SIPNA COLLEGE OF ENGINEERING & TECHNOLOGY, AMRAVATI

An Autonomous Institute Affiliated to

Sant Gadge Baba Amravati University, Amravati, Maharashtra (India)

(Approved by AICTE, New Delhi and Recognized by DTE, Maharashtra)

(Accredited With 'A+' Grade by NAAC)

Bachelor of Technology (B. Tech.)

Syllabus - Semester I and Semester II

Department of Mechanical Engineering

B. Tech. Mechanical Engineering with Multidisciplinary Minor

(Semester Pattern)

Effective from Academic Year 2024-25

Prepared by: Board of Studies - Mechanical Engineering

Approved by: Academic Council - Sipna COET, Amravati

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Chairman Board of Studies	Dean Academics	Chairman Academic Council	Date of Release	Version

Syllabus: Semester I

Program:	B.Tech. (All Branches)			Semester:			I	
Course:	Engineering Mathematics-I			Code:			BTALBS01SH1T	
Teaching Scheme				Evaluation Scheme				
Lecture	Tutorial	Hours	Credit	TA	MSE-I	MSE-II	ESE	Total
3	-	3	3	10	15	15	60	100

Methods of Teacher Assessment (TA): Class Tests, Assignments, Quiz & Class Attendance

Course Objectives: To understand the basic concepts of Differential calculus and Complex numbers.

After completion of the course, the students will be able to:

CO	Course Outcomes	BT Level
CO-1	Distinguish between various types of functions to find n^{th} derivative.	L4
CO-2	Explain the basic concepts of partial differentiation.	L5
CO-3	Classify different forms of complex number.	L4
CO-4	Distinguish between various forms of differential equations.	L4
CO-5	Solve higher order differential equations.	L3
CO-6	Apply differential equations to find orthogonal trajectories and in electrical field.	L3

Unit I: Differential Calculus I	**(6 Hrs.)**
Successive Differentiation, Leibnitz's theorem, Taylor's and Maclaurin's theorems.	
Unit II: Differential Calculus II	**(6 Hrs.)**
Partial differentiation, Euler's theorem on homogenous function. Maxima and Minima of a function of several connected independent variables (Lagrange's Multipliers).	
Unit III: Complex Number	**(6 Hrs.)**
De-Moivre's theorem, Separation of real and imaginary parts, Logarithm of complex numbers.	
Unit IV: Ordinary differential equation of first order and first degree	**(6 Hrs.)**
Ordinary differential equation of first order and first degree in variable separable, Linear differential equation, Exact differential equation, non-exact differential equation.	
Unit V: Differential equations of first order and higher degree	**(6 Hrs.)**
Solution of differential equations of first order and higher degree by various methods (Solvable for x, y and p). Clairaut's differential equation and reducible to Clairaut's differential equation.	
Unit VI: Applications of Differential Equation	**(6 Hrs.)**
Application to Orthogonal trajectories, Electrical circuits and Growth Problems.	
Total Lecture	**36 Hours**

Textbooks:

1. Wartikar P. N., Wartikar J. N – A textbook of applied Mathematics. Volume I, II. V.G. Prakashan, Pune
2. Grewal B. S. – Higher Engineering Mathematics, Khanna Publishers.
3. Kreyszig E.K. - Advanced Engineering Mathematics, John Wiley.
4. Singh R. R. & Bhatt M. - Engineering Mathematics.
5. Ramana B.V. - Higher Engineering Mathematics.

Reference Books:

1. N. P. Bali & Manish Goyal- A textbook of Engineering Mathematics, Laxmi Publications.
2. Veera Rajan T - Engineering Mathematics for first Year, (TMH)

MOOCs Links and additional reading, learning, video material

1. NPTEL : Mathematics - NOC: Engineering Mathematics - I
2. Differential Calculus - Course (swayam2.ac.in)
3. https://www.mooc-list.com/tags/differential-equations
4. Complex Number - Definition, Formula, Properties, Examples (cuemath.com)

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Program:	B. Tech. (All Branches)			Semester:	I			
Course:	Engineering Chemistry			Code:	BTALBS02SH1T			
Teaching Scheme				Evaluation Scheme				
Lecture	Tutorial	Hours	Credit	TA	MSE-I	MSE-II	ESE	Total
3	-	3	3	10	15	15	60	100

Methods of Teacher Assessment (TA): Assignments, Class Tests, Viva Voce, Case Study Report, Attendance

Course Objectives: To impart a sound knowledge of the fundamental concepts of chemistry, involved in the study of several Engineering materials and related applications.

