives or waste management campaigns to promote environmental sustainability.
- Educate the community about eco-friendly practices.

6. Skill Enhancement Workshops:

- Teach basic technical skills, such as basic repairs, to empower locals to address minor challenges independently.
- Provide training on digital literacy to bridge the technological gap.

7. Health and Hygiene Workshops:

- Conduct workshops on personal hygiene, sanitation, and health awareness.
- Collaborate with healthcare professionals to provide basic medical check-ups and guidance.

8. Documentation and Reporting:

- Maintain a daily journal to document experiences, observations, and interactions.
- Compile a comprehensive report outlining findings, proposed solutions, and lessons learned.

9. Cultural Exchange Activities:

- Engage with the community through cultural activities, such as sharing traditional dances, songs, or cuisine.
- Foster a sense of unity and understanding between students and locals.

10. Feedback and Reflection Sessions:

- Regularly engage in discussions to reflect on the challenges faced, lessons learned, and potential improvements.
- Gather feedback from both students and community members to enhance the internship's impact.

The specific activities may vary based on the community's needs and the students' skills. The key is to create meaningful interactions that promote learning, collaboration, and positive impact.

Equivalence for the curriculum revision at First Year B. Tech

We at the B. Tech (All Programs), Department of Technology due for revision in curriculum w.e.f. 2023-2024 have revised the structure and the content as well at the F.Y.B. Tech. The entire structure for Second Year to Final Year B. Tech respective Programs is also designed under this revision. The detailed of course content will be designed and submitted as the First Year batch proceed year to year.

A special mention rather feature of this revision is, ***it is aligned with New National Education Policy 2020 guidelines, and also it follows the directives of National Credit Framework as well as NHEQ Framework. This curriculum is to be implemented starting from FY B. Tech batch from July 2025, (Academic year 2025-26).***

The main feature of this minor modification in the curriculum is the change in the weightage of the theory marks as **40:60 for ISE: ESE in lieu of earlier 30:70**. Secondly, the semester wise credit distribution in this revision is 22 credits per semester. In the last version, there was non-uniform credits distribution across the entire 8 semesters. The justification for making the semester wise credits distribution uniform is to facilitate the results processing task especially for the calculation of the passing credits with respect to ATKT Clause.

Following is a semester wise table that depicts equivalences for the previous version of curriculum with the new one particularly for first two semesters under F.Y B.Tech.

SEM – I

Sr. No.	First Year B. Tech Semester I Pre-revised syllabus	First Year B. Tech Semester I Revised syllabus	Remark
1.	Engineering Mathematics–I	Engineering Mathematics–I	No change in the content.
2.	Engineering Physics (Theory & Lab)	Engineering Physics (Theory & Lab)	No change in the content.
3.	Elements of Mechanical and Electronics Engineering (Theory & Lab)	Elements of Mechanical and Electronics Engineering (Theory & Lab)	No change in the content.
4.	Engineering Mechanics (Theory & Lab)	Engineering Mechanics (Theory & Lab)	No change in the content. One credit is added.
5.	Computer Programming for Engineers (Theory & Lab)	Computer Programming for Engineers (Theory & Lab)	No change in the content.
6.	Professional Communication (English)-I (Theory)	Professional Communication (English)-I (Theory)	No change in the content.
7.	Design Thinking and Innovation-I	Design Thinking and Innovation-I	No change in the content.
8.	Yoga and Meditation	Yoga and Meditation	No change in the content.

SEM – II

Sr. No.	First Year B. Tech Semester II Pre-revised syllabus	First Year B. Tech Semester II Revised syllabus	Remark
1.	Engineering Mathematics–II	Engineering Mathematics–II	Content is revised.
2.	Engineering Chemistry (Theory & Lab)	Engineering Chemistry (Theory & Lab)	No change in the content.
3.	Engineering Graphics (Theory & Lab)	Engineering Graphics (Theory & Lab)	No change in the content. One credit is added.
4.	Elements of Civil and Electrical Engineering (Theory & Lab)	Elements of Civil and Electrical Engineering (Theory & Lab)	No change in the content.
5.	Electrical-Electronic Components and Devices (Theory & Lab)	Electrical-Electronic Components and Devices (Theory & Lab)	No change in the content.
6.	Professional Communication (English)-II (Theory)	Professional Communication (English)-II (Theory)	No change in the content.
7.	Design Thinking and Innovation-II	Design Thinking and Innovation-II	No change in the content.
8.	Social Internship	Social Internship	No change in the content.
9.	Human Rights and Constitution	Human Rights and Constitution	No change in the content.

Courses against Certificate in Respective B.Tech Major

(Exit After First Year B. Tech)

Here onwards are the Program Wise course contents for the two courses, two credits each per Program. These need to be completed by the candidates who wish to exit after their First Year of B.Tech with a claim to be the awardees for the Certificate in respective Major Specialisation. The candidates also have to undergo one month industrial internship with 4 credits, thus with total earning of **08 credits** against this certification. Also such candidates have to pay separate fees for such a certification.



Shivaji University, Kolhapur
Department of Technology

B. Tech (Chemical Engineering), Exit After First Year (Certificate Course in Chemical Engineering)

Teaching & Evaluation Scheme										
Sr. No.	Category	Course Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation Scheme	
				L	T	P			Theory	Practical
									ISE:ESE	IE:EE
1.	SWAYAM (NPTEL) or any other MOOCs Or In face to face mode (Program Core Courses)	CC- CHE1	Fundamentals of Chemical Engineering	02	-	-	02	02	40:60	00:00
2.		CC- CHE2	Introduction to Distributed Control System	02	-	-	02	02	40:60	00:00
3.	Program Based Internship	CC-PBI	In plant Training	One Month				04	00:00	50:50
				-	-	-	-	08*	200**	100
			Total Hours	04	-	-	04	-	-	-

Note: The Workload against the Certificate Course will be finalised at the Program Level considering the strength of the students seeking for the Certificate. *Obtaining these credits will be in addition to 42 regular credits at FY B. Tech

** There is an option for End Semester Examination either on respective MOOC platform if any or through the University System.

Note 1: The students aspiring to exit after first year will undergo the study of courses/MOOC from the list provided by the Program.

Note 2: Program Specific Industry Internship to be completed by such students before commencement of SY B. Tech.

Year, Program, Semester	First Year B. Tech (Chemical Engineering), Part I, Semester I & II				
Course Code	CC-CHE 1				
Course Category	Certificate in Chemical Engineering				
Course Title	Fundamentals of Chemical Engineering				
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits
	02	-	-	02	02
Evaluation Scheme	ISE:40		ESE: 60		Total=100
Pre-requisites(if any)	Prerequisites for this course typically include a solid background in chemistry and mathematics, including topics like stoichiometry, chemical equations, and calculus. Basic understanding of physics principles, such as thermodynamics and fluid mechanics, is also helpful. Familiarity with engineering fundamentals and problem-solving skills is advantageous.				
Course Rationale	The course provides a comprehensive introduction to the core principles and concepts in chemical engineering. It aims to equip students with the foundational knowledge and skills necessary to understand and analyze chemical processes, perform mass and energy balances, and apply engineering principles to solve problems in the field of chemical engineering.				
Course Objectives	<p>The course is aimed at-</p> <ol style="list-style-type: none"> 1. Apply chemical engineering principles to analyze and solve engineering problems in various process industries. 2. Evaluate and interpret mass and energy balances in chemical systems using quantitative analysis techniques. 3. Demonstrate an understanding of thermodynamics and its application to chemical processes. 4. Assess and analyze the performance and design of chemical reactors and separation processes. 				
Course Outcomes	<p>Upon completion of this course, student should be able to-</p> <ol style="list-style-type: none"> 1. Apply chemical engineering principles to solve complex engineering problems in diverse process industries. 2. Analyze and interpret mass and energy balances in chemical systems to ensure efficient and sustainable operations. 3. Explain the application of thermodynamics in predicting and optimizing the behaviour of chemical processes. 4. Evaluate and propose effective reactor designs and separation processes based on performance analysis and optimization techniques. 				

