

Pimpri Chinchwad Education Trust's
Pimpri Chinchwad College of Engineering
SECTOR NO. 26, PRADHIKARAN, NIGDI, PUNE 411044

An Autonomous Institute Approved by AICTE and affiliated to SPPU, Pune

DEPARTMENT OF APPLIED SCIENCES AND HUMANITIES
Department of Mechanical Engineering



Curriculum Structure and Syllabus
of
FY B Tech Mechanical Engineering
(Course 2023)

"Knowledge Brings Freedom"



Effective from Academic Year 2023-24

Institute Vision

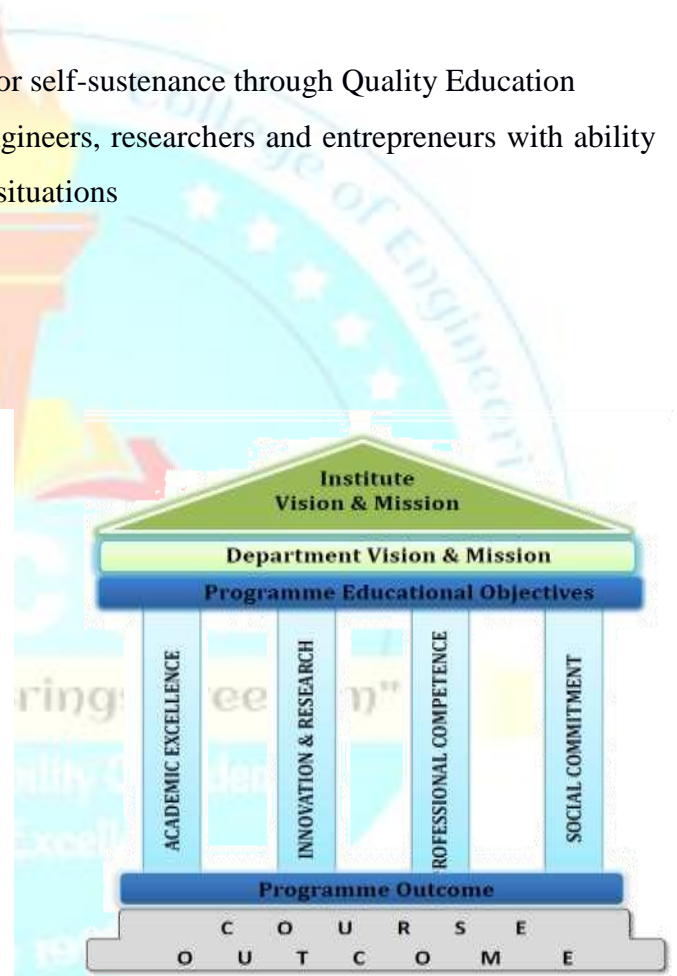
To be one of the top 100 Engineering Institutes of India in coming five years by offering exemplarily Ethical, Sustainable and Value Added Quality Education through a matching ecosystem for building successful careers.

Institute Mission

1. Serving the needs of the society at large through establishment of a state-of-art Engineering Institute.
2. Imparting right Attitude, Skills, Knowledge for self-sustenance through Quality Education
3. Creating globally competent and Sensible engineers, researchers and entrepreneurs with ability to think and act independently in demanding situations

Quality Policy

We at PCCOE are committed to impart Value Added Quality Education to satisfy the applicable requirements, needs and expectations of the Students and Stakeholders. We shall strive for academic excellence, professional competence and social commitment in fine blend with innovation and research. We shall achieve this by establishing and strengthening state-of- the-art Engineering and Management Institute through continual improvement in effective implementation of Quality ManagementSystem.



LIST OF ABBREVIATIONS IN CURRICULUM STRUCTURE

Sr. No.	ABBREVIATION	TYPE OF COURSES
1	BSC	Basic Science Course
2	ESC	Engineering Science Course
3	VSEC	Vocational and Skill Enhancement Course
4	AEC	Ability Enhancement Course
5	PCC	Programme Core Course
6	CC	Co-curricular Courses
7	HSMC	Humanities/ Social Sciences/Management Courses
8	B.Tech	Bachelor of Technology
9	L	Lecture
10	P	Practical
11	T	Tutorial
12	H	Hours
13	CR	Credits
14	CIE	Continuous Internal Evaluation /Examination
15	IE	Internal Evaluation
16	MTE	Mid Term Evaluation
17	ETE	End Term Evaluation
18	TW	Term work
19	OR	Oral
20	PR	Practical
21	LS	Life Skills
22	UHV	Universal Human Values
23	Eng.	English
24	Jap.	Japanese
25	Ger.	German
26	IKS	Indian Knowledge system

First Year B.Tech Mechanical Engineering: Semester-I

Course Code	Course Type	Course Name	Teaching Scheme						Evaluation Scheme							
			L	P	T	H	CR			IE	MTE	ETE	TW	PR	OR	Total
							TH	PR/Tut	Total							
BSH21A01	BSC	Linear Algebra & Univariate Calculus	2	-	1	3	2	1	3	20	30	50	-	-	-	100
BSH21A02	BSC	Engineering Physics	3			3	3		3	20	30	50	-	-	-	100
BSH21A03	BSC	Engineering Physics Laboratory		2		2		1	1				50	-		50
BME21B01	ESC	Engineering Mechanics	3	-	-	3	3	-	3	20	30	50	-	-	-	100
BME21B02	ESC	Manufacturing Science	2	-	-	2	2	-	2	20	-	30	-	-	-	50
BME21C01	PCC	Engineering Graphics Laboratory	-	4	-	4	-	2	2	-	-	-	100	-	-	100
BME21G01	VSEC	Workshop Practice 1	-	2	-	2	-	1	1	-	-	-	50	-	-	50
BME21G02	VSEC	Programming & problem-solving laboratory 1	-	2	-	2	-	1	1	-	-	-	50	-	-	50
BSH21H01/02/03/04	AEC	AEC (Eng/Ger/Jap/Business story telling)	1	2	-	3	1	1	2	30	-	20	-	-	-	50
BSH21K01	CC	Life Skill 1	-	4	-	4	-	2	2	-	-	-	100	-	-	100
Total			11	16	1	28	11	9	20							750

First Year B.Tech Mechanical Engineering: Semester-II

Course Code	Course Type	Course Name	Teaching Scheme						Evaluation Scheme							
			L	P	T	H	CR			IE	MTE	ETE	TW	PR	OR	Total
							TH	PR/Tut	Total							
BSH22A06	BSC	Multivariate Calculus	2		1	3	2	1	3	20	30	50	-	-	-	100
BSH22A04	BSC	Engineering Chemistry	3	-	-	3	3	-	3	20	30	50	-	-	-	100
	BSC	Engineering Chemistry Laboratory	-	2	-	2	-	1	1	-	-	-	50			50
BME22B03	ESC	Engineering Thermodynamics	3	-	-	3	3	-	3	20	30	50	-	-	-	100
BME22B04	ESC	Engineering Thermodynamics Laboratory	-	2	-	2	-	1	1	-	-	-	25	-	25	50
BME22B05	ESC	Fundamentals of Electromechanical Systems	2	-	-	2	2	-	2	20		30				50
BME22B06	ESC	Fundamentals of Electromechanical Systems Laboratory	-	2	-	2	-	1	1	-	-	-	50	-	-	50
BME22G03	VSEC	Workshop Practice 2	-	2	-	2	-	1	1	-	-	-	50	-	-	50
BME22G04	VSEC	Programming & problem-solving laboratory 2	-	2	-	2	-	1	1	-	-	-	50	-	-	50
BSH22H05	IKS	Indian Knowledge system	2	-	-	2	2	-	2	30	-	20	-	-	-	50
BSH22K01	CC	Life skill 2	-	4	-	4	-	2	2	-	-	-	100	-	-	100
Total			12	14	1	27	12	8	20							750

Curriculum Structure

First Year B.Tech

Mechanical Engineering

Semester I

"Knowledge Brings Freedom"

Progress Credibility Confidence
Optimism Excellence

Since 1999

Program: B. Tech. (Mechanical Engineering)				Semester: I			
Course: Linear Algebra & Univariate Calculus				Code: BSH21A01			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial*	Credit	IE	MTE	ETE	Total
2	-	1	3	20	30	50	100
Prior Knowledge:							
1) Elementary Mathematics. 2) Elementary Calculus is essential							
Course Objectives: This course aims at enabling students,							
1) To familiarize with concepts and techniques in Calculus and Matrices. 2) To get acquainted with Mathematical Modeling of physical systems using differential equations. 3) To acquire techniques of advanced level mathematics and its applications that would enhance analytical thinking power.							
Course Outcomes: After learning the course, the students will be able to:							
1) Apply the concept of rank to solve Electrical Circuits problems and Find Eigenvalues and Eigenvectors. 2) Represent Fourier series for the periodic time domain continuous and discrete function into signal form. 3) Use Successive differentiation & Taylor's and Maclaurin's theorems for expansion of a function in infinite series and evaluate the limits of indeterminate forms with L'Hospital rule. 4) Develop and solve models related to Orthogonal Trajectories, Electrical Circuits and One dimensional heat flow using differential equations.							
Unit	Description						Duration (Hrs.)
1	Matrices: Rank, System of linear equations with applications in Electrical circuits, Linear dependence and independence, Linear transformations, Eigenvalues, Eigen vectors.						8
2	Fourier Series: Definition, Dirichlet's conditions, full range Fourier series, Harmonic analysis, and application to engineering.						7
3	Differential Calculus: L' Hospital rule, Taylor's series, Maclaurin's series, Successive differentiation and Leibnitz theorem.						7
4	Differential Equations: Exact differential equations, differential equations reducible to Exact form, Applications of Differential Equations: Orthogonal trajectories, Kirchoff's law of Electrical circuits (L-R and R-C circuits) , One-dimensional conduction of heat (steady state).						8
Total						30	
* Tutorial will be conducted in batches as 1Hr/week/batch							
Sr. No.	List of Tutorials						
1	Rank, System of linear equations,						
2	Applications in Electrical circuits						
3	Linear dependence and independence, Linear transformations						
4	Eigenvalues, Eigen vectors						
5	Full range Fourier series						
6	Full range Fourier series						
7	Harmonic analysis						

8	Application to engineering
9	L' Hospital rule, Taylor's series
10	Maclaurin's series, Successive differentiation
11	Successive differentiation, Leibnitz theorem
12	Exact differential equations,
13	Differential equations reducible to Exact
14	Orthogonal trajectories, Kirchoff's law of Electrical circuits
15	One-dimensional conduction of heat

Text Books:

- 1) Higher Engineering Mathematics by B.V. Ramana , 34e, Tata McGraw-Hill.
- 2) Linear Algebra & Univariate Calculus by Team Mathematics, PCCoE, Pune, 1e, Techknowledge Publication.

Reference Books:

- 1) Advanced Engineering Mathematics by Erwin Kreyszig, 9e, Wiley Eastern Ltd.
- 2) Higher Engineering Mathematics by H. K. Dass , 22e, S. Chand Publication, Delhi.
- 3) Advanced Engineering Mathematics by S.R.K. Iyengar, Rajendra K. Jain, 4e, Alpha Science International, Ltd.
- 4) Advanced Engineering Mathematics, by Peter V. O'Neil, 7e, Thomson Learning.
- 5) Advanced Engineering Mathematics by M. D. Greenberg, , 2e, Pearson Education.
- 6) Higher Engineering Mathematics by B. S. Grewal, 43e, Khanna Publication, Delhi.

E-sources:**NPTEL Course lectures links:**

<https://www.youtube.com/watch?v=4QFsiXfgbzM&list=PLbRMhDVUMngeVrxtbBz-n8HvP8KAWBpI5>

"Knowledge Brings Freedom"

Progress Credibility Confidence

Optimism Excellence

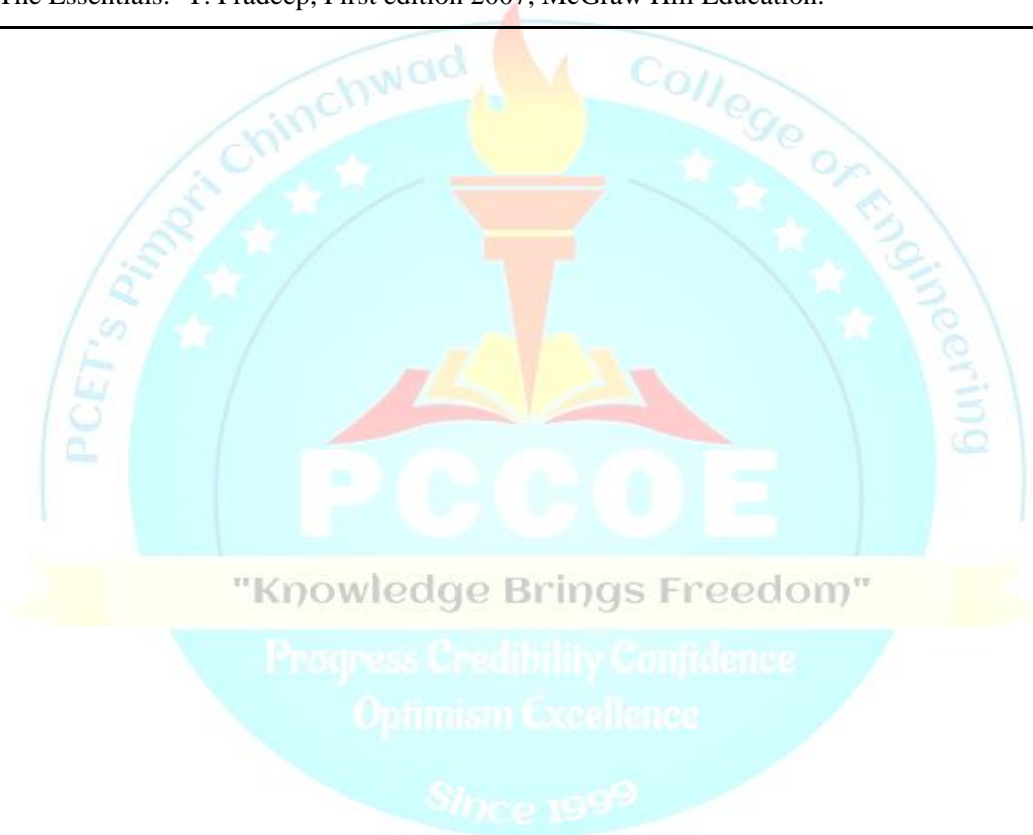
Since 1999

Program: B. Tech. (Mechanical Engineering)				Semester: I			
Course: Engineering Physics				Code: BSH21A02			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	Total
3	-	-	3	20	30	50	100
Prior Knowledge:							
1) Wave theory of light 2) Elasticity 3) Atom, molecule & nuclei 4) Current, electricity & magnetism 5) Electromagnetic Induction							
Course Objectives: This course aims at enabling students,							
1) To build strong conceptual understanding of Optics, Semiconductor Physics & Quantum Physics 2) To explore advances in Physics with introduction of Lasers, Nanotechnology & Superconductivity 3) To provide consciousness about the importance of Physics principles in various engineering applications							
Course Outcomes: After learning the course, the students will be able to:							
1) Interpret intensity variation due to optical phenomena like interference and relate these concepts to various engineering applications 2) Apply basics of semiconductor physics to explain the behavior of charge carriers inside a semiconductor 3) Illustrate the working principle of laser and their prominent applications 4) To distinguish wave behavior of a matter particle for the manipulation of the processes at quantum scale. 5) Interpret properties of superconductors & their applications in advanced technologies 6) Summarize properties, preparation methods of nanomaterials & explore their applications in various engineering fields							
Unit	"Knowledge Brings Freedom"						Duration (Hrs.)
	Description						
1	Wave Optics Interference: Interference, phase difference & path difference between waves, constructive & destructive interference, phase difference due to reflection at boundaries of optical interfaces, thin film, interference due to thin film of uniform thickness, conditions of maxima and minima, anti-reflection coating as an application of interference Diffraction: Diffraction, Fraunhofer diffraction at a single slit (Qualitative)-condition of maxima and minima, resultant intensity distribution pattern, diffraction grating (Qualitative), introduction to X-Ray diffraction						7
2	Semiconductor Physics Band Theory of solids, Electrical conductivity of conductors & semiconductors, Hall effect (with derivation), Fermi Dirac probability distribution function, Fermi energy, position of Fermi level in intrinsic semiconductors (Qualitative) & in extrinsic semiconductors, dependence of Fermi level on temperature & doping concentration, energy band diagram of P-N Junction diode, solar cell I-V characteristics.						6