Course Outcomes: After completion of the course, the students will be able to:

CO	Course Outcomes	BT Level
CO-1	Apply the knowledge of chemistry for treatment of water	L5
CO-2	Understand the importance, need and applications of green technology for power generation by using renewable energy sources	L6
CO-3	Understand the construction, working and applications of advanced batteries.	L6
CO-4	Identify the application of various useful engineering materials such as nanomaterial, cement and lubricants, based on their properties	L3
CO-5	Understand the preparation, properties and uses of various polymeric materials.	L2
CO-6	Identify the need of reducing, reusing and recycling of E-waste to protect the environment.	L6

Unit I: Water Treatment	**(6 Hrs.)**
Hardness of water, Types of hardness- Temporary & Permanent Units of Hardness, Disadvantages of hard water, Softening of water, Softening methods like Ion-Exchange, Reverse Osmosis. Numerical Problem based on calculation of hardness of water.	
Unit II: Green Technology	**(6Hrs.)**
A] Solar Power System: Introduction to solar energy, need of solar energy, Utilization and conversion of solar energy, Photovoltaic cells- construction, working, advantages and disadvantages, Pannels and arrays. B] Green Hydrogen: Introduction to hydrogen energy, various hydrogen production methods- hydrogen from fossil fuels, electrolysis of water, Storage and transportation, Use of green hydrogen as a fuel. Case study on green energy.	
Unit III: Battery Technology	**(6 Hrs.)**
Introduction, classification of batteries- Primary and Secondary, Principle, construction, working and applications of Lead-Acid battery, Nickel-Cadmium battery, Lithium- ion battery. Fuel Cells, Classification of fuel cells, Principle, construction, working and application of H2-O2 fuel cell and DMFC.	
Unit IV: Engineering Material	**(6 Hrs.)**
A) Nanomaterial: Definition and classification of Nanomaterial, Methos of preparation. Properties and Application of nanomaterials. B) Cement: Introduction of cement, Ingredients of cement and their functions, Wet process of manufacturing of cement, Properties of cement- setting and hardening, heat of hydration, soundness of cement. C) Lubricant: Introduction and Functions of lubricant, Classification of lubricant, Properties of liquid lubricant, Viscosity, Viscosity index, Flash point, Fire point, Cloud point and Pour point.	
Unit V: Polymer Science	**(6 Hrs.)**
Introduction, Methods of Polymerization, Addition and Condensation Polymerization, Thermosoftening and Thermosetting polymers, Preparation, Properties & uses of PVC, TEFLON, Bakelite, Epoxy resins (Araldite), Polyurethane (Foam). Rubber: Natural Rubber, Vulcanization of natural rubber and its advantages Biodegradable Polymer: Introduction, Classification and application	
Unit VI: E-Waste Management	**(6 Hrs.)**
Introduction, Sources of E-waste, Types of E-waste, Toxic materials in E-waste and their health hazards, Recycling of E-waste (Separation and direct recycling), Pyrometallurgy, Hydrometallurgy, Control of E-waste. Case study on Ewaste management.	
Total Lecture	**36 Hours**

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Textbooks:	
1.	A Text Book of Engineering Chemistry by S.S.Dara ,S. Chand & Company Ltd.
2.	Engineering Chemistry by Jain & Jain, Dhanpat Rai Publishing Company (P) Ltd.
3.	A Text book of Engineering Chemistry by Shashi Chawla, Dhanpat Rai Publishing Company (P) Ltd.
4.	An Introduction to Nano material & Nanoscience by A K.Das & M.Das (CBS Publisher & Distributor)
5.	A Text book on experiments a calculation in Engineering Chemistry by S.S. Dara, S. Chand & Company Ltd.
6	Advanced Practical in Physical Chemistry by J.B. Yadav, Krishna's Prakashan Media (P) Ltd.

Reference Books:	
1.	Chemistry in Engineering & Technology, Vol I & Vol II by J. Rajaram & J.C. Kuriacose. McGraw-Hill Education
2.	A Text Book of Polymer Science & Tech by V. Gowarikar, New age International Publisher
3.	Nanotechnology Fundamentals and Applications by Manasi Karkare, I K International Publisher
4.	Solar energy: Principles of Thermal collection and storage, S.P. Sukhatme, Tata McGraw-Hill
5.	Solar photovoltaic: Fundamental Technologies and Applications, Chetan singh Solanki Prentice Hall
6.	E-waste: Implications, regulations, and management in India and current global best practices, Johri R., TERI Press, New Delhi

MOOCs Links and additional reading, learning, video material	
1.	https://nptel.ac.in/courses/105107207
2.	https://archive.nptel.ac.in/courses/105/105/105105178/
3	https://onlinecourses.nptel.ac.in/noc20_ph21/preview
4	https://onlinecourses.nptel.ac.in/noc22_ee71/preview
5	https://onlinecourses.nptel.ac.in/noc22_ch66/preview
6	https://onlinecourses.nptel.ac.in/noc21_mm34/preview
7	https://archive.nptel.ac.in/courses/112/102/112102014/
8	https://archive.nptel.ac.in/courses/104/105/104105124/
9	https://archive.nptel.ac.in/courses/113/105/113105028/
10	https://archive.nptel.ac.in/courses/105/105/105105169/

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Program:	B. Tech. (All Branches)			Semester:	I	
Course:	Engineering Chemistry Lab.			Code:	BTALBS03SH1P	
Teaching Scheme				Evaluation Scheme		
Practical	Tutorial	Hours	Credit	INT	EXT	Total
1	-	2	1	30	20	50

Course Objectives:

- To enable the students to get hands-on experience on the concepts discussed during theory classes.
- To provide practical knowledge of quantitative analysis of materials by volumetric and chemical method.
- To impart knowledge about instrumental methods for developing experimental skills.