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	2	-	-	-	-	-	-	-	-
CO2	-	3	2	2	-	-	-	-	-	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	-
CO4	-	-	2	-	2	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	Introduction to Chemical Engineering: <ul style="list-style-type: none"> Overview of chemical engineering principles, scope, and applications Fundamentals of chemical processes, unit operations, and process flow diagrams Introduction to mass and energy balances in chemical systems Overview of safety considerations and ethical responsibilities in chemical engineering 	04
II.	Thermodynamics and Phase Equilibrium: <ul style="list-style-type: none"> Introduction to thermodynamics and its application in chemical engineering Laws of thermodynamics and their relevance to chemical processes Phase equilibrium and its significance in chemical systems Application of thermodynamics to analyze and predict phase behaviour in chemical processes 	04
III.	Chemical Reaction Engineering: <ul style="list-style-type: none"> Fundamentals of chemical kinetics and reaction rate equations Analysis of reaction mechanisms and rate-determining steps Reactor types and their design considerations Application of reaction engineering principles to optimize chemical reactions 	04
IV.	Heat and Mass Transfer: <ul style="list-style-type: none"> Principles of heat transfer and its application in chemical engineering Conduction, convection, and radiation heat transfer mechanisms Mass transfer fundamentals and its relevance in chemical processes Design and analysis of heat exchangers and mass transfer equipment 	04
V.	Separation Processes: <ul style="list-style-type: none"> Introduction to separation processes in chemical engineering Distillation, absorption, extraction, and adsorption processes Membrane separation techniques and their applications Analysis and optimization of separation processes in chemical systems 	04
VI.	Process Control and Safety: <ul style="list-style-type: none"> Basics of process control and instrumentation in chemical engineering Control system components, feedback loops, and PID control Safety considerations and hazard analysis in chemical processes Overview of regulatory frameworks and best practices for process safety 	04
Reference Books		
1.	Felder, R. M., & Rousseau, R. W. (2016). Elementary Principles of Chemical Processes. Hoboken, NJ: Wiley.	
2.	Smith, J. M., Van Ness, H. C., & Abbott, M. M. (2017). Introduction to Chemical Engineering Thermodynamics. New York, NY: McGraw-Hill Education.	
3.	Levenspiel, O. (2016). Chemical Reaction Engineering. Hoboken, NJ: Wiley.	
4.	Coulson, J. M., Richardson, J. F., Sinnott, R. K., & Towler, G. (2017). Chemical Engineering Design: Principles, Practice, and Economics of Plant and Process Design. Oxford, UK: Butterworth-Heinemann.	

5.	Seader, J. D., Seader, J. F., & Lewin, D. R. (2016). Separation Process Principles. Hoboken, NJ: Wiley.
Important web links	
1.	AIChE (American Institute of Chemical Engineers): https://www.aiche.org/
2.	Chemical Engineering World: https://www.chemengonline.com/

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	3	2	2	-	-	-	-	-	-	-
CO2	-	3	2	2	-	-	-	-	-	-	-	-
CO3	-	2	3	2	2	-	-	-	-	-	-	-
CO4	-	-	2	-	2	2	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	Introduction to Control Systems <ul style="list-style-type: none"> Overview of control systems and their importance in various industries Introduction to basic control principles: feedback, feedforward, and closed-loop control. Types of control systems: centralized vs. distributed control Introduction to DCS components: sensors, actuators, controllers 	04
II.	DCS Architecture and Configuration <ul style="list-style-type: none"> Understanding the architecture and structure of a DCS Introduction to hardware components of a DCS: controllers, input/output (I/O) modules Introduction to DCS software and configuration tools Basics of communication protocols used in DCS 	04
III..	DCS Programming and Control Strategies <ul style="list-style-type: none"> Introduction to programming languages used in DCS Basics of control strategies and their implementation in DCS Overview of process control loops and tuning parameters Simple control algorithm design using DCS programming language 	04
IV.	DCS Integration in Industries <ul style="list-style-type: none"> Integration of DCS with various industries: manufacturing, power, chemical, etc. Introduction to safety instrumented systems (SIS) and programmable logic controllers (PLC) Overview of field instrumentation in DCS: sensors, transmitters, control valves Examples of DCS integration in different industrial processes 	04
V.	Human-Machine Interface (HMI) and Operator Interaction <ul style="list-style-type: none"> Understanding the role of HMI in DCS Basics of HMI design and layout principles Introduction to real-time monitoring and control through HMIs Overview of alarms and operator response in DCS environments 	04
VI.	DCS Maintenance and Troubleshooting <ul style="list-style-type: none"> Introduction to preventive maintenance practices for DCS Troubleshooting techniques for common DCS issues Importance of software updates, backups, and system security in DCS Basic safety considerations during maintenance activities 	04

Reference Books	
1.	Wilkes, M.J. (1998). Distributed Control Systems: Their Evaluation and Design. Addison-Wesley.
2.	Gopal, M. (2005). Distributed Control Systems: Concepts and Applications. Alpha Science International Ltd.
3.	Bailey, D.H. (2001). Distributed Control Systems: Their Implications for Process Industries. Wiley-Interscience.
4.	IDC Technologies. (2003). Practical Distributed Control Systems (DCS) for Engineers and Technicians. IDC Technologies.
Important web links	
1.	https://www.controlglobal.com/
2.	https://www.isa.org/



Shivaji University, Kolhapur
Department of Technology

B.Tech (Civil Engineering), Exit After First Year (Certificate Course in Civil Engineering)

Teaching & Evaluation Scheme										
Sr. No.	Category	Course Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation Scheme	
				L	T	P			ISE:ESE	IE:EE
1	SWAYAM (NPTEL) or any other MOOCs Or In face to face mode (Program Core Courses)	CC-CE 1	Fundamentals of Civil Engineering	02	-	-	02	02	40:60	00:00
2		CC- CE 2	Building Planning and Design	02	-	-	02	02	40:60	00:00
3	Program Based Internship	CC-PBI	Industrial Internship	One Month				04	00:00	50:50
							-	08*	200**	100
			Total Hours	04	-	-	04	-		

Note: The Workload against the Certificate Course will be finalised at the Program Level considering the strength of the students seeking for the Certificate. *Obtaining these credits will be in addition to 42 regular credits at FY B. Tech

** There is an option for End Semester Examination either on respective MOOC platform if any or through the University System.

Note 1: The students aspiring to exit after first year will undergo the study of course/MOOC from the list provided by the Program.

Note 2: Program Specific Industry Internship to be completed by such students before commencement of SY B. Tech.