3	<p>Laser & Fiber Optics Laser: Introduction, interaction of light with matter- absorption, spontaneous emission, stimulated emission, population inversion, metastable state, active system, resonant cavity, characteristics of laser, semiconductor hetero-junction laser, carbon dioxide laser, applications of laser-industrial, defense & medical; introduction to holography Fiber Optics: Propagation of light in optical fibers, acceptance angle, numerical aperture, modes of propagation, types of fibers- step index, graded index, single mode & multi-mode; Losses -attenuation, dispersion</p>	8
4	<p>Quantum Mechanics Limitations of classical physics, need of quantum mechanics, wave particle duality of radiation & matter, De Broglie hypothesis, De Broglie wavelength in terms of kinetic & potential energy, concept of wave packet, phase and group velocity, properties of matter waves, Heisenberg's uncertainty principle, wave function & probability interpretation, well behaved wave function, Schrodinger's time independent wave equation, applications of independent wave equation to the problem of (i) particle in rigid box, (ii) particle in a non-rigid box(qualitative), Tunneling effect, examples of tunneling effect, tunnel diode & scanning tunneling microscope (STM)</p>	8
5	<p>Magnetism and Superconductivity Magnetism: Classification of magnetic materials, temperature dependent magnetic transitions (Curie and Neel temperature), magnetic hysteresis loop, magneto-resistance, giant magneto-resistance (GMR), application of magnetic materials in magneto caloric effect, adiabatic demagnetization. Superconductivity: Introduction, critical temperature, properties of superconductors-zero electrical resistance, persistent current, Meissner effect, critical magnetic field, BCS theory, type I and II superconductors, low T_c and high T_c superconductors, Josephson effect, DC-SQUID-construction, working and applications, applications - superconducting magnets, maglev trains</p>	8
6	<p>Introduction to Nanoscience Introduction, surface to volume ratio, quantum confinement, properties of nanomaterials- optical, electrical, mechanical, magnetic; methods of preparation of nanomaterials- bottom-up and top-down approaches, physical methods- high energy ball milling, physical vapor deposition; chemical method - colloidal route for synthesis of gold nanoparticle , aerogels- properties and applications, applications of nanomaterials in medical, energy, automobile, space, defense; introduction to quantum computing.</p>	8
Total		45
<p>Text Books: 1) A textbook of Engineering Physics-Dr. M.N. Avadhanulu, Dr. P.G. Kshirsagar- Revised edition 2015, S. Chand & Company Pvt. Ltd. 2) Engineering Physics-R.K. Gaur, S. L Gupta, -Eighth revised edition 2012, Dhanpatrai Publications (P) Ltd. 3) Nanotechnology -Principles & Practices - Sulabha K. Kulkarni -Third edition -Capital Publishing Company.</p>		

Reference Books:

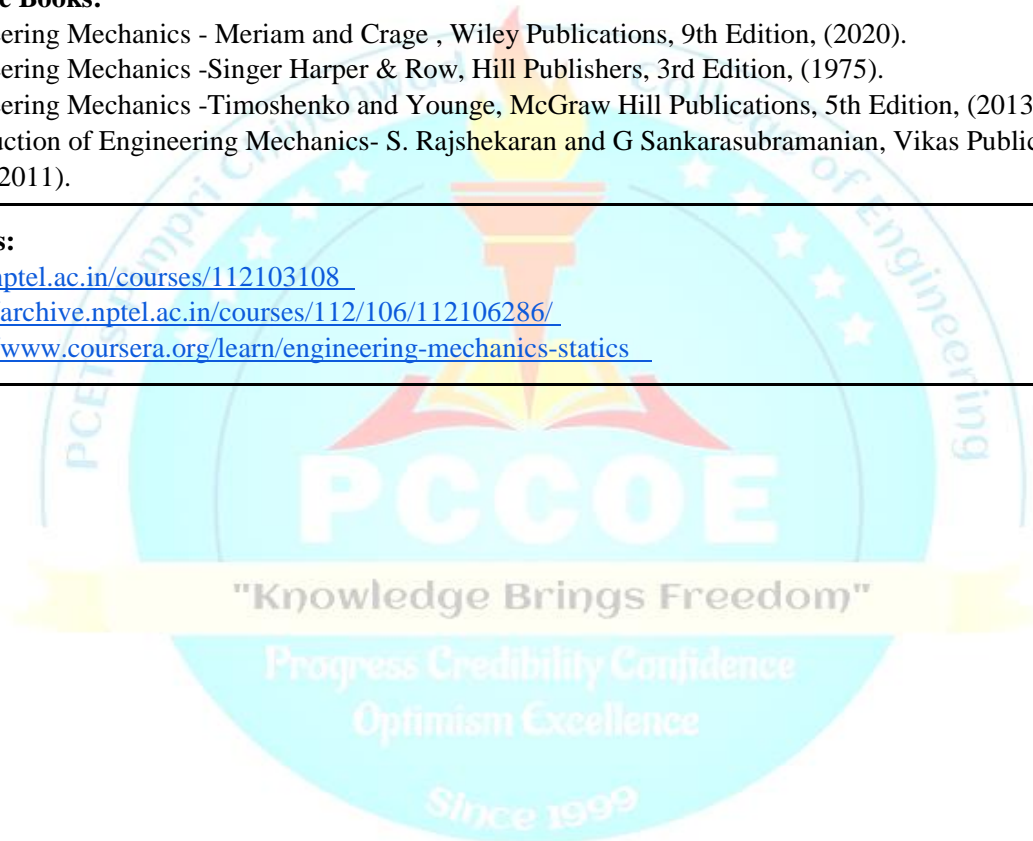
- 1) Lasers & nonlinear Optics-B. B. Laud-Third edition, New Age International (P)Ltd. Publishers.
- 2) Fundamentals of Optics- Francis A. Jenkins, Harvey E. White, Fourth edition, McGraw Hill Education (India) Pvt. Ltd.
- 3) Fundamentals of Physics- Resnick & Halliday (John Wiley & sons)
- 4) An introduction to Laser's theory and applications – Dr. M. N. Avdhanulu, Dr. P.S. Hemne– Revised edition 2017-S. Chand & Company Pvt. Ltd.
- 5) Introduction to Quantum Mechanics. - David J. Griffiths, Darrell F. Schroeter, Third edition, Cambridge University Press.
- 6) Introduction to solid states Physics - Charles Kittel, Eighth Edition, Wiley India Pvt Ltd.
- 7) Nano: The Essentials. -T. Pradeep, First edition 2007, McGraw Hill Education.



Program: B. Tech. (Mechanical Engineering)				Semester: I			
Course: Engineering Physics Laboratory				Code: BSH21A03			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	Oral	Practical	Total
-	2	-	1	50	-	-	50
Prior Knowledge:							
1) Wave theory of light 2) Elasticity 3) Atom, molecule & nuclei 4) Current, electricity & magnetism 5) Electromagnetic Induction							
Course Objectives: This course aims at enabling students,							
1) To provide better understanding of concepts, principles of Physics by giving hands on experience 2) To develop an insight in scientific experimental methodologies							
Course Outcomes: After learning the course, the students will be able to:							
1) Develop an ability to handle measuring instruments and understand uncertainty and errors involved in various measurements 2) Apply the knowledge of Physics to learn various experimental methodologies - by performing experiments related to optics, sound, semiconductors, magnetism & Laser							
Unit	Description (Any 10 experiments from following list)						
1	To determine the radius of curvature of Plano-convex lens using Newton's rings.						
2	To determine unknown wavelength by using plane diffraction grating.						
3	To verify Malus Law of polarization of light.						
4	To determine refractive indices and identification of types of crystal using double refraction.						
5	To determine the number of lines on grating surface using Laser.						
6	To study IV characteristics of solar cell and determine fill factor.						
7	To determine band gap of given semiconductor.						
8	To determine Hall coefficient and charge carrier density.						
9	To determine Magnetic susceptibility of given material by Quinke's Tube Experiment.						
10	To determine compressibility of given liquid using Ultrasonic Interferometer.						
11	To Determine specific rotation of a solution with Laurent's Half Shade Polari meter						
12	To Determine electrical resistivity of given semiconductor using four probe method						
Text Books:							
1) A textbook of Engineering Physics-Dr. M.N. Avadhanulu, Dr. P.G. Kshirsagar- Revised edition 2015, S. Chand & Company Pvt. Ltd. 2) Engineering Physics-R.K. Gaur, S. L Gupta, -Eighth revised edition 2012, Dhanpatrai Publications (P) Ltd.							
Reference Books:							
1) Lasers & nonlinear Optics-B. B. Laud-Third edition, New Age International (P) Ltd. Publishers. 2) Fundamentals of Optics- Francis A. Jenkins, Harvey E. White, Fourth edition, McGraw Hill Education (India) Pvt. Ltd. 3) Fundamentals of Physics- Resnick & Halliday (John Wiley &sons) 4) An introduction to Laser's theory and applications – Dr. M. N. Avdhanulu, Dr. P.S. Hemne– Revised edition 2017-S. Chand & Company Pvt. Ltd. 5) Introduction to solid states Physics - Charles Kittel, Eighth Edition, Wiley India Pvt Ltd.							

Program: B. Tech. (Mechanical Engineering)						Semester: I	
Course: Engineering Mechanics						Code: BME21B01	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	Total
3	-	-	3	20	30	50	100
Prior Knowledge: -Nil							
<p>Course Objectives: This course aims at enabling students,</p> <ol style="list-style-type: none"> 1) To provide adequate knowledge of mechanics to formulate and analyze problems based on real life situations. 2) To make aware about basic concepts of statics and dynamics for particles and rigid bodies. 3) To explain the significance of centroid, center of gravity, and moment of inertia. 4) To impart fundamental knowledge of analysis of structures, equilibrium of force system and friction. 5) To build conceptual understanding of principles of kinetics and kinematics to solve various engineering problems. 							
<p>Course Outcomes: After learning the course, the students will be able to:</p> <ol style="list-style-type: none"> 1) Demonstrates understanding of the resultant and equilibrium of different types of force systems. 2) Comprehend the analysis of structures. 3) Identify type of friction and applicable theory for friction analysis. 4) Compute the inertial resistance offered by plane lamina. 5) Determine motion parameters of particles. 6) Compute motion parameters of rigid bodies. 							
Unit	Description						Duration (Hrs.)
1	<p>Force System: Introduction and Principle of statics, force systems, resolution and composition of forces, resultant of concurrent forces, moment of a force, Varignon's theorem, couple, resultant of general force system, free body diagram, equilibrium of three forces in a plane, equilibrium of concurrent forces.</p>						8
2	<p>Analysis of Structures: Introduction, Truss, Types of Frames, Support reactions, Analysis of structures by method of joint, analysis of structures by method of section.</p>						8
3	<p>Friction: Friction – Coulombs laws of dry friction, Types of friction, Limiting friction, Wedge friction, ladder friction, Belt Friction.</p>						6
4	<p>Centroid and Moment of Inertia: Centroid of plane lamina, applications of centroid, moment of inertia (MI), perpendicular axis theorem, parallel axis theorem, MI of standard shapes(I, C, T), MI of composite figures.</p>						7
5	<p>Dynamics of Particle: Kinematics of particle: Position, Velocity and Acceleration – Rectilinear motion, curvilinear motion, tangential and normal components, radial and transverse components. Kinetics of Particle: Newton's second Law and momentum methods, principle of work energy, Principle of impulse and Momentum</p>						8

6	<p>Dynamics of Rigid Bodies: Basic terms, Kinematics of Rigid Bodies, Translation and fixed axis rotation, general principles in dynamics; Equations of Motion, Angular Momentum, D'Alembert's principle and its applications in plane motion; Work energy principle and its application in plane motion of connected bodies; Kinetics of rigid body rotation</p>	8
Total		45
<p>Text Books: 1) Vector Mechanics for Engineers: Static and Dynamics, Beer & Johnston, Mazurek, Cornwell, Self, Tata McGraw-Hill Publications, (2019) 12th Edition.</p>		
<p>Reference Books: 1) Engineering Mechanics - Meriam and Crage , Wiley Publications, 9th Edition, (2020). 2) Engineering Mechanics -Singer Harper & Row, Hill Publishers, 3rd Edition, (1975). 3) Engineering Mechanics -Timoshenko and Younge, McGraw Hill Publications, 5th Edition, (2013). 4) Introduction of Engineering Mechanics- S. Rajshekaran and G Sankarasubramanian, Vikas Publications, 1st Edition, (2011).</p>		
<p>E sources: 1) http://nptel.ac.in/courses/112103108 2) https://archive.nptel.ac.in/courses/112/106/112106286/ 3) https://www.coursera.org/learn/engineering-mechanics-statics</p>		



Program: B. Tech. (Mechanical Engineering)						Semester: I	
Course: Manufacturing Science						Code: BME21B02	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	Total
2	-	-	2	20	-	30	50
Prior Knowledge: -Nil							
Course Objectives: This course aims at enabling students, 1) Comprehensive knowledge of conventional manufacturing processes used within the manufacturing industry. 2) Impart the insights of manufacturing processes by describing the principles of operations, tools, merits and limitations.							
Course Outcomes: After learning the course, the students will be able to: 1) Select the manufacturing processes used within industries for fabrication of a particular part. 2) Apply the principle of operation involved in non-machining processes and its applications. 3) Compare different shearing and non-shearing operations used for the manufacturing of sheet metal parts. 4) Comprehend the machining and joining processes used within manufacturing industries for different applications.							
Unit	Description						Duration (Hrs.)
1	Manufacturing Processes: Introduction to manufacturing; evolution of manufacturing; Classification of manufacturing processes, machining and non-machining processes, Production system: types merits, demerits and applications.						7
2	Non-Machining Processes: Introduction to casting process: types of casting, steps involved in casting process, pattern making, pattern material, mold making, mold material, defects, applications of casting processes. Introduction to forging process, types of forging, steps involved in forging operation, applications, defects.						8
3	Metal forming processes: Introduction to metal forming processes: shearing and non-shearing processes, classification and principle of operation of rolling, extrusion, drawing, blanking, punching, bending, deep drawing etc. Applications of forming processes, defects in forming processes.						7
4	Machining and Joining Processes: Introduction to single point and multipoint cutting operations: lathe machine, shearing, slotting, and boring, drilling, milling. Introduction to finishing operations: Broaching, lapping, buffing, grinding operation. Introduction to Joining processes: welding, brazing, soldering operation. Defects associated with machining and joining processes.						8
Total						30	
Text Books: 1) P. C. Sharma, A Textbook of Production Engineering and production technology, S. Chand Publication, 8th Edition, 2018. 2) Serope Kalpak Jian, Steven Schmid, Manufacturing Engineering & Technology, 7th Edition, Pearson, 2013.							