Course Outcomes: After completion of the course, the students will be able to:

CO	Course Outcomes	BT Level
1	Determine the hardness and dissolved oxygen in water.	L5
2	Analyze, interpret & utilize the engineering materials in various engineering field.	L4
3	Determine important properties of lubricants like viscosity, flash point, by using suitable methods and instrumentation.	L5
4	Synthesize polymers by using suitable chemicals.	L6
5	Interpret data of conductivity change during acid base reaction as well as relate the cell potential (EMF) to the concentration of electrolyte	L5
6	Analyze the coal sample by proximate analysis.	L4

General Guidelines: Minimum 8 Experiments are to be conducted covering entire syllabus

Expt. No.	List of Experiments
1	Determination of NaOH and Na_2CO_3 in given alkali mixture.
2	Determination of hardness of water by EDTA complexometric titration.
3	Determination of Dissolved oxygen from water.
4	Determination of % of Fe_2O_3 from cement sample
5	Determination of Acid value of lubricating oil.
6	Study of variation in viscosity of lubricating oil on increase temperature by using Redwood viscometer No.1.
7	Determination of Flash point of lubricating oil by using Abel's flash point apparatus.
8	Preparation of Phenol and Urea formaldehyde polymer.
9	To find out strength of acid by titrating it with dilute Alkali conductometrically.
10	Study of EMF of a Daniel cell at varying concentration of electrolyte.
11	To carry out proximate analysis of coal.

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Program:	B. Tech. (All Branches)			Semester:			I	
Course:	Engineering Graphics			Code:			BTALES01ME1T	
Teaching Scheme				Evaluation Scheme				
Lecture	Tutorial	Hours	Credit	TA	MSE - I	MSE - II	ESE	Total
3	-	3	3	10	15	15	60	100

Methods of Teacher Assessment (TA): Attendance, Assignment, Viva

Course Objectives: Inculcate knowledge and develop the essential skills among students to communicate technical information effectively & contribute to the design, manufacturing & analysis of engineering processes.

Course Outcomes: After completion of the course, the students will be able to:

CO	Course Outcomes	BT Level
CO-1	Read/Interpret/prepare the engineering drawings	L 2
CO-2	Show the projections of Lines in different possible positions	L 1
CO-3	Show the projections of 2D objects	L 1
CO-4	Interpret and draw the projections and sectional views of 3D objects	L 2
CO-5	Develop the orthographic views of 3D objects	L 3
CO-6	Develop the isometric views & projections of 3D objects	L 3

Unit I: Introduction to Engineering Graphics **(06 Hrs.)**

Projections of points in all possible positions w.r.t. reference planes. Projections of lines when it is parallel to both reference planes, perpendicular to one of the reference planes, when line is inclined to one and parallel to other reference plane & when line is inclined to both reference planes.

Unit II: Projection of Planes **(06 Hrs.)**

Projection of planes parallel to one and perpendicular to other reference plane, inclined to one reference plane, inclined to both the reference planes.

Unit III: Projection of Right Regular Solids **(06 Hrs.)**

Projection of solid when axis is perpendicular to one of the reference planes and parallel to other reference plane, when axis is inclined to one and parallel to other reference plane, when axis is inclined to both the reference planes, Projection of cube, right regular prisms, right regular pyramids, right circular cylinder, right circular cone & Tetrahedron.

Unit IV: Section of Solids **(06 Hrs.)**

Section of right regular Solids including cube, right regular prisms, right regular pyramids, tetrahedron, right circular cylinder and right circular cone in simple position.

Unit V: Orthographic Projection **(06 Hrs.)**

Principles of Orthographic Projections, Conventions, Multi view orthographic projections for parts/ patterns with isometric/ non-isometric surfaces and circular features and sectional views. Reading of orthographic.

Unit VI: Isometric View and Projection **(06 Hrs.)**

Principles of Isometric projection, Isometric Scale, Isometric Views, Isometric Views of Simple Solids; conversion of Orthographic views to Isometric views and Isometric Projection.