Year, Program, Semester	First Year B. Tech (Civil Engineering), Part I, Semester I & II				
Course Code	CC-CE 1				
Course Category	Certificate in Civil Engineering				
Course Title	Fundamentals of Civil Engineering				
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits
	02	-	-	02	02
Evaluation Scheme	ISE:40		ESE: 60		Total=100
Course Rationale	Every civil engineering activity takes place on the surface of earth and starts with availing and measuring the land, with the subject engineering students will pursue the engineering approach about surveying and Civil engineering is that field of engineering concerned with planning, design and construction for environmental control, development of natural resources, buildings, transportation facilities and other structures. The subject involves surveying activities of taking various measurements on ground that promote habit of working in groups, neatness and care in documentation and also involves introduction of engineering materials and elements of building materials.				
Course Objectives	The course is aimed at- 1. To provide an insight and inculcate the essentials of Civil Engineering discipline to the students. 2. To provide the students an illustration of the significance of the Civil Engineering Profession in satisfying the societal needs.				
Course Outcomes	Upon completion of this course, student should be able to- 1. Understand the use of different materials in Civil Engineering. 2. Apply the various building components, method of constructions and services. 3. Apply different equipment for levelling and surveying.				

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	2	-	-	-	-	-	-	-	-
CO2	2	3	2	2	-	-	-	-	-	-	-	-
CO3	3	2	3	2	-	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I	Introduction To Civil Engineering and Civil Engineering Materials: Various branches and scope of civil engineering, Role of Civil Engineer, building materials- cement, sand, aggregate, timber, steel, aluminium. Selection of good material. Engineering properties and testing of materials. Concrete- Ingredients, grades, various processes like mixing, transportation, placing, compaction and curing. Readymade concrete plants (RMC).	8
II	Introduction to Surveying and Levelling: Surveying: Importance, objectives and principles. Linear Measurement-	8

	Instruments used-Pedometer, electronic distance meter, etc. Angular Measurement-Instrument Used-Electronic theodolite and total station. Levelling: Definitions, terminologies, principles, instruments used, problems based on HI method and Rise and fall method.	
III	Scope of civil engineering a) Transportation engineering- roads, railways, waterways and air ways. Basic of types and important features in design b) Environmental engineering- Water and sanitary system, water, soil and air pollution. Industrial waste disposal. c) Water resource engineering- Irrigation methods, types of dams, major dams in India, dam capacity. Dam maintenance.	8
Text/Reference Books		
1.	N. N. Basak, "Surveying and levelling", Tata McGraw Hill Education.	
2.	S.C. Rangwala, "Civil engineering drawing", Charotar Publication	
3.	S. C. Rangwala, "Town Planning", Charotar Publication	
4.	S. Ramamrutham, "Basic Civil Engineering", Dhanpatrai Publication	
5.	H.S. Peavy, D.R. Rowe and G. Tchbanoglous, "Environmental Engineering", McGraw Hill International Edition	
Important web links		
1.	https://onlinecourses.nptel.ac.in/noc22_ce42/preview	

Year, Program, Semester	First Year B. Tech (Civil Engineering), Part I, Semester I & II				
Course Code	CC-CE2				
Course Category	Certificate in Civil Engineering				
Course Title	Building Planning and Design				
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits
	02	-	-	02	02
Evaluation Scheme	ISE:40		ESE: 60		Total=100
Course Rationale	This subject is core technology subject, enabling the principles of planning for drafting the content into graphical form and there after its execution. Civil engineer has to convert design parameter and process details into actual practice. The principles of planning for building includes the entire facility to be provided as per the individual requirements, economical status and suitable to the users. Therefore students are required to understand, interpret and prepare working drawing.				
Course Objectives	The course is aimed at- 1. To illustrate the importance and application of regulations such as building byelaws and provisions of codes.				

	2. To optimize space use and user functionality in designs. 3. To prepare engineering drawings as per principles of planning using CAD Software.
Course Outcomes	Upon completion of this course, student should be able to- 1. Understand the symbols, signs and conventions from the given drawing. 2. Determine line plans of residential and public buildings using principles of planning. 3. Apply submission and working drawing from the given requirement for Load Bearing Structure. 4. Apply submission and working drawing from the given requirement for Framed Structure.

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2	-	-	-	-	-	-	-	-	-
CO2	2	3	2	-	-	-	-	-	-	-	-	-
CO3	3	2	3	-	-	-	-	-	-	-	-	-
CO 4	2	3	2	-	-	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	Building planning, designing Building Planning Bye laws and regulations, National Building code of India (introduction only), Planning of residential building [bungalows, row Bungalows, apartments and twin bungalows (conceptual only)], UDCPR, Introduction to administration, - Development permission and commencement certificate, General building requirements, Structural safety, Role of architect, structural engineer and geotechnical engineer in building design. Concept of green building, Planning using AutoCAD.	8
II	Building Construction-Foundations- types, soil bearing capacity Load bearing and framed structures, partition walls, types of masonry, AAC block construction. Water proofing treatments, ceiling design, acoustic treatments. damp roof course, building maintenance.	8
III	Water supply and sanitary- Design of water storage system, plumbing materials, various types of taps, design of septic tank, plumbing and sanitary pipes, use of traps, chambers and vent pipes. Repair and maintenance of plumbing and sanitary lines, solar panels	8
Text Books		
1.	Shah, Kale, Patki, " Building Drawing", Tata McGraw- Hill publication	
2.	S.P. Arora, S.P. Bindra, "A Text Book of Building Construction", Dhanpat Rai Publications.	
Reference Books		
1.	Gangrad M.N, Deshmukh B.S., Kanitkar A.K., "A Text book of Building Drawing", Nirali Prakashan	
2.	Charusheela, M. S., Jamadar, "Civil Engineering Drawing", Nirali Prakashan	
3.	SP 7- National Building Code Group 1 to 5 - B.I.S. New Delhi	
4.	UDCPR, Urban Development Department, Government of Maharashtra.	
5.	V.B. Sikka, "A Course in Civil Engineering Drawing", S.K .Kataria and Sons.	

Useful web links		
1.	https://www.youtube.com/watch?v=ph0SYPBq4IY&list=PLkEhI-YDhJ6zuSPVaWcLmaTOR2g4L53G-	
2.	https://www.youtube.com/watch?v=FF_5w5hZav4	
3.	https://nptel.ac.in/courses/124107157	
4.	https://archive.nptel.ac.in/courses/112/102/112102304/	



Shivaji University, Kolhapur Department of Technology

B.Tech (Computer Science and Technology), Exit After First Year (Certificate Course in Computer Science and Technology)

Teaching & Evaluation Scheme										
Sr. No.	Category	Course Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation Scheme	
				L	T	P			Theory	Practical
									ISE:ESE	IE:EE
1.	SWAYAM (NPTEL) or any other MOOCs	CC-CST 1	Fundamentals of Computer Science and Technology	02	-	-	02	02	40:60	00:00
2.	In face to face mode (Program Core Courses)	CC- CST 2	Concept of Programming Using C	02	-	-	02	02	40:60	00:00
3.	Program Based Internship	CC-PBI	Industrial Internship	One Month				04	00:00	50:50
				-	-	-	-	08*	200**	100
			Total Hours	04	-	-	04	-	-	-

Note: The Workload against the Certificate Course will be finalised at the Program Level considering the strength of the students seeking for the Certificate. *Obtaining these credits will be in addition to 42 regular credits at FY B. Tech

** There is an option for End Semester Examination either on respective MOOC platform if any or through the University System.