Reference Books:

- 1) P. N. Rao, Manufacturing Technology, Volume I & II, McGraw Hill Education (India) Private Limited. 4th Edition, 2018.
- 2) M. P. Grover, Fundamentals of Modern Manufacturing: Materials, Processes, and Systems 7th Edition, 2020.
- 3) Amitabha Ghosh, Ashok Kumar Mallik, Manufacturing Science, East-West Press Pvt. Ltd 2nd Edition, 2010.

E sources:

<https://archive.nptel.ac.in/courses/112/107/112107219/>



Program: B. Tech. (Mechanical Engineering)						Semester: I	
Course: Engineering Graphics Laboratory						Code: BME21C01	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	Practical	Oral	Total
-	4	-	2	100	-	-	100
Prior Knowledge:							
1) Basic geometry such as different types of planes, solids etc. 2) Virtual imagination.							
Course Objectives: This course aims at enabling students,							
1) Develop imagination of physical objects to be represented on paper for engineering communication. 2) Develop interpretation and manual drawing skills. 3) Develop the physical realization of the dimension of the objects							
Course Outcomes: After learning the course, the students will be able to:							
1) Effectively communicate engineering ideas and designs through graphical representations ensuring clarity. 2) Develop the ability to visualize engineering objects based on 2D and 3D representations such as orthographic projection or isometric view. 3) Demonstrate proficiency in using drafting tools and techniques to create accurate engineering drawing including line types and dimensioning. 4) Gain proficiency in using CAD software to create and modify engineering drawings and models.							
Unit	Description						Duration (Hrs.)
1	Part A: Introduction to engineering drawing Introduction to drawing instrument and their uses, BIS, types of lines and their applications, dimensioning, Lettering, Limits, Fits and tolerances. Part B: Free hand sketching Free hand sketching of any existing/innovative products and Mechanical Elements Part C: Introduction to Computer aided drafting Introduction to GUI of CAD software, basic operation of CAD software, Draw tools, Modify tools, Dimensions and Properties.						15
2	Part A: Orthographic projections Introduction to first and third angle projection methods, Orthographic projection of given pictorial view by first angle method of projection, types of sections, sectional orthographic projection (only full sectional orthographic view) Part B: Interpretation of given views, Missing views. Part C: Drafting orthographic projections and missing views using CAD tools						15
3	Part A: Development of lateral surface of solids Development of cut section of prism, pyramid, cylinder and cone using single cutting plane. Part B: Intersection of Solids Intersection of combination of regular solid Cone, Cylinder, Prism and Pyramids. Part C: Drafting lateral surfaces of solids and intersection of solids using CAD tools						15
4	Part A: Isometric view Isometric axes, scale, difference between isometric projection and isometric view, isometric view of simple solids and its dimensioning. Part B: Computer aided drafting Drafting Isometric view using CAD tools						15
Total						60	

List of Drawing Sheets:**Sheet no. 1 to 7 shall be submitted on A2 size drawing sheet. (ANY 8)**

- 1) Orthographic projections (min.3 problems two hand drawing and one using CAD)
- 2) Missing View (min 3 problems two hand drawing and one using CAD)
- 3) Development of lateral surface of solids (min.3 problems two hand drawing and one using CAD)
- 4) Intersection of solids (min.3 problems two hand drawing and one using CAD)
- 5) Isometric views (min.3 problems two hand drawing and one using CAD)
- 6) Free hand sketching of any existing/innovative product
- 7) Free hand sketching of Mechanical Elements
- 8) Mini Project: 3D model of existing/innovative product
- 9) Model making for existing/ innovative product

Text Books:

- 1) Engineering Drawing with an introduction to AutoCAD- Dhananjay A. Jolhe, Revised Edition 2017, Tata Magraw Hill publishing company Ltd. New Delhi, India

Reference Books:

- 1) Engineering Drawing, Plane and solid geometry- N.D. Bhatt, 54th edition 2023, Charotar publication house.
- 2) Engineering Drawing- M.B Shah and B.C Rana, 2nd edition 2009, Pearson Publications.
- 3) Engineering Graphics- P.J. Shah, Revised edition 2019, S Chand Publications.
- 4) Fundamentals of Engineering Drawing- Warren J. Luzzader, 11th edition 2015, Prentice Hall of India New Delhi.
- 5) Engineering Graphics for Degree- K.C. John, 2nd edition 2009, PHI learning Pvt. Ltd. New Delhi.
- 6) Auto CAD 2012- Prof. Sham Tickoo and Gaurav Verma, Revised edition 2021, (For engineers and Designers)", Dreamtech Press New Delhi.
- 7) A text book of Engineering Drawing- R.K. Dhawan, Revised Edition 2019, S. Chand and company ltd. New Delhi, India
- 8) Engineering Drawing- Basant Agarwal and C.M. Agarwal, 3rd Edition 2019, Tata McGraw Hill publishing company ltd. New Delhi, India

Program: B. Tech. (Mechanical Engineering)						Semester: I	
Course: Workshop Practice I						Code: BME21G01	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	Practical	Oral	Total
-	2	-	1	50	-	-	50
Prior Knowledge: 1) Algebra 2) Geometry							
<p>Course Objectives: This course aims at enabling students,</p> <ol style="list-style-type: none"> 1) To introduce various machine tools and demonstration on machining 2) To introduce different materials in engineering practices with respect to their workability, formability and machinability. 3) To develop skills through hands on experience. 							
<p>Course Outcomes: After learning the course, the students will be able to:</p> <ol style="list-style-type: none"> 1) Identify appropriate machining parameters and handle machines. 2) Use hand tools and basic measuring instruments used in carpentry, welding, fitting and sheet metal operation. 3) Use advanced manufacturing processes. 4) Follow the safety practices on the shop floor. 							
Sr. No.	List of Experiments						
1	Introduction to safety measures.						
2	Demonstration of Manufacturing processes (Machining: Turning, Drilling, Milling and grinding using one simple machine component and sheet metal operations): Working, operation and types						
3	Demonstration of sand casting and plastic molding: Preparation of sand mold and molding of simple plastic component						
4	Finishing, inspection and assembly of machine components using different tools (Finishing, assembly) and measuring instruments. (For jobs made during preceding practical)						
5	Inspection of component manufactured during preceding practical by using various measuring instruments such as Vernier caliper, micrometer, height gauge etc.						
6	Demonstration of Advanced Manufacturing processes (CNC Machining, Additive manufacturing using one simple machine component)						
7	Pattern Making-1 Job involving joint and wood turning used to manufacture pattern for casting under consideration.						
8	Fitting – 1 Job involving fitting to size, male female fitting with drilling and tapping.						
9	Joining – 1 Job involving welding (Arc), soldering, brazing etc.						
10	Dismantling and Assembly of simple machines.						

Note:

- 1) Assignment on experiment No. 1 is mandatory.
- 2) Any four from experiment No. 2 to 6.
- 3) Any Two from experiment No. 7 to 9.

Submission: Two jobs as mentioned above and write up of demonstration with sketches/illustration.

Reference Book:

- 1) Hajra Chaudhary, Elements of Workshop Technology, Vol. I and II, Media promoters and publishers Pvt. Ltd., 2013
 - 2) P. N. Rao - Manufacturing Technology Volume I & II, Fifth Edition, McGraw Hill Education (India) Private Limited, 2018
 - 3) D. K. Singh, Fundamentals of Manufacturing Engineering, Ane's Books. Pvt. Ltd. 1st Edition, 2008.
 - 4) P N Rao, CAD/CAM: Principles and Applications, Tata McGraw-Hill Education, 2017
- Raghuvanshi, B. S. - Workshop Technology. Vol. 1 & 2, Dhanpat Rai & Co. (P) Ltd, Delhi., 2009



Program: B. Tech. (Mechanical Engineering)						Semester: I	
Course: Programming & Problem-solving Laboratory 1						Code: BME21G02	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	Practical	Oral	Total
-	2	-	1	50	-	-	50
Prior Knowledge: Students are expected to have a good understanding of basic computer principles.							
<p>Course Objectives: This course aims at enabling students,</p> <ol style="list-style-type: none"> 1) To explore MATLAB's work environment, built-in functions, and commands. 2) To create an array and matrix and use script files for problem-solving. 3) To develop flowcharts, algorithms, and codes for solving problems related to branching, loops, and control flow. 4) To visualize the experimental/ literature data using various commands and draw suitable conclusions. 							
<p>Course Outcomes: After learning the course, the students will be able to:</p> <ol style="list-style-type: none"> 1) Explain the MATLAB work environment, built-in functions, and commands to write codes for solving problems. 2) Apply suitable commands and functions to create arrays, script files, branches, and loops to simplex engineering/ fundamental science problems. 3) Select a suitable plot to visualize the data using MATLAB programs and draw practical/ relevant interpretations. <p>Prepare flowcharts, algorithms, and MATLAB codes to solve simple real-world problems.</p>							
Sr. No.	Lab work/ Assignments						
1	<p>Introduction to Matrix Laboratory (MATLAB) Work environment; Windows; Symbols; Built-in functions and constants; Commands; Variables; Pre-defined variables; Saving and loading variables. Case study/ example/ numerical</p>						
2	<p>Creating Vectors and Matrices Creating arrays; matrices; Creating evenly spaced vectors; Creating arrays with functions; commands for creating special matrices. Case study/ example/ numerical.</p>						
3	<p>Array Addressing Indexing into arrays; Extracting multiple elements; Changing values in arrays; built-in functions for handling arrays. Case study/ example/ numerical.</p>						
4	<p>Script Files input; disp; fprintf; fopen; fclose; and use of special commands; case study/ example/ numerical</p>						
5	<p>Branches, Loops, and Control Flow if-elseif-else; switch; try/ catch; while loop; for loop; break statement; continue statement; Case study/ example/ numerical</p>						
6	<p>Plots/ Data Visualization Visualize variables using plotting functions; single and multiple graphs; Stem plot; plotting with two Y-axis; sub-plots; semilogx; semiology; loglog; xlim; ylim; bar chart; histogram; pie chart; scatter plot; surface and mesh plot; contour plots; 3-D plotting;</p>						
<p>Mini-Project (to be completed in a group of 2-3 students) The mini-project should be based on any topics related to the Mathematics/ Statistics/ Physics/ Chemistry/ Biology; Engineering Mechanics; Thermodynamics/ mechatronics</p>							

Text Books:

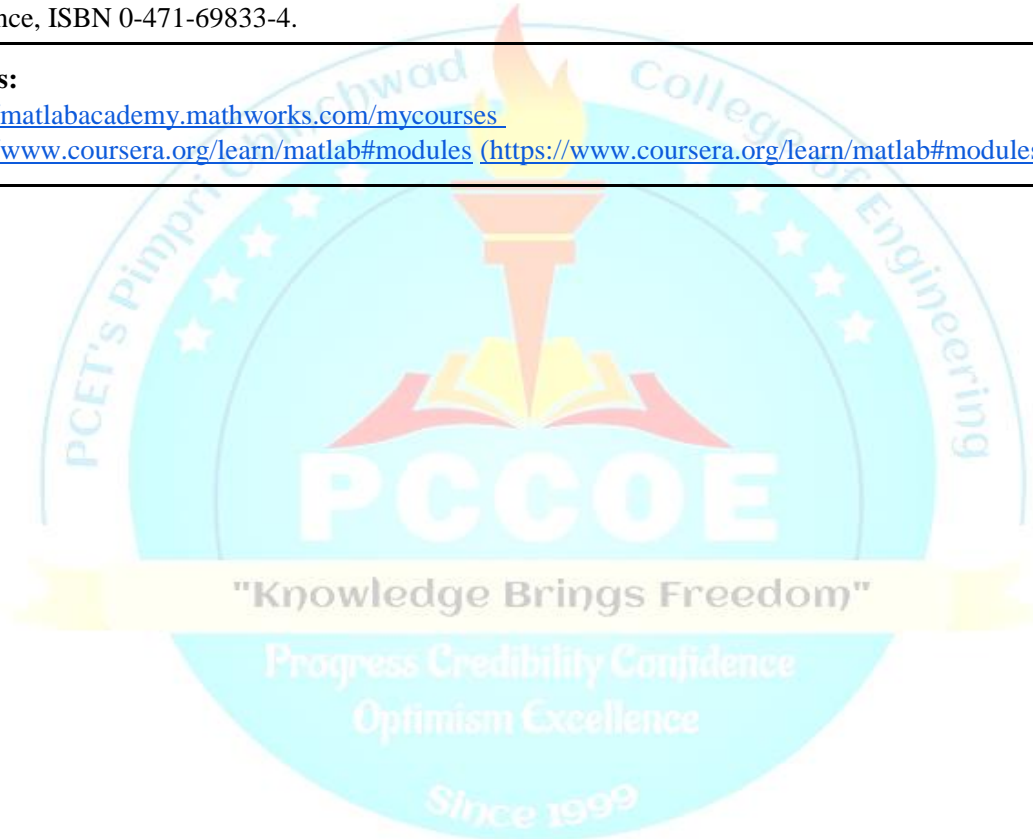
- 1) Dorothy C. Attaway, 2022, "MATLAB. A Practical Introduction to Programming and Problem-Solving," 6th Edition.
- 2) S. Eshkabilov, 2022, "Beginning MATLAB and Simulink – From beginner to Pro," Edition Second, Apress, ISBN 1484287479.
- 3) D. T. Valentine, 2022, "Essential MATLAB for Engineers and Scientists," Apress, Edition Eight, 0323995489.