Total Lectures **36 Hrs.**

Textbooks:

1. Bhatt N. D., Panchal V.M. Engineering Drawing, Charotar Publishing House.
2. Jolhe D. A. Engineering Drawing with an Introduction to Auto CAD, Tata McGraw- Hill Publishing Co. Ltd., New Delhi.
3. Shah P. J., Engineering Drawing, S. Chand Publication

Reference Books:

1. Naraynan K. L., Kannaiah P. – Engineering Drawing, Scitech
2. Dhawan R. K. – Engineering Drawing, S. Chand Publication

MOOCs Links and additional reading, learning, video material

1. NPTEL Course: Engineering Drawing & Computer Graphics, Link: https://nptel.ac.in/courses/112105294

Program:	B. Tech. (All Branches)			Semester:		I
Course:	Engineering Graphics Lab.			Code:		BTALES02ME1P
Teaching Scheme				Evaluation Scheme		
Practical	Tutorial	Hours	Credit	INT	EXT	Total
2	-	2	1	30	20	50

Course Objectives: Inculcate knowledge and develop the essential skills among students to communicate technical information effectively & contribute to the design, manufacturing & analysis of engineering processes.

Course Outcomes: After completion of the course, the students will be able to:

CO	Course Outcomes	BT Level
CO-1	Read/Interpret/prepare the engineering drawings	L 2
CO-2	Show the projections of Lines in different possible positions	L 1
CO-3	Show the projections of 2D objects	L 1
CO-4	Interpret and draw the projections and sectional views of 3D objects	L 2
CO-5	Develop the orthographic views of 3D objects	L 3
CO-6	Develop the isometric views & projections of 3D objects	L 3

General Guideline: Prepare any six drawing sheets out of seven listed below

Sheet No.	List of Drawing Sheets
1	Projection of Lines
2	Projection of Planes
3	Projection of Solids
4	Section of Solids
5	Orthographic Projection
6	Isometric View & Projection
7	Free hand sketches of simple machine elements, like: (a) Screw threads ISI profile, (b) Types of nuts, bolts, studs, set screws, washers, locking arrangement of nuts & bolts (c) Foundation bolts – Rag, eye, lewis types

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Program:	B. Tech. (Mechanical Engineering)			Semester:			I	
Course:	Engineering Mechanics			Code:			BTMEES03CE1T	
Teaching Scheme				Evaluation Scheme				
Lecture	Tutorial	Hours	Credits	TA	MSE-I	MSE-II	ESE	Total
2	-	2	2	10	15	15	60	100

Methods of Teacher Assessment (TA): Attendance, Assignment, Class test, Group activity.

Course Objectives: The objective of this course is to present basic principles of Statics and help to develop the proficiency in applying these principles to formulate & solve Statics problems.

Course Outcomes: After completion of the course, the students will be able to

CO	Course Outcomes	BT Level (L1 to L6)
CO-1	Identify and analyze different types of force systems.	L4
CO-2	Apply the concept of equilibrium and analyze simply supported beams.	L3
CO-3	Understand the concept of friction and trusses.	L2
CO-4	Determine centroid and moment of inertia of plane sections.	L4

Unit I: Resultant of Co-planar force System **(6Hrs.)**

Fundamental concepts, system of forces, laws of mechanics, principle of transmissibility of force, Moment of force, Principle of moment, Couple, Resultant of a Co-planar force system.

Unit II: Equilibrium of planar force System **(6Hrs.)**

Free body diagrams, Conditions of equilibrium, Lami's Theorem, types of supports, types of beams, types of loads on beam, Analysis of Simply supported beams, Equilibrium of a Co-planar force system.

Unit III: Friction and Trusses **(6Hrs.)**

Friction: Coulomb's laws of dry friction, plane friction.
Trusses: Types of trusses, assumptions in analysis of truss, Analysis of truss by method of joint.

Unit IV: Centroid & Moment of Inertia **(6Hrs.)**

Centroid, First Moment of Area, Problem on Centroid of composite sections, Moment of inertia of plane sections, Radius of Gyration, product of inertia, perpendicular and parallel axis theorem, polar moment of inertia, Definition of principal axes and principal moment of inertia.

Total Lecture **24 Hours**

Textbooks:

1. Engineering Mechanics by F. L. Singer, Harper Collins Publisher India.
2. Engineering Mechanics by S. S. Bhavikatti, New Age International Publication.
3. Engineering Mechanics (Statics and Dynamics), N.H.Dubey, Tata McGraw Hill.
4. Engineering Mechanics by Dr. R. K. Bansal, Laxmi Publication (P) Ltd.

Reference Books:

1 Engineering Mechanics by R C Hibbler, Pearson
2 Vector Mechanics for Engineers: Statics and Dynamics by Beer & Johnsons, McGraw Hill Education.