Note 1: The students aspiring to exit after first year will finalise the title of the course/MOOC from the list provided by the Program.

Note 2: Program Specific Industry Internship to be completed by such students before commencement of SY B. Tech.

Year, Program, Semester	First Year B. Tech (Computer Science and Technology), Part I, Semester I & II				
Course Code	CC-CST 1				
Course Category	Certificate in Computer Science and Technology				
Course Title	Fundamentals of Computer Science and Technology				
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits
	02	-	-	02	02
Evaluation Scheme	ISE:40		ESE: 60		Total=100
Pre-requisites(if any)	Preliminary knowledge of computer, their operations and applications				
Course Rationale	This course provides an overview of introductory concepts about computers, number systems, basics of software, operating system and components of computer system. It builds the foundation of the computer application courses.				
Course Objectives	The course is aimed at- <ol style="list-style-type: none"> 1. To Introduce Computer Science and Technology in a simple language to students. 2. To help students to pursue specialized programs leading to technical and professional careers and certifications in the IT industry. 3. To introduce skills relating to IT basics, computer applications, programming, interactive medias, Internet basics etc. 4. To introduce basics of operating system and data communications. 				
Course Outcomes	Upon completion of this course, student should be able to- <ol style="list-style-type: none"> 1. Understand basic concepts and terminology of Computer Science and Technology. 2. Have a basic understanding of personal computers and their operations. 3. Understand computer arithmetic. 4. Familiar with various software and operating system. 5. Demonstrate concept of data communication. 				

Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	Introduction to Computers and Computer Organization: Introduction, Definition, .Characteristics of computer, Evolution of Computer, Block Diagram Of a computer, Generations of Computer, Classification Of Computers, Applications of Computer, Capabilities and limitations of computer. Role of I/O devices in a computer system. Input Units and types, Output Units and types	04
II.	Computer Arithmetic: Binary, Binary Arithmetic, Number System: Positional & Non Positional, Binary, Octal, Decimal, Hexadecimal, Converting from one number system to another , Converting	04

	from one number system to another , Converting from one number system to another.	
III.	Storage Fundamentals: Primary Vs. Secondary Storage, Data storage & retrieval methods. Primary Storage: RAM ROM, PROM, EPROM, EEPROM. Secondary Storage: Magnetic Tapes, Magnetic Disks. Cartridge tape, hard disks, Floppy disks Optical Disks, Compact Disks, Zip Drive, Flash Drives.	04
IV.	Software: Software and its needs, Types of S/W. System Software: Operating System, Utility Programs Programming Language: Machine Language, Assembly Language, High Level Language their advantages & disadvantages. Application S/W and its types: Word Processing, Spread Sheets Presentation, Graphics, DBMS s/w.	04
V.	Operating System: Functions, Measuring System Performance, Assemblers, Compilers and Interpreters. Batch Processing, Multiprogramming, Multi-Tasking, Multiprocessing, Time Sharing, DOS, Windows, Unix/Linux.	04
VI.	Data Communication: Communication Process, Data Transmission speed, Communication Types (modes), Data Transmission Medias, Modem and its working, characteristics, Types of Networks, LAN Topologies, Computer Protocols, Concepts relating to networking.	04
Text Books		
1.	Computer Fundamentals by P.K.Sinha , BPB Publication, New Delhi, India	
Reference Books		
1.	Fundamentals of Computers by E.Balguruswamy, McGraw-Hill Education, Europe	
2.	Introduction to Computer Fundamentals by Bright Saiw Afriyie, Trafford Publishing	

Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	Introduction to the C Language – Algorithm, Pseudo code, Flow chart, Background, C Programs, Identifiers, Data Types, Variables, Constants, Input / Output, Operators(Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associativity, Expression Evaluation, Type conversions.	04
II.	Enumerated, Structure and Union Types– The Type Definition (typedef), Enumerated types, Structures –Declaration, initialization, accessing structures, operations on structures, Complex structures, structures and functions, Passing structures through pointers, self-referential structures, unions, bit fields, C programming examples.	04

III.	Data Structures – Introduction to Data Structures, abstract data types. Linear list – singly linked list implementation, insertion, deletion and searching operations on linear list, circularly linked lists- Operations for Circularly linked lists, doubly linked list implementation, insertion, deletion and searching operations, applications of linked lists.	04
IV.	Stack ADT- definition, operations, array and linked implementations in C, applications- infix to postfix conversion, Postfix expression evaluation, recursion implementation. Queue ADT- definition and operations, array and linked Implementations in C, Circular queues-Insertion and deletion operations, Deque (Double ended queue) ADT, array and linked implementations in C	04
V.	Searching and Sorting – Searching-linear and binary search methods Sorting- selection sort, bubble sort, insertion sort, quick sort, merge sort comparison of sorting and searching methods.	04
VI.	Trees – Definitions, tree representation, properties of trees, Binary tree, Binary tree representation, binary tree properties, binary tree traversals, binary tree implementation, applications of trees.	04
Text Books		
1.	Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.	
2.	The C Programming Language by Brian Kernighan and Dennis Ritchie 2nd edition	
Reference Books		
1.	Let Us C by Yashavant Kanetkar, BPB Publications.	
2.	Absolute beginner's guide to C, Greg M. Perry, Edition 2, Publisher: Sams Pub., 1994.	
3.	Computer Programming and Data Structures by E Balagurusamy, Tata McGraw Hill.	



Shivaji University, Kolhapur
Department of Technology

B.Tech (Electronics & Telecommunication Engineering),
Exit After First Year (Certificate Course in Electronics & Telecommunication Engineering)

Teaching & Evaluation Scheme										
Sr. No.	Category	Course Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation Scheme	
				L	T	P			Theory	Practical
				L	T	P			ISE:ESE	IE:EE
1.	SWAYAM (NPTEL) or any other MOOCs Or In face to face mode (Program Core Courses)	CC-ETC 1	Consumer Electronics	02	-	-	02	02	40:60	00:00
2.		CC-ETC 2	Digital Techniques	02	-	-	02	02	40:60	00:00
3.	Program Based Internship	CC-PBI	Industrial Internship	One Month				04	-	50:50
							-	08*	200**	100
			Total Hours	04	-	-	04	-	-	-

Note: The Workload against the Certificate Course will be finalised at the Program Level considering the strength of the students seeking for the Certificate. *Obtaining these credits will be in addition to 42 regular credits at FY B. Tech

** There is an option for End Semester Examination either on respective MOOC platform if any or through the University System.

Note 1: The students aspiring to exit after first year will finalise the title of the course/MOOC from the list provided by the Program.

Note 2: Program Specific Industry Internship to be completed by such students before commencement of SY B. Tech.