Reference Books:

- 1) Steven C. Chapra, 2012, "Applied Numerical Methods with MATLAB for Engineers and Scientist," Tata McGraw Hill Publishing Co-Ltd, 2008, ISBN 0-07-064853-0.
- 2) W. Y. Yang, W. Cao, T-S Chung, and J. Morris, 2002, "Applied Numerical Methods Using MATLAB," Wiley-Interscience, ISBN 0-471-69833-4.

E-sources:

- 1) <https://matlabacademy.mathworks.com/mycourses>
- 2) <https://www.coursera.org/learn/matlab#modules> (<https://www.coursera.org/learn/matlab#modules>)



Program: B. Tech. (Mechanical Engineering)						Semester: I	
Course: HSMC-English						Code: BSH21H01	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	Total
1	2	-	2	30	-	20	50
Prior knowledge: 1. Basic Knowledge of English grammar. 2. Basic Vocabulary, Listening and Speaking Skills							
Course Objectives: This course aims at enabling students, 1. To develop basic LSRW skills for effective communication. 2. To develop a sense of confidence among students to present themselves at professional as well as societal level. 3. To enhance the language competence.							
Course Outcomes: After learning the course, the students will be able to 1. Understand the role of effective listening skills, grammar and vocabulary in effective communication. 2. Formulate grammatically correct sentences and Enrich their vocabulary 3. Demonstrate reading skills to comprehend various documents 4. Communicate effectively and enhance their phonetic skills.							
Unit	Description						Duration
1	Listening Skills: Importance of Listening Skills, Listening and Hearing, Types of Listening: Active / Selective / Passive Listening, Barriers to Listening, Tips to Improve Listening Skills Grammar & Vocabulary: Common Errors in Daily Discourse, Compound and Complex Sentences, Modal Auxiliaries. Processes of Word Formation, One Word Substitutions, Words often Confused, Usage of Business Phrases & Idioms.						3
2	Writing Skills : Elements of Effective Writing, Writing Styles (Formal & Informal), Paragraph Writing (Descriptive, Technical) Professional Writing: Job Application, Leave Application, Enquiry and Complaint Letter. Features of Technical Writing, Report Writing; Progress, Accident Report, Event Report.						4
3	Reading Skills: Importance of Reading, Scanning, Skimming, Reading between the Lines, Reading Comprehension: Factual / Expository / Informative texts, Case Studies, Reading Research Articles Literary Reading: 1 The Story of An Hour by Kate Chopin, 2 The Classical Student by Anton Chekhov 3 A Chameleon by Anton Chekhov.						4
4	Speaking Skills: Basic Sounds-IPA, Word Stress, Intonation, Language Functions (Requesting, Apologizing, Complaining, Complementing, Thanking, etc) Art of Asking and Responding to Questions Public Speaking: Importance of Public Speaking, Art of Extempore & Presentations, Role Play, Delivering Welcome Speech, Vote of Thanks, Group Discussion.						4
Total						15	
Practical/Lab Sessions							
Lab Session	Activities						Duration (Hrs)
1	Listening 1: Listen to the audio and answer the questions (IELTS)						2
2	Listening 2 : Listen to the audio and Summarize (Ted Talks)						2
3	Grammar: Correct the sentences and understand the business usages.						2
4	Vocabulary: Different ways to improve vocabulary and activities						2

5	Writing Skills 1: Formal writing such as Job Application, Leave Application, Enquiry and Complaint Letter.	2
6	Writing Skills 2: Different Styles of writing and Paragraph Writing (Descriptive, Technical)	2
	Writing Skills 3: Technical Writing, Report Writing; Progress, Accident Report, Event Report.	2
8	Reading Activity 1: Communication Case Studies	2
9	Reading Activity 2: IELTS based Comprehension Skills	2
10	Reading Activity 3: Research Articles and Technical Documents	2
11	Reading Activity 4: Literary Reading and Discussion	2
12	Speaking Activity 1: IPA Pronunciation and Phonetics Exercises	2
13	Speaking Activity 2: Delivering speeches and Mastering the Art of Public Speaking	2
14	Speaking Activity 3: Preparing and Participating Group Discussions / Elevator Speeches	2
15	Speaking Activity 4: Oral/PPT Presentation with Q&A Session	2
Total		30
Text Books: Raymond Murphy, Essential English Grammar in Use, Cambridge University Press; 2015		
Reference Books:		
1. Michael Swan, Practical English Usage, Oxford, 3rd Edition; 2005		
2. David F. Beer, Writing and Speaking in the Technology Professions: A Practical Guide, Wiley-IEEE Press; 2nd Edition, 2003		
3. Sunita Mishra, C. Muralikrishna, Communication Skills for Engineers, Pearson Education; 2011		
4. Clifford Whitcomb, Leslie E. Whitcomb, Effective Interpersonal and Team Communication Skills for Engineers, Wiley-Blackwell; Nil edition, 2013.		
5. Krishnaswami, N and Sriraman, T, Creative English for Communication, Macmillan.		
Saran Freeman, Written Communication in English, Orient Longman.		
E Sources -		
1. https://www.google.com/url?q=https://onlinecourses.nptel.ac.in/noc19_hs19/&sa=D&source=editors&ust=1654924489543365&usg=AOvVaw0vWIA1-FXdmtGD4TbPCXo-		
2. https://www.google.com/url?q=https://onlinecourses.nptel.ac.in/noc19_hs22/&sa=D&source=editors&ust=1654924489545718&usg=AOvVaw1JiV6Z4RihjTKbm8Sd2HDC		
3. https://takeielts.britishcouncil.org/take-ielts/prepare/free-ielts-practice-tests/listening/section-1		

Program: B. Tech. (Mechanical Engineering)				Semester: I			
Course: HSMC-German				Code: BSH21H02			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	Total
1	2	-	2	30	-	20	50
Prior Knowledge: English Language							
Course Objectives: This course aims at enabling students, 1. To get familiar with the basics of German language and develop their interest in the language. 2. To get equipped with basic language skills, namely listening, speaking, reading, and writing for the purpose of socializing, providing and obtaining information. 3. To develop inter cultural competence and understanding of perceptions, gestures, family, and community dynamics.							
Course Outcomes: After learning the course, the students will be able to, 1. Demonstrate understanding of simple texts in German 2. Apply grammar rules to frame correct sentences in German 3. Communicate in a simple manner in German 4. Construct simple texts in German							
Unit	Description						Duration (Hrs.)
1	Building Vocabulary, Developing Listening and Reading Skills <ul style="list-style-type: none"> ● Self-introduction, things of day-to-day use, Hobbies & Free time, Food & Beverages, Clock time & Daily Routine, Living & Working in Germany, Weather and Healthcare ● Listen and understand short conversations, announcements, voice mail in German ● Read and comprehend from instruction boards, advertisements, simple texts, short messages, letters and emails in German B64:B67 						3
2	German Grammar and Sentence Structure <ul style="list-style-type: none"> ● Personal Pronouns: Singular and Plural ● Verbs and Verb-Conjugation: regular, irregular, mixed, separable, modal auxiliaries ● Types of Articles: definite, indefinite, negative, possessive ● Cases: nominative, accusative, dative ● Types of the sentences: declarative, interrogative, imperative ● Basic German conjunctions: and, or, but, because 						4
3	Speaking Skills <ul style="list-style-type: none"> ● Spelling and pronunciation ● Asking for and giving simple information ● Requesting and responding to requests ● Learning simple German dialogues and speaking with expression ● Role play: Presenting a simple dialogue on given situation 						4
4	Writing Skills <ul style="list-style-type: none"> ● Building words and simple sentences ● Filling up personal information in very simple forms (e.g. name, address, etc) ● Using punctuation marks correctly in given texts ● Correcting errors in given draft ● Writing simple texts, short messages, letters and emails on given topics 						4
Total						15	

Practical/Lab Sessions		
Lab Session	Activities	Duration (Hrs)
1	Vocabulary 1: Exercises to recall and enhance vocabulary	2
2	Listening 1: Listen to the audio and repeat (phonetics)	2
3	Listening 2: Listen to the audio and select the correct option (A1 practice)	2
4	Vocabulary 2: Exercises to recall and enhance vocabulary	2
5	Reading 1: Read short texts and fill up the information in table	2
6	Reading 2: Read short texts and mark true or false (A1 practice)	2
7	Reading 3: Read short texts and answer the questions	2
8	Grammar 1: Solve simple grammar exercises	2
9	Grammar 2: Construct correct sentences by applying grammar rules	2
10	Speaking 1: Spell and pronounce the words correctly (A1 practice)	2
11	Speaking 2: Give your short introduction (A1 practice)	2
12	Speaking 3: Frame simple questions, requests and reply (A1 practice)	2
13	Writing 1: Fill up simple data in forms (A1 practice)	2
14	Writing 2: Correct errors in given draft	2
15	Writing 3: Write simple texts, short messages, emails and letters (A1 practice)	2
Total		30
Text Books:		
Netzwerk A1: Dengler, Rusch, Schmitz, Sieber, Ernst Klett Sprachen, Stuttgart Germany, Goyal Publishers & Distributors, Delhi, 2015		
Reference Books:		
1) Linie 1: Kaufmann, Moritz, Rodi, Rohrmann, Sonntag, Klett-Langenscheidt GmbH, München Germany, Goyal Publishers & Distributors, Delhi, 2018		
2) Tangram aktuell 1: Dallapiazza, Eduard von Jan, Schönherr, Max Hueber Verlag, Ismaning, Germany, Goyal Publishers & Distributors, Delhi, 2005		
E-sources:		
1) NPTEL Course lectures (IIT Madras) link: https://onlinecourses.nptel.ac.in/noc23_hs98/preview		
2) Udeemy Course lectures link: https://www.udemy.com/topic/german-language/free/		

Program: B. Tech. (Mechanical Engineering)						Semester: I	
Course: HSMC-Japanese						Code: BSH21H03	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	Total
1	2	-	2	30	-	20	50
Prior Knowledge: English/Marathi/Hindi language for learning Japanese language.							
Course Objectives: This course aims at enabling students 1. To be aware of Japanese scripts (Hiragana, Katakana) and basic Kanjis. 2. To familiarize themselves with the Japanese language and use basic greetings in day-to-day life. 3. To develop language skills namely listening, speaking, reading and writing skills for socializing, providing and obtaining information. 4. To express themselves using basic sentences and develop cross cultural skills and understanding of gestures, family and community, perceptions.							
Course Outcomes: After learning the course, the students will be able to 1. Understand Japanese scripts through oral and written communication 2. Explore Japanese culture and etiquettes 3. Express themselves by using simple sentences and responses to questions 4. Develop language skills namely speaking, reading and writing skills for providing and obtaining information.							
Unit	Description						Duration (Hrs.)
1	Introduction: Hiragana Script. <ul style="list-style-type: none"> ● Listening: Short video skit on self-introduction. ● Speaking: Song of greetings. ● Reading: Hiragana words ● Writing: Japanese scripts (Hiragana) ● Test on Hiragana 						3
2	Katakana script <ul style="list-style-type: none"> ● Listening: English words ● Speaking: Song on body parts. ● Reading: Katakana words ● Writing: Locating countries on map, Wordhunt. ● Grammar: Test on Katakana. 						4
3	わたしはマイク。ミラーです。 <ul style="list-style-type: none"> ● Speaking: Self-introduction ● Listening: Conversation based on L-1 ● Writing: Writing about yourself. ● Reading: Lesson reading no.-1 ● Grammar: Introduction to 1. particles (は、か、も、か) 2. Verb (です、ではありません) 						4

4	<p>これからお世話になります。</p> <ul style="list-style-type: none"> ● Speaking: Greetings. ● Listening: Conversation based on L-2 ● Writing: Numbers (0- 100) in Japanese. ● Reading: Lesson reading no.2 ● Grammar: (past, negative form), ● Introduction to 12, questioning words (なん、だれ、どなた). ● 2. この、その、あの、どの 3. Particle の ● Test on grammar 	4
Total		15
Practical/Lab Sessions		
Lab Session	Activities	Duration (Hrs)
1	Speaking skill 1: Japanese greetings	2
2	Writing Skill 1: Hiragana script	2
3	Listening Skill 1: Writing 'Hiragana' words	2
4	Reading Skill 1: Reading and recognizing 'Hiragana' words	2
5	Writing Skill 2: World map activity	2
6	Reading Skill 2: Reading 'Katakana' words	2
7	Speaking Skill 2: Self introduction	2
8	Writing Skill 3: Basic sentence formation using grammar.	2
9	Reading Skill 3: Chapter-1 reading	2
10	Listening Skill 3: Conversation in the office.	2

PCCOE

"Knowledge Brings Freedom"

Progress Credibility Confidence
Optimism Excellence

Since 1999

11	Speaking Skill 3: Dialogues between people of different nationality.	2
12	Writing Skill 4: Writing Japanese numbers using 'Hiragana' and 'Kanjis'.	2
13	Reading Skill 4: Chapter-2 reading	2
14	Listening Skill 4: Listening to Days of the week and dates of the month	2
15	Speaking Skill 4: Daily routine using verbs.	2
Total		30

Textbook:

1. Minna no Nihongo Part I and II Publication: Goyal Publishers & Distributors Pvt. Ltd. , Author: Tsuruo Yoshiko (Compiled) , Edition: 2018
2. NihongoShoho Publication: JALTAP , Author: JALTAP(With permission of Japan Foundation, Tokyo), Edition: April 2008

Reference Books:

1. Genki1 Author: Eri Banno, Yoko Sakane, Yutaka Ohno, Chikako Shinagawa, and Kyoko Tokashiki. Publication: The Japan Times. Edition: 2011
2. MOMO Author: Japan Foundation, New Delhi, Publication: Goyal Publisher & Distributors (P) Ltd., Edition: October 2007
3. MOMO Japanese work book Japan Foundation, New Delhi, Publication: Goyal Publisher & Distributors (P) Ltd., Edition: October 2007
4. MOMO Japanese workbook Japan Foundation, New Delhi, Publication: Goyal Publisher & Distributors (P) Ltd., Edition: October 2007