MOOCs Links and additional reading, learning, video material

1 https://nptel.ac.in/courses/112106286

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Program:	B. Tech. (Mechanical Engineering)			Semester:		I
Course:	Engineering Mechanics Lab			Code:		BTMEES04CE1P
Teaching Scheme				Evaluation Scheme		
Practical	Tutorial	Hours	Credit	INT	EXT	Total
2	-	2	1	30	20	50
Course Objectives: To provide hands-on experience for the students to outline the basic concepts of statics and simple lifting machines.						
Course Outcomes: After completion of the course the students will be able to						

CO	Course Outcomes	BT Level
CO1	Identify forces and moments through different problems	L4
CO2	Describe static equilibrium equations and apply them to solve the problems of statics.	L3
CO3	Apply the concept of friction.	L3
CO4	Recognize and outline the basic concept of motion, kinetics of motion.	L1
CO5	Understand the importance of mass moment of inertia.	L2
CO6	Apply laws of machines to determine efficiency of simple machines.	L3

General Guide lines: Minimum 08 experiments are to be conducted covering entire syllabus.	
Expt. No.	List of Experiments
1	To verify law of polygon of forces using universal force board.
2	To determine the support reactions of a simply supported beam.
3	To determine the forces in the members of a jib crane apparatus.
4	To determine the coefficient of friction between two surfaces of different material using inclined plane apparatus.
5	To determine the mass moment of inertia of a fly wheel.
6	To determine velocity ratio, mechanical advantage, efficiency & law of machine for screw jack.
7	To determine velocity ratio, mechanical advantage, efficiency & law of machine for differential wheel & axle.
8	To determine velocity ratio, mechanical advantage, efficiency & law of machine for worm & worm wheel.
9	To determine velocity ratio, mechanical advantage, efficiency & law of machine for single purchase winch crab.
10	To determine velocity ratio, mechanical advantage, efficiency & law of machine for double purchase winch crab.
11	Graphical solution of any two problems of statics.

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Program:	B. Tech. (Mechanical Engineering)			Semester:	I	
Course:	Workshop Practice Lab.			Code:	BTMEVS01ME1P	
Teaching Scheme				Evaluation Scheme		
Practical	Tutorial	Hours	Credit	INT	EXT	Total
2	-	2	1	30	20	50

Course Objectives:

- To give students 'hands-on experience' of craftsmanship which can boost confidence in their abilities and prepare them for future challenges & make students familiar with different work trades.
- To develop quality, safety consciousness & skill sets for creating entities from primitive engineering materials.
- This exercise aims at inculcating respect for physical work and hard labor.

Course Outcomes: After completion of the course, the Students will be able to:

CO	Course Outcomes	BT Level
CO-1	Explain the concept of dimensional accuracy & tolerances & different manufacturing processes commonly employed in industry using various manufacturing techniques.	L 2
CO-2	Create/fabricate the components in the Sheet metal shop	L 6
CO-3	Create/fabricate the components in the Fitting shop	L 6
CO-4	Create/fabricate the components in the Smithy shop	L 6
CO-5	Create/fabricate job using Taps & Dies	L 6

Sr. No.	Syllabus
1	**Introduction to Workshop Practice:** Introduction to different shops in workshop, different tools and equipment used in the workshop, Safety measures to be followed.
2	**Sheet Metal shop:** Introduction to tools and equipment, different operations like marking, cutting, bending, joining, etc. different sheet metal joints and their uses.
3	**Fitting shop:** Introduction to different tools, equipment and Operations like marking, filing, hacksaw cutting etc in Fitting Shop.
4	**Taps and Dies shop:** Introduction to different tools, equipment and operations in Taps and Dies shop, their uses, Preparation of job involving External and Internal threading, marking, center punching, cutting, filing and drilling.
5	**Smithy shop:** Introduction to different tools, equipment and Smithy operations like upsetting, drawing, bending, forming, flattering etc.

Job No.	List of Practical's
1	Identify the different tools & equipment commonly employed in workshop along with prevailing safety practices.
2	To prepare one job in Sheet Metal shop.
3	To prepare one job in Fitting shop.
4	To prepare one job in Smithy shop
5	To prepare one job in Taps and Dies shop.
6	To prepare one job in a group of three to five students. (Using the knowledge and skill gained in the above shops, students will have to identify the shop, material, tools, etc. and prepare drawing for given task and complete the job).
7	Visit to Fabrication/Manufacturing Industry and Prepare a report on the same.

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Program:	B.Tech. (Mechanical Engineering)			Semester:			I	
Course:	Design Thinking			Code:			BTMEVS02ME1T	
Teaching Scheme				Evaluation Scheme				
Lecture	Tutorial	Hours	Credit	TA	MSE-I	MSE-II	ESE	Total
01	--	01	01	50	--	--	--	50

Methods of Teacher Assessment (TA): Attendance, Case Study, Assignment, Group activity

Course Objectives:

- To introduce students to the fundamental principles and stages of design thinking, including empathy, ideation, and prototyping.
- To enhance students' ability to approach complex problems creatively and collaboratively, using design thinking methodologies.
- Show students how to use design thinking techniques in everyday situations to come up with innovative solutions.