Year, Program, Semester	First Year B. Tech (Electronics & Telecommunication Engineering), Part I, Semester I & II				
Course Code	CC-ETC 1				
Course Category	Certificate in Electronics & Telecommunication Engineering				
Course Title	Consumer Electronics				
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits
	02	-	-	02	02
Evaluation Scheme	ISE:40		ESE: 60		Total=100
Pre-requisites(if any)	Preliminary knowledge of Semiconductor Physics, Basic science and mathematics				
Course Rationale	This course will introduce the students with working principles of consumer electronic appliances like audio video systems, microwave oven, washing machine and others and to troubleshoot the same in systematic way. Such knowledge help them to start their own enterprises				
Course Objectives	The course is aimed at- <ol style="list-style-type: none"> 1. Introduce fundamental concept of audio. 2. Explain the principles and operations of audio systems. 3. Explain TV fundamentals and transmitter receiver operation. 4. Develop a skill to troubleshoot consumer electronic appliances. 				
Course Outcomes	Upon completion of this course, student should be able to- <ol style="list-style-type: none"> 1. Troubleshoot different types of microphones and speakers. 2. Maintain audio systems. 3. Analyse the composite video signal in TV receivers and Troubleshoot colour TV receivers. 4. Maintain various consumer electronics appliances. 				

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	-	3	-	-	-	-	-	-	-
CO2	2	3	-	-	2	-	-	-	-	-	-	-
CO3	3	-	-	-	-	-	-	-	-	-	-	-
CO4	-	3	2	-	3	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	Audio Fundamentals Basic characteristics of sound signal, mono and stereo amplifiers, microphone working principle and types, speakers working principle and types, troubleshooting procedure	04
II.	Audio Systems Block diagram and operation of CD player, components of CD mechanism, Hi-Fi amplifier, PA system block diagram and operation, speaker impedance matching	04

	system , Home theatre system, troubleshooting of audio systems	
III.	Television Fundamentals Basic concepts as aspect ratio, image continuity, interlace scanning, scanning periods, resolution, VSB transmission, colour signal bandwidth, colour theory, CCIR-B standards, positive and negative modulation, merits and demerits of negative modulation.	04
IV.	Television Transmitters TV transmission and reception, monochrome transmitter- block diagram and operation and colour TV transmitter block diagram and operation and troubleshooting.	04
V.	Television Receivers Block diagram of colour TV receiver and operation, PAL-D decoder operation, principle and working of LCD TV, LED TV, troubleshooting of colour TV receiver	04
VI.	Consumer Electronic Appliances Principle of operation of microwave oven, washing machine, digital camera, and their troubleshooting procedure	04
Text Books		
1.	Bali, S.P. Consumer Electronics, Pearson Education India, Delhi 2007	
2.	Gupta R.G. Audio Video systems principles, maintenance and troubleshooting. McGraw-Hill, New Delhi, India.2010	
Reference Books		
1.	Gulati R.R. Modern Television Practice: Transmission, Reception and Applications. New Edge International, New Delhi 2015	
2.	Bali Rajeev, Bali S.P. Audio Video systems: Principle, Practices and troubleshooting. Khanna Book Publishing Co.(P) Ltd.Delhi.2014	

Year, Program, Semester	First Year B. Tech (Electronics & Telecommunication Engineering), Part I, Semester I & II				
Course Code	CC-ETC 2				
Course Category	Certificate in Electronics & Telecommunication Engineering				
Course Title	Digital Techniques				
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits
	02	-	-	02	02
Evaluation Scheme	ISE:40		ESE: 60		Total=100
Pre-requisites(if any)	Preliminary knowledge of Basic science and mathematics				
Course Rationale	This course deals with analysis and design of various digital electronic circuits with its applications.				
Course Objectives	The course is aimed at- <ol style="list-style-type: none"> 1. Introduce fundamental concept of digital techniques. 2. Enhance basic knowledge of digital logic. 3. Develop a skill to design and implement digital circuits. 4. Conduct-the analysis of various digital electronic circuits. 				
Course Outcomes	Upon completion of this course, student should be able to- <ol style="list-style-type: none"> 1. Understand number systems and its arithmetic operations and Illustrate use of Boolean algebra. 2. Formulate and apply Karnaugh Map to reduce Boolean expressions and logic circuits to their simplest forms. 3. Design of combinational circuits like comparators multiplexers, demultiplexers, encoder, decoder and different code converters. 4. Understand working of flip-flops, its characteristics and conversion using truth table. 				

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1	3	2	3	-	3	-	-	-	-	-	-	-
CO2	2	3	2	-	2	-	-	-	-	-	-	-
CO3	3	3	-	-	-	-	-	-	-	-	-	-
CO4	-	-	2	-	3	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	Binary Codes and Boolean algebra Binary Number System. Addition, Subtraction, Multiplication, Division of binary numbers. Binary codes: weighted and non-weighted codes, self-complementary codes, BCD, Graycodes, Alphanumeric codes, ASCII Codes. Boolean algebra: Boolean Laws and Expression using Logic Gates, Universal gates, De-Morgan's Theorem, Duality Theorems.	04
II.	Boolean Function minimization Techniques Standard forms: SOP, POS, Simplification of Switching function & representation (Maxterm & Minterm), Boolean expression & representation using	04

	logic gates,Karnaugh map: K-map, mapping and minimization of SOP and POS expression, conversion from SOP to POS and POS to SOP form using K-map, Minimization of multiple output circuits	
III.	Combinational Circuits Design Adder & Subtractor (Half and Full), Parallel Binary adder, BCD Adder, Code Converters,Comparators,Decoder,BCDto7-segmentDecoder,Encoders,Priority Encoders,Multiplexers,De Multiplexers.	04
IV.	Sequential Circuits Elements Introduction to sequential circuit, Flip-flop & Timing Circuits:SR latch, Gated latch, Tristate logic, Edge triggered flip-flop:-D,JK,T Flip-flop, flip-flop asynchronous inputs ,characteristic table of Flip-flop, excitation table of Flip-flop,masterslave JK flip flop.	04
V.	Shift Registers and Counters Shift registers: buffer register, controlled buffer register. Data transmission in shift resistor, Bidirectional shift register, and universal shift registers.Counter:Rippleor asynchronous counter, up-down counter, Design of Mod-n counter, synchronous counter, Ring counter, Johnson counter.	04
VI.	Logic Families and Memory Technology Digital IC specification terminology, Logic families: TTL,CMOS families, comparison of TTL & CMOS, Memory Technology: Memory organization, Classification of Memory.	04

Text Books

1.	A.AnandKumar, Fundamentals of Digital Circuits. PHI Publications
2.	R.P.Jain, Modern Digital Electronics'. IIIrdEdition-Tata McGrawHill,Publication
Reference Books	
1.	M.Morris Mano.Digital Design(Third Edition).PHI Publications
2.	Williml.Fletcher. An Engineering Approach to Digital Design. PHI Publication



Shivaji University, Kolhapur
Department of Technology

B.Tech (Food Technology), Exit After First Year (Certificate Course in Food Technology)

Teaching & Evaluation Scheme										
Sr. No.	Category	Course Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation Scheme	
				L	T	P			Theory	Practical
									ISE:ESE	IE:EE
1	SWAYAM (NPTEL) or any other MOOCs Or In face to face mode (Program Core Courses)	CC-FT 1	Food Processing and Preservation	02	-	-	02	02	40:60	00:00
2		CC-FT 2	Nutrition and Dietetics	02	-	-	02	02	40:60	00:00
3	Program Based Internship	CC-PBI	Industrial Internship	One Month				04	00:00	50:50
							-	08*	200**	100
			Total Hours	04	-	-	04	-		

Note: The Workload against the Certificate Course will be finalised at the Program Level considering the strength of the students seeking for the Certificate. *Obtaining these credits will be in addition to 42 regular credits at First Year B. Tech

** There is an option for End Semester Examination either on respective MOOC platform if any or through the University System.