Program: B. Tech. (Mechanical Engineering)				Semester: I			
Course: HSMC-Business Storytelling				Code: BSH21H04			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	Total
1	2	-	2	30	-	20	50
Prior Knowledge: Basic competence of English language.							
Course Objectives: This course aims at enabling students, 1. To understand storytelling as one of the tools of influential communication. 2. To strengthen their creativity, critical thinking and social skills. 3. To use stories to face leadership, management and professional challenges.							
Course Outcomes: After learning the course, the students will be able to 1. Identify nuances of storytelling method as an influential communication 2. Demonstrate the ability to engage and inspire others through the development of narratives, tone and style 3. Apply storytelling techniques to communicate effectively in a business context 4. Develop stories to build, maintain professional relationships, deliver messages and motivate others toward action.							
Unit	Description						Duration (Hrs.)
1	Concept and Scope: What is a story? A Brief History & Importance of Storytelling, Basics of Storytelling - Entertainment, Engagement, Personalization, Critical Thinking, Observation Skills in Storytelling, Benefits of Storytelling, Storytelling in Engineering, Business Storytelling, Activity: Analysis of Steve Jobs Commencement Speech at Stanford (2005)						3
2	Process of Storytelling: Elements of a Story - Context and Relevance, Style and Detailing, Plot, and Characters, The Flow of the Story - Relevance - Action - Result, Know the Purpose - Inspire Action, Educate People, Showcase Values, Build Collaboration, Know your Audience - Educational, Social Background and Age, Developing Narratives: Characteristics of a Narrative, Data Visualization, Presenting a Word Picture, Triggering Emotions of the Audience, Choosing Media - Audio, Written, Oral and Digital Storytelling Activity: Analysis of a Short Story: 'The Three Hermits by Leo Tolstoy', The Last Painting by O' Henry						4
3	Types of Stories - Customer Story, Origin Story, Event Story, Product Stories, Storytelling Techniques for Presentations, Using Power Words Effectively, Using Narratives to Manage Conflicts, Using a Narrative to Interpret the Past and Shape the Future, Storytelling in Marketing, Story Strategies - Using Anchor Stories Case studies - Brand storytelling -Steve Jobs / Jack Maa - Product Presentation, Lido Anthony "Lee" Iacocca.						4
4	Crafting a Story Crafting a Story from a Picture/an Idea/Situation/Artifacts, Storyline - Beginning / Motive / Struggle / Achievement, Six-word Story - Memoirs to Being with, Detailing of Character and the Context, Delivering a Story – Tone / Emotions / Voice Modulation Activity -Developing and Delivering Presentation through Storytelling on the Given Situation/Context						4

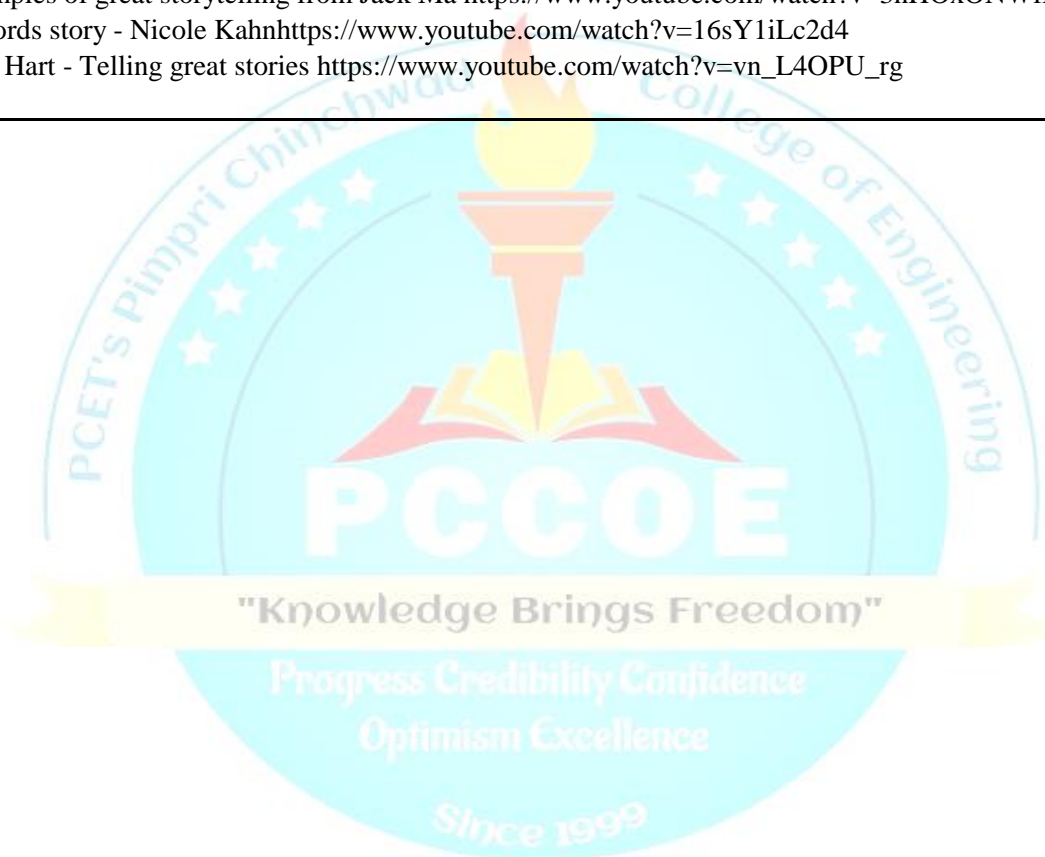
		Total	15
Practical/Lab Sessions			
Lab Session	Activities	Duration (Hrs)	
1	Basic of Storytelling: Using Five Senses in storytelling activity and Elements of Storytelling	2	
2	Analysis of a Short Story: 'The Three Hermits by Leo Tolstoy', and The Last Painting by O' Henry.	2	
3	Character Study: Create a detailed character profile of a fictional character, including their background, motivations, and personality traits. Write a short story or scene that showcases this character in action	2	
4	Personal Storytelling: Write and present a short personal story that highlights a challenge you've faced and how you overcame it	2	
5	Collaborative Storytelling: Partner with another student to create a collaborative story. Take turns writing alternating sections, focusing on maintaining a consistent tone and narrative flow.	2	
6	Historical Business Story: Research and narrate a significant historical event or moment in a well-known business's journey, focusing on how storytelling played a role in shaping public perception	2	
7	Social Impact Story: Develop a story that demonstrates how a business initiative or project positively impacted a community or addressed a social issue	2	
8	Customer Success Story: Craft a narrative that showcases a customer's journey with your fictional business	2	
9	Change Management Story: Design a narrative that communicates a change initiative within a company, addressing challenges, resistance, and the ultimate benefits of the change	2	
10	Investor Pitch Story: Craft a persuasive story for a startup pitch. Highlight the problem, solution, market opportunity, and potential for growth in a captivating way	2	
11	Leadership Story: Compose a story that illustrates effective leadership qualities and strategies. Highlight a leader's ability to motivate, inspire, and guide a team toward success	2	
12	Cultural Storytelling: Explore how storytelling can bridge cultural gaps in a global business context. Share a story that demonstrates cultural sensitivity and understanding	2	
13	Ethical Dilemma Story: Present a complex ethical dilemma faced by a business or individual. Use storytelling to explore various perspectives and potential solutions	2	
14	Marketing Campaign Story: Design a storytelling-based marketing campaign for a specific product or service launch, incorporating different media and channels	2	
15	Crisis Turnaround Story: Narrate a scenario where a business successfully navigated a crisis through strategic communication and storytelling, ultimately regaining trust and reputation.	2	
		Total	30
Text Books: 1. Kendall Haven, Story Smart, Libraries Unlimited, 2014			

Reference Books:

1. Kendall Haven, Story Proof, Libraries Unlimited, 2007.
2. Rob Biesenbach, Unleash the Power of Storytelling: Win Hearts, Change Minds, Get Results, Eastlawn Media, 2018.
3. Yiannis Gabriel, Storytelling in Organizations: Facts, Fictions, and Fantasies, Oxford University Press, 2011.

E-resources:

1. The Art of Business Storytelling | AmeenHaque | Talks at Google ,
<https://www.youtube.com/watch?v=77FUr6ZsWjY>
2. Marketing Storytelling - <https://www.referralcandy.com/blog/storytelling-examples/>
3. 5 examples of great storytelling from Jack Ma <https://www.youtube.com/watch?v=3nHOxONWfEs>
4. Six words story - Nicole Kahn <https://www.youtube.com/watch?v=16sY1iLc2d4>
5. Kevin Hart - Telling great stories https://www.youtube.com/watch?v=vn_L4OPU_rg



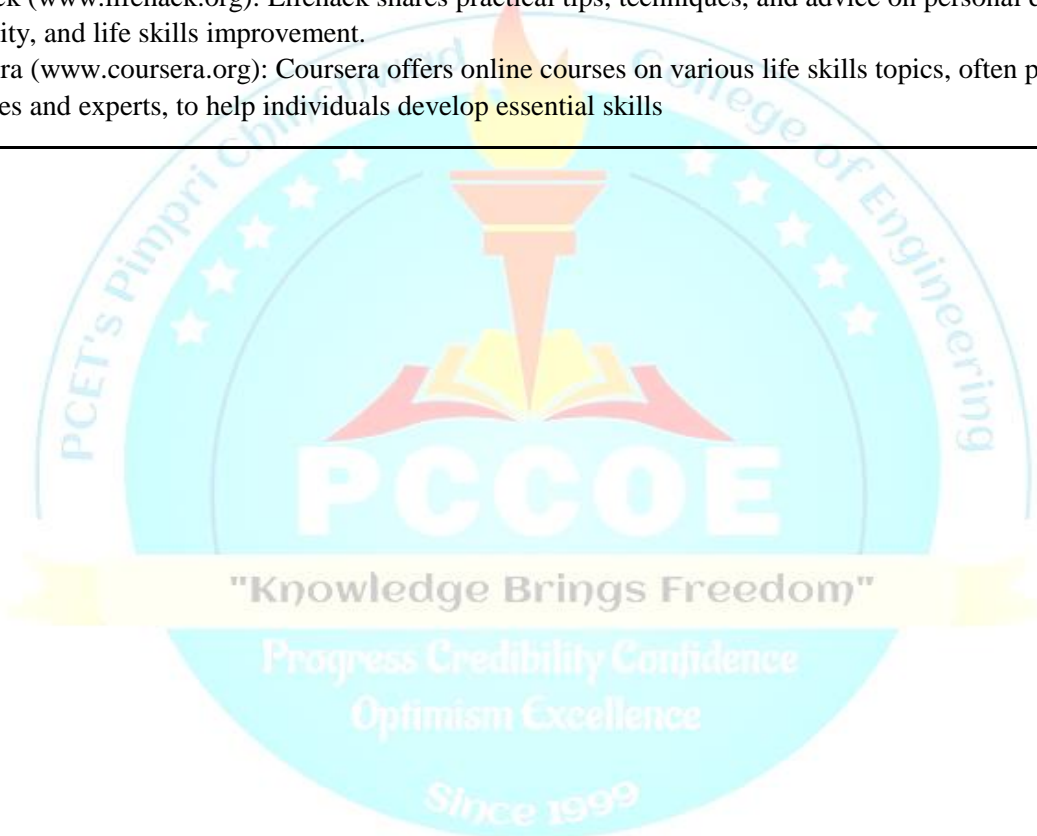
Program: B. Tech. (Mechanical Engineering)				Semester: I			
Course: Life Skills 1				Code: BSH21K01			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	Practical	Oral	Total
-	4	-	2	100	-	-	100
Prior Knowledge:- Nil							
Course Objectives:							
1. To equip them with essential skills and knowledge that complement their academic education, preparing them to excel not only as engineers but also as well-balanced individuals							
2. To develop students' vital life skills that promotes personal growth, resilience, and success in their academic journey and beyond							
Course Outcomes: Students will be able to							
1. Understand the true essence of happiness by being harmony with oneself.							
2. Explore skills to get along with others to create and maintain healthy relationships.							
3. Apply different ways of rational thinking.							
4. Develop emotional intelligence.							
Unit	Description						Duration (Hrs.)
1	Happy You, Happy Life! (i) Healthy Mind - Music Therapy, Yoga, Meditation, Happiness and Success. (ii) Self-Awareness - Know your personality, Develop your Self- Esteem, Johari Window, SWOT, Setting goals for yourself (SMART). (iii) Healthy Lifestyle - Nutrition, Significance of Physical Activity in Daily routine.						15
2	Building Relationships (i) People Skills - Networking, Developing Healthy Relationships, Collaboration, Reliability, Respectfulness, Open- Mindedness (ii) Effective Communication in Relationships-My Relationship Web, Relationship Recipe, Active Listening and Conflict Resolution (iii) Embracing Diversity: Respect for Different Perspectives and Cultures.						15
3	The Reflective Engineer (i) Critical Thinking - Fact or Fiction, Convergent & Divergent Thinking (ii) Creative Thinking - Imagination, Formulate and Articulate Ideas (iii) Perspective Thinking – Understanding others view Points, Respecting Others Opinions (iv) Decision Making – Rational, Analytical & Ethical Solutions.						15
4	You CAN DO IT... (i) Managing Stress - Good Stress , Bad Stress, Anxiety (ii) Managing time - Planning, Prioritization, Delegation, Productivity and Positivity (iii) Managing Emotions – Self- Regulation, Self-Motivation, Empathy, Assertiveness, Anger Management (iv) Handling Peer Pressure- Types of Peer Pressure: Spoken Peer Pressure, Unspoken Peer Pressure, Direct Peer Pressure, Indirect Peer Pressure, Positive Peer Pressure, Negative Peer Pressure.						15
Total						60	

Reference Books

1. "The 7 Habits of Highly Effective Teens" by Sean Covey Publisher: Simon & Schuster, 2017
2. "How to Win Friends and Influence People" by Dale Carnegie Publisher: Simon & Schuster, 2020
3. "Emotional Intelligence: Why It Can Matter More Than IQ" by Daniel Goleman Publisher: Bantam Books, 2021
4. "Mindset: The New Psychology of Success" by Carol S. Dweck Publisher: Ballantine Books, 2019
5. "The Power of Habit: Why We Do What We Do in Life and Business" by Charles Duhigg Publisher: Random House, 2016

Weblinks

1. Psychology Today (www.psychologytoday.com): Psychology Today publishes articles and insights from psychologists and mental health experts that can be useful for improving life skills and emotional intelligence.
2. Lifehack (www.lifehack.org): Lifehack shares practical tips, techniques, and advice on personal development, productivity, and life skills improvement.
3. Coursera (www.coursera.org): Coursera offers online courses on various life skills topics, often provided by universities and experts, to help individuals develop essential skills



Curriculum Structure

First Year B.Tech

Mechanical Engineering

Semester II

"Knowledge Brings Freedom"