CO	Course Outcomes	BT Level
CO-1	Know the steps of design thinking and how to use them to create new solutions for problems.	L3
CO-2	Better at understanding what people need, which helps in making designs that work well for users.	L5
CO-3	Make simple models and improve them by testing and getting feedback to find the best solutions.	L5

Unit I: An Overview & Applications of Design Thinking	**(06 Hrs.)**
Introduction to Design Thinking, Creativity and Innovation- The Drivers of Design Thinking, Attributes of Design Thinking, Critical Success Factors, Principles of Design Thinking, Evolution of Design Thinking, 3Ps of Design Thinking, Design Thinking as a Business Strategy, Features and Applications of Design Thinking, Phases of Design Thinking, Applications of Design Thinking	
Unit II: Double Diamond Design Thinking and Sustainability: Growth and Ethics	**(06 Hrs.)**
Design Thinking Tools and Techniques, Double Diamond Design Thinking: Double Diamond Model, the 4 D's of Double Diamond, Designing for Business Growth, Ethics in Design Thinking, Design Thinking for Sustainability: Introduction, Pillars of Sustainability.	

Textbooks:

1. E. Balagurusamy, Bindu Vijaykumar, "Design Thinking: A Beginner's Perspective", McGrawHill Publications.
2. E. Balagurusamy, Developing Thinking Skills.

Reference Books:

1. Anuja Agarwal, "Design Thinking: A Framework for Applying Design Thinking in Problem Solving", Cengage Publications.
2. Pavan Soni, "Design Your Thinking.

MOOCs Links and additional reading, learning, video material

1. https://onlinecourses.nptel.ac.in/noc22_mg32/ (Design Thinking - A Primer By Prof. Ashwin Mahalingam, Prof. Bala Ramadurai | IIT Madras

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Program:	B. Tech. (All Branches)			Semester:	I
Course:	Professional Communication			Code:	BTALAE01SH1P
Teaching Scheme				Evaluation Scheme	
Practical	Tutorial	Hours	Credit	INT	EXT	Total
2	1	3	2	30	20	50

Course Objectives:

- To impart knowledge and orient students about:
- Communication, barriers to communication and non-verbal cues of communication
- Basic writing, oral communication, business communication, & computer proficiency skills
- Providing hands-on experience through group discussion, mock interview, group and individual presentation

Course Outcomes: After completion of the course, the students will be able to:

CO	Course Outcomes	BT Level (L1 to L6)
1.	Understand the process of communication and overcome the barriers.	L3
2.	Prepare and present effective presentations aided by ICT tools.	L5
3.	Develop a comprehensive understanding of some specific forms of writing used in professional communication.	L6
4.	Demonstrate the formats, strategies and content of business communication at workplace.	L5
5.	Ability to communicate effectively in both formal and informal situations.	L6
6.	Ability to handle the interview process confidently.	L5

General Guidelines: All practicals are mandatory

Expt. No.	List of Experiments	
1	Types of communication: Formal, Informal	**Introduction to Communication**
2	Understanding various barriers to communication	
3	Introduction to body language: gestures, posture & facial expressions	
4	Introduction to MS-Office: Word, Power-point &Excel	**Computing Skills**
5	Creating Google Forms, arranging Google meet	
6	Letter Writing	**Business Communication**
7	Email Writing	
8	Vocabulary for business correspondence	
9	Group Discussion	**Team Building Skills**
10	Presentation	
11	Self-Introduction: Digital resume	**Job Readiness Skills**
12	Resume writing	
13	Interview techniques	
14	Creating LinkedIn profile	

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Program:	B.Tech. (All Branches)			Semester:	I			
Course:	Values & Ethics			Code:	BTALVE01SH1T			
Teaching Scheme				Evaluation Scheme				
Lecture	Tutorial	Hours	Credit	TA	MSE-I	MSE-II	ESE	Total
2	-	2	2	10	15	15	60	100

Methods of Teacher Assessment (TA): Assignment, Class Test, Attendance, Quiz

Course Objectives: To understand universal human values & ethics.

Course Outcomes: After completion of the course, the students will be able to:

CO	Course Outcomes	BT Level
CO-1	Identify the need of value education	L3
CO-2	Understand harmony in human being and society	L2
CO-3	Outline the relationship and natural ethical justice	L2
CO-4	Evaluate the case studies of holistic systems.	L5