Note 1: The students aspiring to exit after the first year will finalise the title of the course/MOOC from the list provided by the Program.

Note 2: Program Specific Industry Internship to be completed by such students before commencement of S.Y. B. Tech.

Year, Program, Semester	First Year B.Tech (Food Technology), Part I, During Semester I & II				
Course Code	CC-FT I				
Course Category	Certificate in Food Technology				
Course Title	Food Processing and Preservation				
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits
	02	-	-	02	02
Evaluation Scheme	ISE:40		ESE: 60		Total=100
Pre-requisites(if any)	Prerequisites for this course typically include a solid background in Food science and Technology including topics like food composition, food spoilage organisms, and food processing machinery. Basic understanding of physics principles, such as thermodynamics and fluid mechanics, is also helpful. Familiarity with engineering fundamentals and problem-solving skills is advantageous.				
Course Rationale	The course provides food preservation and processing techniques. It aims to equip students with the foundational knowledge and skills necessary to understand and apply the various preservation and processing techniques to solve and develop new products in food processing industries.				
Course Objectives	<p>The course is aimed at-</p> <ol style="list-style-type: none"> 1. Understand the importance of food preservation and processing in food industries. 2. Learn the principles of food preservation methods to solve problems in food stability. 3. Think about new food processing techniques to preserve and development of new food products. 4. Demonstrate the causes of food spoilage and the effective techniques to reduce the spoilage. 				
Course Outcomes	<p>Upon completion of this course, student should be able to-</p> <ol style="list-style-type: none"> 1. Apply preservation techniques to improve the shelf life of food products and reduces the production of waste 2. Assess the effect of different food processing techniques to develop new products 3. Know the application of unit operations in food processing industries. 4. Design processing and preservation technologies to solve the problems. 				

Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High

Unit No.	Course Content	Hours
I.	Introduction to Food Science : <ul style="list-style-type: none"> • Classification of Food • Functions of Food • Composition of Food • Types of Food Quality 	04
II.	Food Spoilage : <ul style="list-style-type: none"> • Introduction to food spoilage • Types and causes of food spoilage • Physicochemical changes in food • Microbial changes in food 	04
III.	Food Preservation : <ul style="list-style-type: none"> • Importance of Food Preservation • Principle of Food Preservation • Preservation of Food by thermal method • Preservation of food by Non thermal method 	04
IV.	Food Processing: <ul style="list-style-type: none"> • Introduction to Food Processing • Importance of Food Processing • Classification of Food Processing Methods • Unit operations in Food Processing Industry 	04
V.	Processing and Preservation of fruits and Vegetable : <ul style="list-style-type: none"> • Spoilage of fruits and vegetables • Importance of Fruits and Vegetable preservation • Methods of Fruits and Vegetable preservation • Processing of Fruits and vegetable by products 	04
VI.	Processing and Preservation of Milk and Milk Products : <ul style="list-style-type: none"> • Spoilage of Milk and Milk Products • Importance of Fruits and Vegetable preservation • Methods of Fruits and Vegetable preservation • Processing of Fruits and vegetable by products 	04
Reference Books		
1.	Sivasankar, B. (2002). Food processing and preservation. PHI Learning Pvt. Ltd.	
2.	Fellows, P. J. (2022). Food processing technology: principles and practice. Woodhead publishing.	
3.	Zeuthen, P., & Bogh-Sorensen, L. (Eds.). (2003). Food preservation techniques. Elsevier.	
4.	Smith, J. S., & Hui, Y. H. (Eds.). (2008). Food processing: principles and applications. John Wiley & Sons.	
5.	Desrosier, N. W., & Desrosier, J. N. (1977). The technology of food preservation (No. Ed. 4). AVI Publishing Company, Inc.	
Important web links		
1.	https://epgp.inflibnet.ac.in/Home/ViewSubject?catid=iWHzbXYGExXDS52DSnAzdQ==	
2.	https://www.britannica.com/topic/food-preservation	

Course Outcome and Program Outcome Mapping

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

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	Food and Nutrition: <ul style="list-style-type: none"> • Classification of Food • Classification of Nutrients in Food • Importance of Nutrients • Food Pyramid 	04
II.	Body Composition and Energy Balance : <ul style="list-style-type: none"> • Body Composition and Function • Body size and composition data in nutrition • Energy Intake • Energy Expenditure 	04
III.	Major Dietary Component : <ul style="list-style-type: none"> • Carbohydrates and Its Metabolism • Fats and Its Metabolism • Proteins and Its Metabolism • Water Balance and Requirements 	04
IV.	Minor Dietary Component : <ul style="list-style-type: none"> • Water Soluble Vitamins • Fat Soluble Vitamins • Minerals and Trace Elements • Phytochemicals 	04
V.	Diet Planning and Nutrition : <ul style="list-style-type: none"> • Classification of balanced diet • Preparation of balanced diet for groups • Diets and disorders • Recommended dietary allowances for various age groups 	04
VI.	Diet Planning and Nutrition : <ul style="list-style-type: none"> • Nutrition During Pregnancy • Nutrition during Lactation • Diet for Sports and Exercise • Diet for Sports and Disease 	04
Reference Books		
1.	Geissler, C., & Powers, H. J. (Eds.). (2017). Human nutrition. Oxford University Press.	

2.	Mann, J., & Truswell, A. S. (Eds.). (2017). Essentials of human nutrition. Oxford University Press.
3.	Gibney, M. J., Lanham-New, S. A., Cassidy, A., & Vorster, H. H. (Eds.). (2013). Introduction to human nutrition. John Wiley & Sons.
4.	Eastwood, M. A. (2013). Principles of human nutrition. Springer.
5.	Barasi, M. (2003). Human nutrition: a health perspective. CRC press.
Important web links	
1.	https://eggp.inflibnet.ac.in/Home/ViewSubject?catid=iWHzbXYGExXDS52DSnAzdQ==
2.	https://www.nin.res.in/downloads/DietaryGuidelinesforNINwebsite.pdf



Shivaji University, Kolhapur
Department of Technology

B.Tech (Mechanical Engineering), Exit After First Year (Certificate Course in Mechanical Engineering)

Teaching & Evaluation Scheme										
Sr. No.	Category	Course Code	Course Title	Hours per week			Contact Hours	Credits	Evaluation Scheme	
				L	T	P			Theory	Practical
									ISE:ESE	IE:EE
1.	SWAYAM (NPTEL) or any other MOOCs Or In face to face mode (Program Core Courses)	CC-ME 1	Fundamentals of Mechanical Engineering	02	-	-	02	02	40:60	00:00
2.		CC-ME 2	Manufacturing Technology	02	-	-	02	02	40:60	00:00
3.	Program Based Internship	CC-PBI	Industrial Internship	One Month				04	00:00	50:50
				-	-	-	-	08*	200**	100
			Total Hours	04	-	-	04	-	-	-

Note: The Workload against the Certificate Course will be finalised at the Program Level considering the strength of the students seeking for the Certificate.*Obtaining these credits will be in addition to 42 regular credits at FY B. Tech

** There is an option for End Semester Examination either on respective MOOC platform if any or through the University System.