Progress Credibility Confidence
Optimism Excellence

Since 1999

Program: B. Tech. (Mechanical Engineering)				Semester: II			
Course: Multivariate Calculus				Code: BSH22A06			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial*	Credit	IE	MTE	ETE	Total
2	-	1	2	20	30	50	100
Prior Knowledge:							
1) Elementary Mathematics.							
2) Elementary Calculus							
Course Objectives: This course aims at enabling students,							
1) To strengthen the concepts of multivariable calculus and its application in maxima & minima, error & approximation area, volume							
2) To make students acquainted with advanced techniques to evaluate integrals.							
Course Outcomes: After learning the course, the students will be able to:							
1) Evaluate Partial Differentiation and apply the concept of partial differentiation to find Maxima & Minima and Error & Approximation.							
2) Solve for First order and first degree partial differential equations.							
3) Understand definite improper integrals like Gamma, Beta function, DUIS.							
4) Apply multiple integration techniques to analyze Area, Volume.							
Unit	Description						Duration (Hrs.)
1	Partial Differentiation: Partial derivatives, Composite function, Chain Rule, variable to be treated as constant, total derivatives. Euler's theorem for homogeneous functions. Application of Partial derivatives: Jacobian for explicit function, Errors and Approximations, Maxima and Minima of two variable functions.						8
2	Partial Differential Equation(PDE): Definition of PDE, order and degree of PDE, Formation of PDE, Classification of PDE, Initial and Boundary value problems, Solution of First order Partial differential equations.						7
3	Integral Calculus: Beta and Gamma functions, differentiation under integral sign (DUIS).						7
4	Multiple Integral: Double integration, conversion into polar form, application of double integration to the area, Triple integration, Dirichlet's theorem, application of triple integration to Volume.						8
Total						30	
* Tutorial will be conducted in batches as 1Hr/week/batch							
Sr. No.	List of Tutorials						
1	Partial derivatives basic rules, Mixed partial derivatives & properties ;						
2	Euler's theorem on Homogeneous Functions and deductions;						
3	Examples on variables to be treated as constant, Composite functions;						
4	Definition of Jacobian, Jacobian of explicit functions;						
5	Errors & Approximations, problem solving;						
6	Maxima and minima of functions of two variables;						
7	Partial differential equation formation, classification,						
8	Solution of first order first degree						
9	Beta, Gamma Function & its properties;						
10	Differentiation under integral sign & Problems;						
11	Concept of Double Integration and problem Solving;						
12	Application of double integration to find Area;						
13	Concept of Triple integration and problem Solving;						
14	Dirichelet's theorem and Problems;						

15	Application of triple integration to find Volume;
Text Books: 1) Higher Engineering Mathematics by B.V. Ramana (Tata McGraw-Hill). 2) Advanced Engineering Mathematics by Erwin Kreyszig (Wiley Eastern Ltd.)	
Reference Books: 1) Higher Engineering Mathematics, 22e, by H. K. Das (S. Chand Publication, Delhi). 2) Advanced Engineering Mathematics, 4e, by S.R.K. Iyengar, Rajendra K. Jain (Alpha Science International, Ltd). 3) Advanced Engineering Mathematics, 7e, by Peter V. O'Neil (Thomson Learning). 4) Advanced Engineering Mathematics, 2e, by M. D. Greenberg (Pearson Education). 5) Higher Engineering Mathematics by B. S. Grewal (Khanna Publication, Delhi).	



Program: B. Tech. (Mechanical Engineering)				Semester: II			
Course: Engineering Chemistry				Code: BSH22A04			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	Total
3	-	-	3	20	30	50	100
Prior Knowledge: 1) Structure of water. 2) Volumetric analysis. 3) Electromagnetic radiations. 4) Classification and properties of polymers. 5) Fossil and derived fuels. 6) Corrosion and its effects. 7) Electrochemical series.							
Course Objectives: This course aims at enabling students, 1) To familiarize students with instrumental methods for qualitative and quantitative analysis and explore the importance of green chemistry. 2) To lead students to investigate the advancement in engineering materials, batteries and structural elucidation by spectroscopy. 3) To build consciousness about the recent development in alternate energy sources and corrosion control. 4) To develop experimental skills and thereby forge their conceptual lucidity.							
Course Outcomes: After learning the course, the students will be able to: 1) Analyse the water quality, interpret techniques of water purification and compare green over traditional synthesis of polycarbonate. 2) Apply basic principles of various electro-analytical techniques for qualitative and quantitative analysis and understand battery technology. 3) Apply the principles, instrumentation of UV & IR spectroscopy for structural elucidation. 4) Perceive the fuel quality and understand the scope of derived alternate fuels. 5) Relate the preventive methods of corrosion to real-life problems. 6) Interpret the chemical structure, properties and synthesis of various polymers and nanomaterials and their uses.							
Unit	Description						Duration (Hrs.)
1	Water Technology and Green Chemistry: a) Hardness of water, its types, units of hardness and hardness calculation. Chemical analysis of water by determination of hardness by EDTA method. Alkalinity of water and its determination. Numerical on EDTA method and alkalinity. Disadvantages of hard water in boilers. Water softening techniques: Permutit and Ion exchange method. Dissolved oxygen (DO), biological oxygen demand (BOD) and Chemical oxygen demand (COD). b) Introduction of Green Chemistry: Definition, goals, principles and green synthesis of Polycarbonate.						9

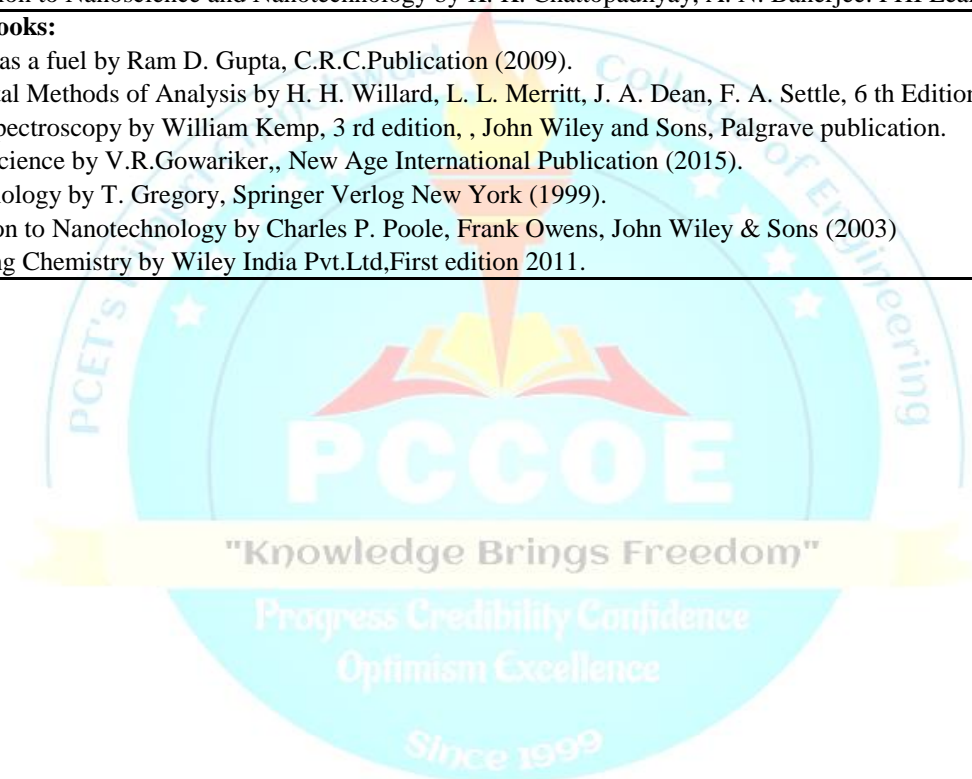
2	<p>Instrumental Analysis and battery technology.</p> <p>a) Electrochemistry: fundamentals of an electrochemical cell, EMF of cell, reference and indicator electrodes and Nernst Equation.</p> <p>b) Basic principles, instrumentation and applications of :-</p> <p>i) Conductometry: Introduction, Kohlrausch's law, measurement of conductance and conductometric titrations of strong acid versus strong base, strong acid versus weak base and weak acid versus strong base.</p> <p>ii) pH-metry: theory of buffers and preparation, standardization of pH-meter, titration of weak acid versus strong base, simple and differential plots.</p> <p>iii) Potentiometry: Introduction, principle and application: potentiometric titration of Fe²⁺ versus Ce⁴⁺ along with simple and differential plots.</p> <p>Battery technology and Fuel Cell: introduction and types of batteries, construction, working and applications of Lithium ion battery, charging and discharging reactions at respective electrodes. H₂- O₂ fuel cell.</p>	7
3	<p>Spectroscopic techniques: Ultra Violet and Infrared spectroscopy</p> <p>a) UV Spectroscopy: nature of electromagnetic radiation and its characteristics. Interaction of matter with UV radiations leading to different electronic transitions. Beer's & Lambert's law, their derivations and applications. Instrumentation of UV -Visible spectrophotometer. Terms used in UV spectroscopy-chromophore, auxochrome, bathochromic shift (red shift), hypochromic shift (blue shift), hyper chromic and hypochromic effect.</p> <p>b) IR spectroscopy: principle, types of vibrations (stretching and bending), Different regions of IR spectrum such as fundamental group region, finger print region and aromatic region. Applications of IR spectroscopy.</p>	8
4	<p>Fuels and combustion</p> <p>a) Fuels: definition, calorific value and its units. Calorific value (CV), gross calorific value (GCV), net calorific value (NCV). Determination of calorific value - Bomb calorimeter, Boy's calorimeter and numerical.</p> <p>i) Solid fuels: coal, proximate and ultimate analysis of coal, numerical based on analysis of coal. ii) Liquid fuels: composition of petroleum, refining of petroleum. Synthesis, properties, advantages and disadvantages of Power alcohol and Biodiesel.</p> <p>iii) Gaseous fuels: Hydrogen gas as a future fuel, production by steam reforming of methane and by electrolysis of water. Challenges in storage and transportation of H₂ gas.</p> <p>b) Combustion: chemical reactions, calculations on air requirement for combustion.</p>	8
5	<p>Corrosion and Corrosion control</p> <p>a) Corrosion: introduction, types of corrosion, mechanism of atmospheric corrosion and wet corrosion. Galvanic series. Factors affecting corrosion: nature of metal and nature of environment. Different types of corrosion: Pitting corrosion, concentration cell corrosion, stress corrosion and soil corrosion.</p> <p>b) Corrosion control: methods of prevention of corrosion - cathodic and anodic protection, metallic coatings and its types - anodic and cathodic coatings. Method to apply metallic coatings - hot dipping, cladding, electroplating and cementation.</p>	6
6	<p>Chemistry of Polymers and Novel Carbon Compounds</p> <p>a) Polymers: definition, classification of polymers on the basis of thermal behaviour, properties of polymers: degree of polymerization, crystallinity, T_g & T_m and factors affecting T_g. Polymerization and its types. Advanced polymeric materials: Structure, properties and applications of liquid crystal polymer – Kevlar, conducting polymers - Polyacetylene, electroluminescent polymer – PPV and biodegradable polymers – PHBV.</p> <p>b) Nanomaterials: definition, types of nanomaterials and properties of nanomaterials. Quantum dots: Types, properties and applications of QDs. Structure properties and applications of Graphene and Carbon Nano Tubes (CNTs).</p>	7
Total		45

Text Books:

- 1) Engineering Chemistry by S.S. Dara, S.Chand Publications (2010).
- 2) Engineering Chemistry by B.S. Chauhan, UnivScPress.(2015).
- 3) A Text Book Of Engineering Chemistry by ShashiChawla, DhanpatRai& Co. (2015).
- 4) Spectroscopy of Organic Compounds by P. S. Kalsi, New Age International (2007).
- 5) Nanotechnology: principles and practices by S.K. Kulkarni, Springer (2014).
- 6) Instrumental methods of Chemical Analysis by GurdeepChatwal, Himalaya publishing house (1996).
- 7) Engineering Chemistry by Jain and Jain, DhanpatRai Publishing Co.(2016).
- 8) Engineering Chemistry by Wiley India (2012).
- 9) Engineering Chemistry by O.G. Palanna, McGraw-Hill Education.
- 10) Introduction to Nanoscience and Nanotechnology by K. K. Chattopadhyay, A. N. Banerjee. PHI Learning (2009).

Reference Books:

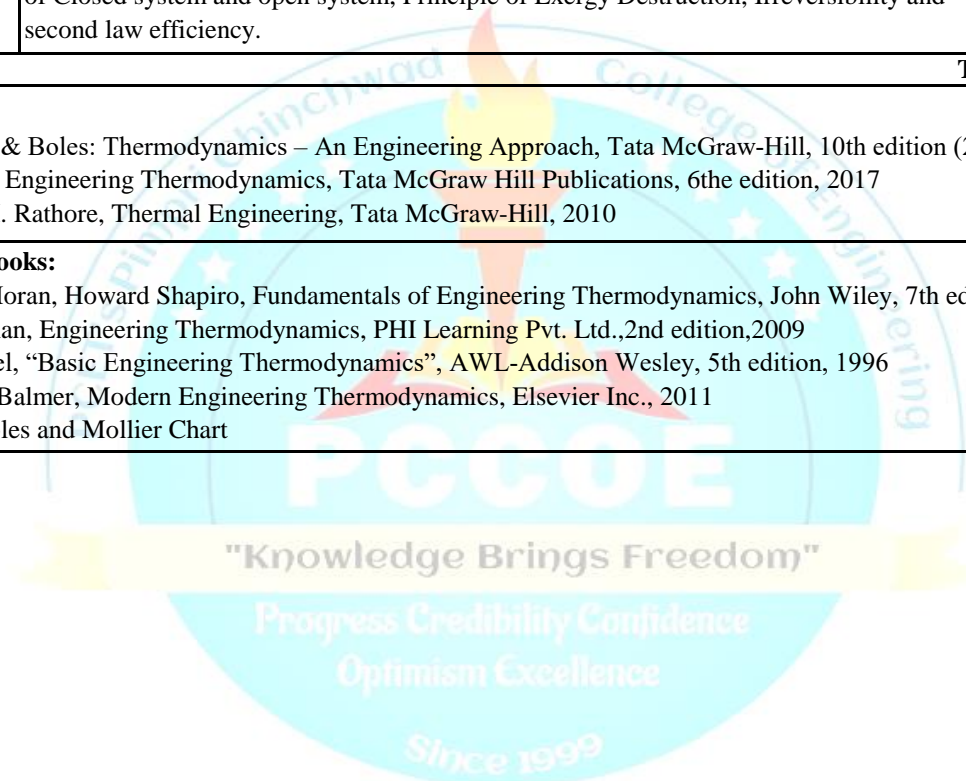
- 1) Hydrogen as a fuel by Ram D. Gupta, C.R.C.Publication (2009).
- 2) Instrumental Methods of Analysis by H. H. Willard, L. L. Merritt, J. A. Dean, F. A. Settle, 6 th Edition, CBS Publisher.
- 3) Organic Spectroscopy by William Kemp, 3 rd edition, , John Wiley and Sons, Palgrave publication.
- 4) Polymer Science by V.R.Gowariker,, New Age International Publication (2015).
- 5) Nanotechnology by T. Gregory, Springer Verlag New York (1999).
- 6) Introduction to Nanotechnology by Charles P. Poole, Frank Owens, John Wiley & Sons (2003)
- 7) Engineering Chemistry by Wiley India Pvt.Ltd,First edition 2011.