Unit I: Introduction to Value Education	**(6 Hrs.)**
Need Basic Guidelines, Content and Process for Value Education Purpose and motivation for the course, recapitulation from Universal Human Values-I, Self- Exploration-what is it? - Its content and process; 'Natural Acceptance' and Experiential Validations the process for self-exploration, Continuous Happiness and Prosperity- A look at basic Human Aspirations, Right understanding, Relationship and Physical Facility- the basic requirements for fulfilment of aspirations of every human being with their correct priority, Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario, Method to fulfill the above human aspirations: understanding and living in harmony at various levels.	
Unit II: Understanding Harmony in the Human Being and Society	**(6 Hrs.)**
Harmony in Myself Understanding human being as a co-existence of the sentient 'I' and the material 'Body', Understanding the needs of Self ('I') and 'Body' - happiness and physical facility, Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer), Understanding the characteristics and activities of 'I' and harmony in 'I', Understanding the harmony in the society (society being an extension of family)	
Unit III: Understanding Harmony in the Family and Nature	**(6Hrs.)**
Harmony in Human-Human Relationship, Understanding values in human-human relationship; meaning of justice (nine universal values in relationships), Understanding the meaning of Trust; Difference between intention and competence, Understanding the meaning of Respect, Difference between respect and differentiation. Understanding the harmony in the Nature, Interconnectedness, and mutual fulfillment among the four orders of nature-recyclability and self-regulation in nature.	
Unit IV: Holistic Development Towards Universal Human Orders	**(6Hrs.)**
Case studies of typical holistic technologies, management models and production systems, Strategy for transition from the present state to Universal Human Order: a) At the level of individual: as socially and ecologically responsible engineers, technologists and managers b) At the level of society: as mutually enriching institutions and organizations.	
Total Lecture	**24Hours**

Textbooks:

1. A Foundation Course in Human Values and Professional Ethics, R.R. Gaur, R. Asthana, G.P. Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1
2. Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, R.R. Gaur, R. Asthana, G.P. Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2

Reference Books:	
1.	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amar kantak, 1999.
2.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3.	The Story of Stuff website, https://www.storyofstuff.com/
4.	The Story of My Experiments with Truth - by Mohandas Karamch and Gandhi
5.	Small is Beautiful - E. F Schumacher.
6.	Slow is Beautiful - Cecile Andrews
7.	Economy of Permanence - J C Kumarappa
8.	Bharat Mein Angreji Raj – Pandit Sunderlal
9.	Rediscovering India - by Dharampal
10.	Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11.	India Wins Freedom - Maulana Abdul Kalam Azad
12.	Vivekananda - Romain Rolland (English)
13.	Gandhi - Romain Rolland (English)

MOOCs Links and additional reading, learning, video material	
1.	Universal Human Values website, http://www.uhv.org.in/
2.	https://aktu.ac.in
3.	https://onlinecourses.nptel.ac.in/noc20_ee67/preview

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Program:	B.Tech. (All Branches)			Semester:				I
Course:	Environmental Studies			Code:				BTALVE02SH1T
Teaching Scheme				Evaluation Scheme				
Lecture	Tutorial	Hours	Credit	TA	MSE-I	MSE-II	ESE	Total
1	0	1	1	50	-	-	-	50

Methods of Teacher Assessment (TA): Assignment, Project work, Quiz, Attendance

Course Objectives:

- Comprehend Sustainable Development Goals for present generation
- Appreciate concept and method from ecological and physical science and their application in environmental problem solving.
- Analyze the status of environment with respect to precautionary mechanisms and control measures.

Course Outcomes: After completion of the course, the students will be able to:

CO	Course Outcomes	BT Level
CO-1	Understand and evaluate the concept of scope of environment and it's social issues.	L2
CO-2	Apply and analyze the concept of causes, effect and control of different types of environmental pollution.	L4

Unit I: The Multidisciplinary Approach in Environmental Studies and it's Ecosystem **(06 Hrs.)**

Definition, scope and importance, Need for public awareness. Unsustainable to Sustainable Development.

Natural Resources: Renewable and Non-Renewable resources:

Availability, Use, Over exploitation and associated environmental problems related to following Natural resources: Forest resources, Water resources, Mineral resource, Food resources, Energy resources, Land resources, Role of individual in conservation of natural resources, Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem: - Forest ecosystem, Grassland ecosystem, Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries.

Unit II: Biodiversity Conservation and Environmental Pollution **(06 Hrs.)**

Introduction – Definition: genetic, species and ecosystem diversity, Bio geographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega diversity nation, Hot-spot of biodiversity,Threatstobiodiversity:habitatloss,poachingofwildlife,man-wildlifeconflicts,Endangeredand endemic species of India, Conservation of biodiversity : In-situ and Ex-situ conservation of biodiversity. Case Studies: • Visit to a local area to document environmental assets- river/ forest/grassland.

Study of local ecosystems – pond, lake, river, forest etc. Definition, Cause, effects and control measures of: -Air pollution, Water pollution (CETP,ETP),Soil pollution ,Marine pollution, Noise pollution, Thermal pollution, nuclear hazards, Solid waste Management :Causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides.

Case Studies: Visit to a local polluted site –industrial/agricultural/rural/urban.