Note 1: The students aspiring to exit after first year will finalise the title of the course/MOOC from the list provided by the Program.

Note 2: Program Specific Industry Internship to be completed by such students before commencement of SY B. Tech.

Year, Program, Semester	First Year B. Tech (Mechanical Engineering), Part I, Semester I & II				
Course Code	CC-ME 1				
Course Category	Certificate in Mechanical Engineering				
Course Title	Fundamentals of Mechanical Engineering				
Teaching Scheme and Credits	L	T	P	Total Contact Hours	Total Credits
	02	-	-	02	02
Evaluation Scheme	ISE:40		ESE: 60		Total=100
Pre-requisites(if any)	Prerequisites for this course typically include a basic understanding of physics principles, such as thermodynamics and fluid mechanics. Familiarity with engineering fundamentals and problem-solving skills is advantageous.				
Course Rationale	The course provides a comprehensive introduction to the core principles and concepts of Mechanical Engineering. It aims to equip students with the foundational knowledge and skills necessary to understand and analyze Mechanical processes, perform mass and energy balances, and apply engineering principles to solve problems in the field of Mechanical Engineering.				
Course Objectives	The course is aimed at- <ol style="list-style-type: none"> 1. Apply Mechanical engineering principles to analyze and solve engineering problems in various process industries. 2. Evaluate and interpret mass and energy balances in Mechanical systems using quantitative analysis techniques. 3. Demonstrate and understanding of the thermodynamics concept and its application to Mechanical processes. 4. Demonstrate and understanding of various components under static and dynamic loads. 				
Course Outcomes	Upon completion of this course, student should be able to- <ol style="list-style-type: none"> 1. Apply Mechanical engineering principles to solve complex engineering problems in diverse process industries. 2. Analyze and interpret mass and energy balances in Mechanical systems. 3. Explain the application of several of Mechanical Engineering processes. 4. Evaluate and propose various components of IC Engine and Refrigeration for improving performance. 				

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	2	-	-	-	-	-	-	-	-
CO2	-	3	2	2	-	-	-	-	-	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	-
CO4	-	-	2	-	2	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	Introduction to Mechanical Engineering: <ul style="list-style-type: none"> Overview of Mechanical engineering principles, scope, and applications Fundamentals of Mechanical processes, unit operations, and process flow diagrams Introduction to thermodynamics and its application in Mechanical engineering Overview of safety considerations and ethical responsibilities in Mechanical engineering 	04
II.	Engineering Thermodynamics: <ul style="list-style-type: none"> Laws of thermodynamics and their relevance Application of thermodynamics to analyze and predict phase behaviour in chemical processes 	04
III.	Internal Combustion Engines and Refrigeration: <ul style="list-style-type: none"> Introduction and Classification of IC Engine, construction and working of two and four-stroke Petrol and diesel engines with air standard cycles (Otto and Diesel Cycle) Refrigeration Cycles and Systems: Reverse Carnot cycle – Coefficient of Performance, Vapour compression refrigeration and Vapour absorption refrigeration cycle and system Applications of Air conditioning and Refrigeration 	04
IV.	Heat and Mass Transfer: <ul style="list-style-type: none"> Principles of heat transfer and its application in chemical engineering Conduction, convection, and radiation heat transfer mechanisms Mass transfer fundamentals and its relevance in chemical processes Design and analysis of heat exchangers and mass transfer equipment 	04
V.	Power Transmission Devices, Pumps, Compressor and Turbines: <ul style="list-style-type: none"> Types of Belts and belt drives, Chain drives, Types of gears: Types, Construction, working and applications Pumps: Types, Construction, working and applications Compressor and Hydraulic Turbines: Types, Construction, working and applications 	04
VI.	Introduction to Manufacturing Technology: <ul style="list-style-type: none"> Introduction to Manufacturing Processes and their Applications Casting, Sheet metal forming and metal joining processes 	04
Reference Books		
1.	T. S. Rajan, Basic Mechanical Engineering, New Age International Publishers.	
2.	P. K. Nag, Engineering Thermodynamics, Tata McGraw Hill Pub. Company Limited, New Delhi	
3.	S.S.Rattan, Theory of Machine, Tata McGraw Hill, New Delhi	
4.	Hajara Chaudhari S.K., Workshop Technology, Vol. I and II, Media Prom and Publication,	

	Mumbai.
5.	Bhandari V.B., Design of Machine Elements, Tata McGraw Hill Publication Co. Ltd.
6.	Shigley J.E. and Mischke C.R., Mechanical Engineering Design, McGraw Hill Publication Co. Ltd
7.	V. Ganesan, Internal Combustion Engines, Tata McGraw Hill, Second Edition.

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	-	2	-	-	-	-	-	-	-	-
CO2	-	3	2	2	-	-	-	-	-	-	-	-
CO3	3	-	2	-	-	-	-	-	-	-	-	-
CO4	-	-	2	-	2	-	-	-	-	-	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Unit No.	Course Content	Hours
I.	<p>Hot and cold working of metals Hot and cold working:</p> <ul style="list-style-type: none"> Principles of rolling, forging, drop, press, upset, roll forging, extrusion, drawing, spinning, and effect of hot working. Cold working processes, Cold rolling, swaging, forging, extrusion forward, backward and impact roll forming, tube drawing, wire drawing, spinning, shot penning, high energy rate forming, sheet metal working, types of presses, drives, different operations and types of dies. 	04
II.	<p>Joining processes:</p> <ul style="list-style-type: none"> Introduction, classification of joining processes Arc welding- Theory, SMAW, GTAW, GMAW, FCAW, Submerged arc welding, Stud welding, Resistance welding- Theory, spot and seam projection welding processes, Gas welding Friction welding, Ultrasonic welding, Thermit welding, EBW and LASER welding Use of adhesive for joining, classification of adhesives, types of adhesive and their application, surface preparation and various joints Welding defects and quality control in welding 	04
III.	<p>Foundry- Pattern making, moulding and casting:</p> <ul style="list-style-type: none"> Importance of casting as manufacturing process, advantages and disadvantages of casting processes, foundry layouts and mechanization Introduction to patterns, core boxes and gating systems: types of patterns, pattern materials, pattern-making allowances, core boxes, core making, core prints, components of gating system, functions and importance of runners and risers, solidification control devices: chills, ceramics bricks, progressive and directional solidification, sand properties Hand and machine moulding Melting and pouring - melting furnaces- Cupola, fuel fired electric arc and induction furnaces. Cleaning, finishing of casting, casting defects. Advanced casting methods: Lost wax processes, shell moulding and investment 	04

	casting. Permanent mould dies casting- Die-casting, low-pressure permanent mould casting, hot and cold chamber processing, centrifugal casting, semi-centrifugal casting and continuous casting.	
IV.	Lathe and drilling machine: <ul style="list-style-type: none"> Working principles, types, specifications, principal parts, accessories and attachments, lathe construction. Concept of speed, feed and depth of cut, thread cutting operation. Introduction to boring Machines, Capstan and Turret lathe. Fundamentals of drilling processes, hoist, drill geometry, tool holder, types of drilling machines, operations performed on drilling machines, type of drill. Reaming processes and reamer types. 	04
V.	Milling, shaping, planning and broaching: <ul style="list-style-type: none"> Fundamental aspects, cutter types and geometry, Operations performed on a milling machine, dividing head method of indexing. Construction, working and operations performed on shaper, planer, and broaching machines 	04
VI.	Grinding: <ul style="list-style-type: none"> Classification, grinding wheels, wheel marking, wheel selection, wheel mounting, wheel balancing, Grinding wheels- Abrasives, bonds and bonding processes, grit, grade and structure of wheel, types of grinding machines. Honing, lapping, super finishing, buffing and burnishing processes. 	04