Program: B. Tech. (Mechanical Engineering)						Semester: II	
Course: Engineering Chemistry Laboratory						Code: BSH22A05	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	Practical	Oral	Total
-	2	-	1	50	-	-	50
Prior Knowledge: Nil							
Course Objectives: This course aims at enabling students, 1) To help students to procure conceptual clarity of Engineering Chemistry through laboratory experiments. 2) To develop experimental skills to acquire insight into societal and environmental issues.							
Course Outcomes: After learning the course, the students will be able to: 1) Analyze the quality of water for its hardness and alkalinity. 2) Apply various instrumental methods like pH-metry, conductometry, spectroscopy and electrochemical techniques for quantitative and qualitative chemical analysis. 3) Demonstrate the skill for determination of quality of coal by proximate analysis and synthesis of engineering materials. 4) Learn the chromatographic technique for separation of mixture of compounds. 5) Explore mini projects which are relevant to societal and environmental issues to develop research attitude.							
Note: First five experiments are mandatory. A student has to perform either next five experiments or mini project in lieu of experiments.							
Sr. No.	I) List of Experiments						
1	Determination of total hardness (by EDTA method) and alkalinity of given water sample.						
2	To determine the dissociation constant of a weak acid (acetic acid) using pH meter.						
3	Titration of mixture of strong acid with strong base using Conductivity meter and determine strength of acid.						
4	To determine the maximum wavelength of absorption of KMnO_4 , verify Beer's law and find concentration of the unknown sample.						
5	Structural elucidation of unknown compounds by applying principles of UV and IR spectroscopy.						
6	Proximate analysis of Coal.						
7	To determine the electrochemical equivalent (ECE) of Cu. formaldehyde resin.						
8	To prepare the Phenol						
9	Preparation of biodiesel.						
10	Chromatographic separation of ortho- and para nitro-phenol						
Sr. No.	II) Topics for Mini project (Student has to choose one of the topics from list given below but not limiting to)						
1	Synthesis of nano-materials.						
2	Determination of active ingredients from medicines / concentration of dyes in commercial beverages using UV-Spectrophotometer.						
3	Water audit of water samples						
4	One-pot synthesis of biologically active compounds.						
5	Microwave assisted chemical reactions.						
6	Study of corrosion of metals in a medium of different atmospheric conditions						
7	Soil analysis of agricultural soil samples.						
Laboratory manual: 1. Vogel's Text book of Qualitative Chemical Analysis by J.Mendham, R,C,Denny, J.D.Barnes, M.J.K.Thomas, 6 e, Pearson Education Ltd. 2. Applied Chemistry Theory and Practice by O.P.Virman and A.K.Narula, 2e, New age International (P) Ltd							

Program: B. Tech. (Mechanical Engineering)						Semester: II	
Course: Engineering Thermodynamic						Code: BME22B03	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	Total
3	-	-	3	20	30	50	100
Prior Knowledge:							
1) Fundamental concepts of physics like Volume, Pressure, Velocity, Work , Energy 2) Concepts of mathematics like derivative, integration , nature of curves , slope of curve is essential							
Course Objectives: This course aims at enabling students,							
1) To understand of the fundamental concepts and Laws of thermodynamics 2) To differentiate between energy and energy transfer , heat and work transfer 3) To be able to apply of the laws of thermodynamics 4) To understand the equations and processes governing the ideal gas behavior 5) To be able to use of steam tables/ Mollier chart for reading properties of steam. 6) To apprehend the concept of Exergy and its application to open and closed systems							
Course Outcomes: After learning the course, the students will be able to:							
1) Identify work transfer by using the operation definition 2) Apply the first law of Thermodynamics to various processes and systems and draw inferences. 3) Check the Possibility of the processes and cycles 4) Estimate heat transfer, work transfer & other important thermodynamic entities for the processes undergone by ideal gas. 5) Use steam tables and Mollier Chart for solving problems related to steam processes 6) Estimate the exergy of simple thermodynamic systems							
Unit	Description						Duration (Hrs.)
1	Basic Ideas and definitions: Role of thermodynamics in mechanical Engineering, Thermodynamic System, Boundary, Types of system, State of system, Properties of system, Viewpoints, Classification of properties, Thermodynamic Equilibrium, State Postulate-1, Thermodynamic Process, Quasi-static Process, Thermodynamic cycle, The operational definition of work Interaction, types and calculation of work transfer, Complexity of system, State Postulate-2						7
2	The first Law of thermodynamics: Defining Change of energy and Heat Transfer through analysis of the Joule's Experiment, Closed system formulation of First law, Special case: closed system undergoing cycle, Open system formulation of First law of thermodynamics, Special case: Steady Flow Energy equation (SFEE), Application of SFEE to typical Engineering Devices, Application of first law to day-to -day life examples, concept of PMM-I, Zero`th Law of thermodynamics						8
3	The second Law and Entropy: Limitations of First Law, Kelvin-Plank and Clausius Statements and their equivalence, Reversible process, cycle, Carnot Theorem and its corollaries, PMM-II, Criteria to check Possibility of a cycle , Entropy change as a property change, Entropy Generation and the Criteria to check Possibility of a process, Entropy change calculation : General case, Incompressible systems, T.E.R.s, Simple compressible system (Tds equations), How the second law overcomes the limitations of first law, Carnot cycle for Heat Engine. (T-v and T-s diagram).						8
4	Working fluid-I: Ideal Gas: Definition, Laws pertaining to Ideal Gas, Specific Heat, Joules Experiment on Ideal Gases, Various process (Constant P/T/V/H and Polytropic, P-v and T-s diagrams): Evaluation of Work transfer, Heat transfer and Entropy change. P-v diagram of Carnot Cycle with Ideal Gas.						7

5	Working fluid-II: Steam: Steam as pure substance, Formation of steam at constant pressure (T-v and T-s diagram), Formation of steam at constant temperature (p-v diagram), generation of h-s diagram from T-ds equation (Mollier Chart), Criteria for identification of phases of water substance, Deviation of steam from Ideal gas behavior , use of steam tables and Mollier Chart , Properties of Wet steam: dryness fraction, Separating, Throttling and Combined Separating-throttling Calorimeter, various steam processes	8
6	Availability: Concept of Dead state, Definition of Availability/Exergy, Exergy as a property of system, Exergy associated with K.E. and P.E., Exergy by Heat and work transfer, Exergy of Closed system and open system, Principle of Exergy Destruction, Irreversibility and second law efficiency.	7
Total		45
Text Books:		
1) Y. Cengel & Boles: Thermodynamics – An Engineering Approach, Tata McGraw-Hill, 10th edition (2024)		
2) P. K. Nag, Engineering Thermodynamics, Tata McGraw Hill Publications, 6th edition, 2017		
3) Mahesh M. Rathore, Thermal Engineering, Tata McGraw-Hill, 2010		
Reference Books:		
1) Michael Moran, Howard Shapiro, Fundamentals of Engineering Thermodynamics, John Wiley, 7th edition, 2010		
2) M. Achuthan, Engineering Thermodynamics, PHI Learning Pvt. Ltd., 2nd edition, 2009		
3) Rayner Joel, “Basic Engineering Thermodynamics”, AWL-Addison Wesley, 5th edition, 1996		
4) Robert T. Balmer, Modern Engineering Thermodynamics, Elsevier Inc., 2011		
5) Steam Tables and Mollier Chart		



Program: B. Tech. (Mechanical Engineering)				Semester: II			
Course: Engineering Thermodynamics Lab				Code: BME22B04			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	Practical	Oral	Total
-	2	-	1	25	-	25	50
Prior Knowledge:							
1) Fundamental concepts of physics like Volume, Pressure, Velocity, Work, Energy							
2) Concepts of mathematics like derivative, integration, nature of curves, slope of curve is essential							
Course Objectives: This course aims at enabling students,							
1) To understand the working of various steady flow devices							
2) To be able to apply of the laws of thermodynamics							
3) To utilize steam table for estimating properties.							
Course Outcomes: After learning the course, the students will be able to:							
1) Apply the first law of Thermodynamics to various processes and systems and draw inferences.							
2) Identify the Possibility /type of processes and cycles							
3) Evaluate heat transfer, work transfer & properties of working fluids							
Sr. No.	Experiments						
Total eight experiments out of the following are to be performed (Any 3 out of experiment no. 1 to 5 and any 5 out of assignments no. 6 to 13)							
1	Joule's experiment on the first law of thermodynamics						
2	Demonstration of heat pump and refrigerator and calculation of actual COP						
3	Demonstration of various steady flow devices/systems. (Boiler, Heat exchangers, compressor, pump, turbine etc.)						
4	Determination of Cp or Cv of Ideal Gas						
5	Determination of Dryness fraction of steam by using Combined separating & Throttling Calorimeter						
6	Assignment on identification and calculation of work interaction between two systems						
7	Assignment on application of the first law of thermodynamics to closed systems						
8	Assignment on application of the first law of thermodynamics to open systems						
9	Assignment on identification of the possibility of thermodynamic processes						
10	Assignment on identification of the possibility of thermodynamic cycles						
11	Analysis of different processes of ideal gas by using computer programming/software						
12	Analysis of different processes of steam by using computer programming/software						
13	Assignment on determination of availability of processes/ cycles						
Text Books:							
1) Y. Cengel & Boles: Thermodynamics – An Engineering Approach, Tata McGraw-Hill, 10th edition (2024)							
2) P. K. Nag, Engineering Thermodynamics, Tata McGraw Hill Publications, 6th edition, 2017							
3) Mahesh M. Rathore, Thermal Engineering, Tata McGraw-Hill, 2010							
Reference Books:							
1) Michael Moran, Howard Shapiro, Fundamentals of Engineering Thermodynamics, John Wiley, 7th edition, 2010							
2) M. Achuthan, Engineering Thermodynamics, PHI Learning Pvt. Ltd., 2nd edition, 2009							
3) Rayner Joel, "Basic Engineering Thermodynamics", AWL-Addison Wesley, 5th edition, 1996							
4) Robert T. Balmer, Modern Engineering Thermodynamics, Elsevier Inc., 2011							
5) Steam Tables and Mollier Chart							

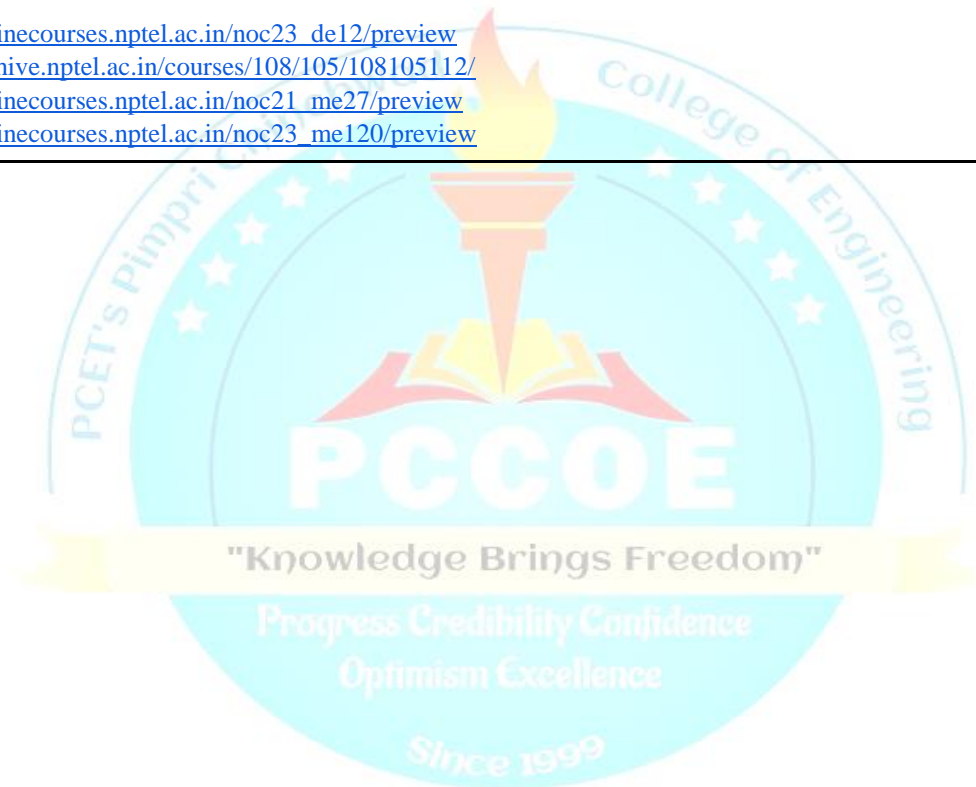
Program: B. Tech. (Mechanical Engineering)				Semester: II			
Course: Fundamentals of Electromechanical Systems				Code: BME22B05			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	IE	MTE	ETE	Total
2	-	-	1	20	-	30	50
Prior Knowledge: - Elementary mathematics, Basic knowledge of electrical, electronics and circuits							
Course Objectives: This course aims at enabling students, 1) Learn the fundamentals of electromechanical systems 2) Learn the working principles of electrical actuators and machines 3) Learn the various types and concepts of sensors 4) Learn the basics of robotics.							
Course Outcomes: After learning the course, the students will be able to: 1) Demonstrate the fundamentals of electromechanical systems 2) Identify the electrical actuator for any application 3) Recognize the different types of sensors and their applications 4) Use the basic concepts of robotics in different applications							
Unit	Description						Duration (Hrs.)
1	Fundamentals: Ohm's law, Kirchhoff's voltage and current laws, Faraday's law, Norton's theorem, Thevenin's Theorem, Superposition theorem, Nodes-Branched and loops, Series elements and Voltage Division, Parallel elements and Current Division, Star-Delta transformation, Introduction of independent sources, Resistors, Capacitors, Inductors, Transformers, Diodes, Transistors, Op-amps, Types of signals, Basic digital electronic principles						8
2	Electrical Actuators and Machines: Classification of actuators; DC motors: PMDC and BLDC; AC motors: induction motor; Special purpose motors: Stepper motor and Servo motor; Selection of motors and its applications; electro-mechanical solenoid; DC Machine: D.C. generator; AC Machine: Single phase transformer						8
3	Introduction to Sensors and Arduino: Classification of sensors; Position sensors: Potentiometer, LVDT, Digital encoder, Ultrasonic Sensor, Proximity sensors: Optical, Inductive, Capacitive; Temperature sensor: RTD, Thermocouples, Thermister, pyrometer, Basics of Arduino.						7
4	Introduction to Robotics: History, Laws of Robotics, Specifications of Robots, Structure of a robot, Robot Anatomy and Configurations, Precision and Accuracy, Classification and Applications, Dexterity and Compliance of Robots, Description of frame in the robotic system.						7
Total						30	
Text Books: 1) V.N.Mittal and Arvind Mittal, Basic Electrical Engineering, 2nd Ed, Tata McGraw-Hill, 2017. 2) V.K.Mehta and Rohit Mehta, Basic Electrical Engineering, S. Chand & Company Ltd., 2023 3) William Bolton, Mechatronics: Electronics Control Systems in Mechanical and Electrical Engineering, 6th Ed, 2019. 4) K.P. Ramchandran, G.K. Vijayaraghavan, M.S. Balasundaram, Mechatronics: Integrated Mechanical Electronic Systems, Willey Publication, 2008. 5) S. R. Deb and S. Deb, Robotics Technology and Flexible Automation, McGraw Hill Education, 2017.							