Reference Books

1.	Chapman W.A. Workshop Technology, Vol. II, III, and I, Edward Arnold Pub. Ltd. London
2.	Hajra Chaudhary S.K. Elements of Workshop Technology, Vol. I and II, Media Prom and Pub, Mumbai
3.	S.Klpakjim, S.R. Schmid, Manufacturing Processes for Engineering Materials, Pearson Education
4.	M.P. Groover, Fundamentals of Modern Manufacturing, Wiley India Pvt. Ltd.
5.	P L Jain, Principles of foundry technology, Tata McGraw-Hill, New Delhi
6.	P. C. Sharma., Production technology, S. Chand and Company Ltd.,

The document over the next pages is for one-month Industrial Internship necessary as a part of requirement to fulfil the credits 4 in number in addition to the 4 credits against two theory courses. The student aspiring to exit after the first year will have total 8 credits earned over and above the 42 credits from the First Year. The scheme for this Industrial Internship is common to all the UG Programs. It is as follows.

Year, Program, Semester	Exit after First Year of B. Tech (Respective Specialization), Certificate Claim								
Course Code	CC-PBI								
Course Category	Course for Certificate in Respective Specialization								
Course Title	Industrial Internship								
Teaching Scheme and Credits	L	T	P	Total Contact Hours			Total Credits		
	One Month				04				
Evaluation Scheme	ISE		ESE		IOE	IPE	EOE	EPE	Total
	-		-		50	-	50	-	100
Pre-requisites(if any)	Completion of all the courses of FY B. Tech.								
Course Rationale	The purpose of the In Plant Training course is to provide students with practical exposure to the industry. This hands-on experience allows students to apply theoretical knowledge gained in the classroom to real-world scenarios. By engaging in industrial training, students develop essential skills, gain industry insights, and enhance their employability in the respective engineering field.								
Course Objectives	The training will ensure students 1. To gain practical exposure to industrial processes in respective engineering field.								
Course Outcomes	Upon completion of the In-Plant Training course, students will be able to 1. Understand industrial processes in respective field of engineering. 2. Apply theoretical knowledge to practical situations. 3. Utilize tools and techniques effectively in experiments. 4. Identify and mitigate workplace safety hazards. 5. Collaborate effectively in multidisciplinary teams. 6. Communicate findings professionally.								

Course Outcome and Program Outcome Mapping

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO 1	3	-	-	-	-	-	-	-	-	-	-	-
CO 2	-	3	-	-	-	-	-	-	-	-	-	-
CO 3	-	-	2	-	-	-	-	-	-	-	-	-
CO 4	-	-	-	2	-	-	-	-	-	-	-	-
CO 5	-	-	-	-	-	-	-	-	3	-	-	-
CO 6	-	-	-	-	-	-	-	-	-	3	-	-

Level of Mapping as: Low 1, Moderate 2, High 3

Course Content

The In-Plant Training course encompasses a comprehensive blend of theoretical learning and hands-on experience in an industrial setting. The course content includes the following however all the contents may not be exactly applicable to all the specializations. There may be variation from Specialization to Specialization:

1. Introduction to respective Engineering Industry: Overview of different sectors, processes, and applications within the particular engineering domain.
2. Safety Procedures and Protocols: Training on safety regulations, hazard identification, emergency procedures, and personal protective equipment (PPE) usage.
3. Equipment Familiarization: Hands-on experience with common equipment and instrumentation used in particular engineering processes, including pumps, reactors, distillation columns, and control systems or any other as applicable to the field.
4. Process Simulation and Optimization: Practical exercises on process simulation software and optimization techniques to enhance efficiency and productivity.
5. Troubleshooting and Maintenance: Practical sessions on diagnosing and resolving equipment malfunctions, conducting routine maintenance, and ensuring operational integrity.
6. Industrial Visits and Guest Lectures: Field trips to industrial facilities and guest lectures by industry experts to provide first hand insights into real-world applications and challenges.
7. Project Work: Collaborative projects or case studies addressing specific engineering problems or process improvements relevant to the host industry.
8. Evaluation and Assessment: Continuous evaluation based on performance during training, report submissions with the components of the report has been separately mentioned under Evaluation Method.

Evaluation Method

1. **Attendance and Participation:** Regular attendance and active participation in training sessions, workshops, and industrial visits will be monitored.
2. **Skills Assessment:** Evaluation of practical skills demonstrated during hands-on training activities, including equipment operation, experimentation, troubleshooting, and safety compliance.
3. **Performance Review:** Ongoing assessment of individual and group performance based on assigned tasks, projects, and team collaborations.
4. **Supervisor Feedback:** Feedback from industry supervisors regarding student performance, professionalism, attitude, and adaptability in the workplace.
5. **Training Report:** Submission of a comprehensive training report summarizing the learning outcomes, experiences, observations, and insights gained during the In Plant Training period.

Training Report Format: The training report should follow a structured format to ensure clarity, coherence, and completeness. Here's a suggested outline:

1. **Title Page:**
 - Title of the report: "In Plant Training Report"
 - Student's name
 - Enrolment number
 - Department/Program
 - Name of the institution
 - Duration of the training period

- Name and address of the host industry
- 2. **Acknowledgments (Optional):**
 - Acknowledge any individuals, organizations, or institutions that contributed to the training experience.
- 3. **Table of Contents:**
 - List of sections and subsections with corresponding page numbers.
- 4. **Introduction:**
 - Brief overview of the training objectives, scope, and significance.
 - Description of the host industry and the specific department or division where the training was conducted.
- 5. **Training Objectives:**
 - Recapitulation of the objectives outlined at the beginning of the training period.
- 6. **Training Activities:**
 - Detailed account of the activities undertaken during the training, including:
 - Description of the tasks assigned and responsibilities undertaken.
 - Summary of workshops, seminars, industrial visits, and hands-on training sessions participated in.
 - Highlights of any notable experiences, challenges faced, and lessons learned.
- 7. **Skills Acquired:**
 - Discussion of the practical skills and knowledge gained throughout the training period.
 - Reflection on the application of theoretical concepts in real-world industrial scenarios.
- 8. **Observations and Insights:**
 - Analysis of observations made during the training, including:
 - Observations regarding industry practices, processes, and technologies.
 - Insights into workplace dynamics, organizational culture, and professional etiquettes.
 - Suggestions for improvement or areas of further learning identified during the training.
- 9. **Conclusion:**
 - Summary of key takeaways and learning outcomes from the training experience.
- 10. **References:**
 - List of sources referenced or consulted during the preparation of the report (if applicable).
- 11. **Appendices (Optional):**
 - Additional materials such as photographs, diagrams, charts, or supplementary documents supporting the content of the report.
- 12. **Declaration:**
 - Statement affirming the authenticity and originality of the report, along with the student's signature and date.

The training report should be well-organized, concise, and professionally presented, demonstrating the student's ability to articulate their learning experiences and insights gained during the In-Plant Training period.