Reference Books:

- 1) Alciatore and Histan, Introduction to Mechatronics and Measurement Systems, 5th Ed, Mc-Graw Hill, 2019
- 2) Robert H.Bishop, Mechatronics – An Introduction, CRC press, 2017.
- 3) Mahalik, Mechatronics – Principles, concepts and applications, Tata Mc-Graw Hill publication, New Delhi, 2003.
- 4) D.C. Kulshreshtha, Basic Electrical Engineering, 1st Ed, Mc-Graw Hill, 2012.
- 5) Edward Hughes, Electrical and Electronic Technology, 10th Ed, Pearson-Prentice Hall, 2016.
- 6) S. K.Saha, Introduction to Robotics, McGraw-Hill Education, 2017.
- 7) J.Craig, Introduction to Robotics: Mechanics and Control, 4th Ed, Pearson Education.2022.
- 8) S.B.Niku, Introduction to Robotics, Analysis, Control, Applications, 2nd Ed, Wiley Publication,2020.

E Sources

- 1) https://onlinecourses.nptel.ac.in/noc23_de12/preview
- 2) <https://archive.nptel.ac.in/courses/108/105/108105112/>
- 3) https://onlinecourses.nptel.ac.in/noc21_me27/preview
- 4) https://onlinecourses.nptel.ac.in/noc23_me120/preview



Program: B. Tech. (Mechanical Engineering)						Semester: II	
Course: Fundamentals of Electromechanical Systems Laboratory						Code: BME22B06	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	Practical	Oral	Total
-	2	-	1	50	-	-	50
Prior Knowledge: Nil							
<p>Course Objectives: This course aims at enabling students,</p> <ol style="list-style-type: none"> 1) Learn the importance of safety measures in the lab environment while working with electrical and mechatronics system 2) Gain the practical experience in working with mechatronics, electrical and robotics system enhancing their technical skills. 							
<p>Course Outcomes: After learning the course, the students will be able to:</p> <ol style="list-style-type: none"> 1) Apply the basic concepts of electrical engineering 2) Develop a simple mechatronics system by using sensors /actuators 3) Explore various applications of robotics 							
Sr. No.	List of Experiments						
1	To build a switch board with switches, plug points, fuse and regulators						
2	To verify Kirchhoff law/ Thevenin's Theorem for DC network						
3	Perform load test on DC Shunt Motor to determine the efficiency.						
4	Perform speed control of DC Shunt Motor to plot characteristics.						
5	To determine efficiency and regulation of single-phase transformer by direct loading test.						
6	Study and Demonstration of various sensors in engineering applications						
7	To sense the Temperature and measure the Distance using suitable sensors and arduino						
8	Demonstrate an Interfacing of any actuator with arduino						
9	Demonstration of Robots / Industrial Visit						
Assignment on the study of electricity bill of LT consumer (Compulsory)							
<p>Text Book:</p> <ol style="list-style-type: none"> 1) V.N.Mittal and Arvind Mittal, Basic Electrical Engineering, 2nd Ed, Tata McGraw-Hill, 2017. 2) V.K.Mehta and Rohit Mehta, Basic Electrical Engineering, S. Chand & Company Ltd., 2023 3) William Bolton, Mechatronics: Electronics Control Systems in Mechanical and Electrical Engineering, 6th Ed, 2019. 4) K.P. Ramchandran, G.K. Vijayaraghavan, M.S. Balasundaram, Mechatronics: Integrated Mechanical Electronic Systems, Wiley Publication, 2008. 5) S. R. Deb and S. Deb, Robotics Technology and Flexible Automation, McGraw Hill Education, 2017. 							
<p>Reference Books:</p> <ol style="list-style-type: none"> 1) Alciatore and Histan, Introduction to Mechatronics and Measurement Systems, 5th Ed, Mc-Graw Hill, 2019 2) Robert H. Bishop, Mechatronics – An Introduction, CRC press, 2017. 3) Mahalik, Mechatronics – Principles, concepts and applications, Tata Mc-Graw Hill publication, New Delhi, 2003 4) D.C. Kulshreshtha, Basic Electrical Engineering, 1st Ed, Mc-Graw Hill, 2012. 5) Edward Hughes, Electrical and Electronic Technology, 10th Ed, Pearson-Prentice Hall, 2016. 6) S. K. Saha, Introduction to Robotics, McGraw-Hill Education, 2017. 7) J. Craig, Introduction to Robotics: Mechanics and Control, 4th Ed, Pearson Education, 2022. 8) S.B. Niku, Introduction to Robotics, Analysis, Control, Applications, 2nd Ed, Wiley Publication, 2020. 							

E-Sources:

- 1) https://onlinecourses.nptel.ac.in/noc23_de12/preview
- 2) <https://archive.nptel.ac.in/courses/108/105/108105112/>
- 3) https://onlinecourses.nptel.ac.in/noc21_me27/preview
- 4) https://onlinecourses.nptel.ac.in/noc23_me120/preview



Program: B. Tech. (Mechanical Engineering)						Semester: II	
Course: Workshop Practice – II						Code: BBME22G03	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	Practical	Oral	Total
-	2	-	1	50	-	-	50
Prior Knowledge:							
1) Hand tools and accessories 2) Basic measurement instruments (caliper, micrometer, dial gauge, etc.) 3) Machine tools 4) Safety practices on the shop floor are essential							
Course Objectives: This course aims at enabling students,							
1) Get hand on experience of working on various machine tools and welding machine. 2) Select appropriate machining parameters. 3) Experience dimensional and geometrical tolerances. 4) Get acquainted with automation in machining processes							
Course Outcomes: After learning the course, the students will be able to:							
1) Identify the appropriate manufacturing process for the part under consideration. 2) Handle different conventional machines such as lathe machine, grinding machine, drilling machine etc. 3) Identify the suitable joining process for part under consideration. 4) Use different G codes and M codes for writing the NC part program.							
Sr. No.	List of Experiments						
1	Manufacture of one useful industrial component/part using various machining operations.						
2	Manufacture of one useful industrial component on the milling machine using an indexing mechanism.						
3	Fabrication of utility component by using suitable joining process.						
4	Manufacturing of job using CNC turning or vertical machining centre (VMC).						
Submission: Jobs as mentioned above and write up of demonstration with sketches/illustration.							
Reference Books:							
1) Hajra Chaudhary, Elements of Workshop Technology, Vol. I and II, Media promoters and publishers Pvt. Ltd., 2013 2) P. N. Rao - Manufacturing Technology Volume I & II, Fifth Edition, McGraw Hill Education (India) Private Limited, 2018. 3) D. K. Singh, Fundamentals of Manufacturing Engineering, Ane's Books. Pvt. Ltd. 1st Edition, 2008. 4) P N Rao, CAD/CAM: Principles and Applications, Tata McGraw-Hill Education, 2017 5) Raghuvanshi, B. S. - Workshop Technology. Vol. 1 & 2, Dhanpat Rai & Co. (P) Ltd, Delhi., 2009							

Program: B. Tech. (Mechanical Engineering)						Semester: II	
Course: Programming & Problem-Solving Laboratory 2						Code: BME22G04	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	Practical	Oral	Total
-	2	-	1	50	-	-	50
Prior Knowledge:							
1) Programming and problem-solving Laboratory – I 2) Basics of physics, chemistry, mathematics, and engineering mechanics.							
Course Objectives: This course aims at enabling students,							
1) To explore Python platforms and work environment. 2) To use different built-in functions and operators for programming and problem-solving. 3) To develop flowcharts, algorithms, and codes using conditional and looping statements. 4) To explore descriptive statistics in Python. 5) To visualize the experimental/ literature data using various commands and draw suitable conclusions.							
Course Outcomes: After learning the course, the students will be able to:							
1) Explain the Python platforms, various built-in functions, and commands to write codes for solving problems. 2) Apply conditional and looping statements for solving the problems consists conditions and iterations. 3) Estimate various measures of descriptive statistics. 4) Select a suitable plot to visualize the data using Python programs, and draw practical/ relevant interpretations. 5) Prepare flowcharts, algorithms, and Python codes to simple real-world problems.							
Sr. No.	Lab work/ Assignments						
1	Introduction to Python Platforms; Installation process; Environment; Jupiter file; Python libraries; Dictionaries; file handling;						
2	Built-in Functions, Data Types, and Operators Symbols; Built-in functions; input and output functions; Basic functions; Basic datatypes; Variables; Types of operators; Type casting. Case study/ example/ numerical						
3	Indexing Slicing, and Data Structure Indexing; slicing; Concatenation; Multiplication; Comparison; String function; Data structure – types, tuple, set; Manipulation methods; Case study/ example/ numerical						
4	Conditional Statements and Looping Statements if; if-elif; if-elif-else; For loop; nested for loop; while loop; Statements – break, continue, pass; Case study/ example/ numerical						
5	Descriptive Statistics Measures of central tendency; Measures of spread; Percentiles; Quartiles; Quantiles; Deciles; Case study/ example/ numerical						
6	Data Visualization Frequency plots; Histogram; Stem and leaf plot; Scatter plot; Box plot; Visualize variables using plotting functions; Case study/ example/ numerical						
Mini-Project (to be completed in a group of 2-3 students)							
The mini-project should be based on any topics related to the Mathematics/ Statistics/ Physics/ Chemistry/ Biology; Engineering Mechanics; Thermodynamics/ mechatronics							
Text Books:							
1) Reema Thareja, 2019, “Python programming using problem solving approach”, Oxford University Press, ISBN 13:978-0019-948017-6. 2) R. Nageswara Rao, 2006, “Core Python programming”, Dreamtech Press, Second Edition, ISBN-10:938605230X, ISBN-13:978-9386052308 ASIN; B07BFSR3LL. 3) Sarah Guido and Andreas C. Muller, 2016, “Introduction to Machine Learning with Python: A Guide for Data Scientists”.							

Reference Books:

- 1) T. R. Padmanabhan, 2017, "Programming with Python," Springer Nature Singapore, ISBN 9789811032776.
- 2) Gowrishankar S., and Veena A., Introduction to Python Programming," CRC Press, ISBN 9781351013222.
- 3) Alexander Kenan, 2020, "Python for Mechanical and Aerospace Engineering," ISBN 9781736060605.

E-sources:

- 1) <https://padhai.onefourthlabs.in/courses/data-science>
- 2) <https://www.coursera.org/learn/python?specialization=python>



Program: B. Tech. (Mechanical Engineering)				Semester: II			
Course: Life Skills 2				Code: BSH22K01			
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	Practical	Oral	Total
-	4	-	2	100	-	-	100
Prior Knowledge: -Nil							
<p>Course Objectives: This course aims at enabling students,</p> <p>1) To equip them with essential skills and knowledge that complement their academic education, preparing them to excel not only as engineers but also as well-balanced individuals</p> <p>2) To develop students' vital life skills that promotes personal growth, resilience, and success in their academic journey and beyond</p>							
<p>Course Outcomes: After learning the course, the students will be able to:</p> <p>1) Understand the ways to nurture their passion.</p> <p>2) Develop skills growth mindset to be successful in personal and professional life.</p> <p>3) Demonstrate adaptability and flexibility for any environment.</p> <p>4) Apply essential skills for successful and happy life management.</p>							
Unit	Description						Duration (Hrs.)
1	<p>Nurture Your Passion</p> <p>(i) Developing Hobbies- Importance, Ways and Benefits</p> <p>(ii) Exploring Skills - Singing/Painting/Dancing etc</p> <p>(iii) Sports: Basketball, Table tennis, Football and Volleyball</p> <p>(iv) Performing Arts: Painting/ Sketching/ Drawing</p> <p>(v) Stage performance</p> <p>(vi) Let's Play to Learn - games and play forms possible, like, Puzzles & Brainteasers, quiz.</p>						15
2	<p>Lead Yourself - Growth Mindset</p> <p>(i) Understanding the concept for personal development.</p> <p>(ii) Embracing change: Coping with the dynamic nature of life</p> <p>(iii) Resilience and perseverance: Overcoming obstacles and setbacks</p> <p>(iv) Developing self-leadership skills and taking initiative/ responsibilities.</p>						15
3	<p>Adaptability and Flexibility</p> <p>(i) Adaptability in a rapidly changing world</p> <p>(ii) Problem-solving and decision-making in dynamic situations. Approaching Problem Differently</p> <p>(iii) Embracing uncertainty: Coping with ambiguity and making the most of new opportunities</p> <p>(iv) Flexibility in teamwork: Navigating diverse team dynamics effectively.</p>						15
4	<p>Life Management</p> <p>(i) Financial Literacy-Saving is earning, Value of money</p> <p>(ii) Coping up with Virtual Life and Reality</p> <p>(iii) Understanding the responsibilities and impact of Global Citizenship</p> <p>(iv) Environmental awareness and sustainable practices</p> <p>(v) Social responsibility: Contributing positively to the community.</p>						15
Total						60	

Reference Books

- 1) "Mindset: The New Psychology of Success" by Carol S. Dweck Publisher: Ballantine Books
- 2) "The Financial Diet: A Total Beginner's Guide to Getting Good with Money" by Chelsea Fagan and Lauren VerHage
- 3) "Grit: The Power of Passion and Perseverance" by Angela Duckworth Publisher: Scribner, 2018

Weblinks

- 1) SkillsYouNeed (www.skillsyouneed.com): This website offers comprehensive information and practical guidance on a wide range of life skills, including communication, time management, problem-solving, and more
- 2) MindTools (www.mindtools.com): MindTools provides resources on personal effectiveness, leadership, communication skills, and other essential life skills to enhance professional and personal development
- 3) TED Talks (www.ted.com): TED Talks offer inspiring and informative speeches by experts and thought leaders covering various life skills topics, including resilience, emotional intelligence, and personal growth
- 4) Verywell Mind (www.verywellmind.com): This website covers mental health, emotional well-being, and self-improvement topics that contribute to overall life skills development