Total Lectures **12 Hours**

Text Books:

1. Text Book of Environmental studies, Erach Bharucha, UGC
2. Miller T.G., Jr., Environmental Science. Wads worth Publications
3. Clark R.S., Marine Pollution, Clanderson Press Oxford
4. Mhaskar A.K., Matter Hazardous, Techno-Science Publications

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Reference Books:	
1.	Agrawal,K.C.,2001,Environmental Biology, Nidi Publ. Ltd., Bikaner.
2.	De A. K., Environmental Chemistry, Wiley Eastern Ltd.
3.	Odum, E.P., 1971, Fundamentals of Ecology, W.B. Saunders CO., U.S.A.,574p.
4.	Shrama B.K. 2001, EnvironmentalChemistry,GoelPubl.House,Meerut.
5.	Fundamental concepts in Environmental Studies, D D Mishra, S.Chand & Co Ltd.
6.	Ecology, M.P. Arora, Himalaya Publishing House.
7	Ecology and Environment, P.D.Shrama
MOOCs Links and additional reading, learning, video material:	
1.	https://onlinecourses.swayam
2.	https://www.ugc.gov.in
3.	https://www.hzu.edu.in
4	https://www.researchgate.net

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Syllabus: Semester II

Program:	B. Tech. (All Branches)			Semester:			II	
Course:	Engineering Mathematics - II			Code:			BTALBS04SH2T	
Teaching Scheme				Evaluation Scheme				
Lecture	Tutorial	Hours	Credit	TA	MSE-I	MSE-II	ESE	Total
3	-	3	3	10	15	15	60	100

Methods of Teacher Assessment (TA): Class Tests, Assignments, Quiz & Class Attendance

Course Objectives: To acquire the basic concepts of integral calculus, Matrix and Infinite Series.

After completion of the course, the students will be able to:

CO	Course Outcome	BT Level
CO-1	Utilize concepts of matrix through different problems.	L2
CO-2	Find Fourier series for different functions	L1
CO-3	Explain the concepts of differential under integral sign, curve tracing	L5
CO-4	Apply the knowledge of double integration to find area.	L3
CO-5	Find volume by triple integration	L1
CO-6	Test convergence of series by various tests.	L4

Unit I: Matrix	**(6 Hrs.)**
Rank of a matrix, system of linear equations, Eigen values & Eigen vectors.	
Unit II: Fourier Series	**(6 Hrs.)**
Fourier expansion of periodic function in (C, C+2L), Half range Fourier series, Practical harmonic analysis.	
Unit III: Integral calculus & Curve tracing	**(6 Hrs.)**
Differentiation under integral sign, Tracing of curve in Cartesian form, polar form.	
Unit IV: Integral Calculus I	**(6 Hrs.)**
Double Integration, Transformation to polar coordinates, Evaluation of area by double integration.	
Unit V: Integral Calculus II	**(6 Hrs.)**
Triple Integration, Transformation to spherical polar coordinates, Volume by triple integration.	
Unit VI: Infinite Series	**(6 Hrs.)**
Test of convergence, Comparison test, Cauchy's Root test, D'Alembert's Ratio test.	
Total Lectures	**36 Hours**

Textbooks:

1. Wartikar P. N., Wartikar J. N – A text book of applied Mathematics. Volume I, II. Vidyarthi Griha Prakashan, Pune
2. Grewal B. S. – Higher Engineering Mathematics, Khanna Publishers.
3. Kreyszig E.K. - Advanced Engineering Mathematics, John Wiley.
4. Singh R. R. & Bhatt M. - Engineering Mathematics.
5. Ramana B.V. - Higher Engineering Mathematics.

Reference Books:

1. N. P. Bali & Manish Goyal- A text book of Engineering Mathematics, Laxmi Publications.
2. Veera Rajan T - Engineering Mathematics for first Year, (TMH)

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MOOCs Links and additional reading, learning, video material	
1.	NPTEL :: Mathematics - NOC: Engineering Mathematics - I
2.	leep203.pdf (ncert.nic.in)
3.	Integral Calculus Engineering Mathematics - YouTube
4.	Convergence tests - Wikipedia
5.	Summary of Convergence Tests - Mathematics LibreTexts

MOOCs Links and additional reading, learning, video material	
1.	https://archive.nptel.ac.in/courses/115/102/115102124/
2.	https://archive.nptel.ac.in/courses/115/107/115107095/
3.	https://archive.nptel.ac.in/courses/115/105/115105099/

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Program:	B. Tech. (Mechanical Engineering)			Semester:		II		
Course:	Engineering Physics			Code:		BTMEBS05SH2T		
Teaching Scheme				Evaluation Scheme				
Lecture	Tutorial	Hours	Credits	TA	MSE-I	MSE-II	ESE	Total
3	-	3	3	10	15	15	60	100

Methods of Teacher Assessment (TA): Attendance, Assignment, Class Test, Quiz

Course Objectives: To acquire the fundamental knowledge about
- Semiconducting materials.
- Electromagnetic phenomenon and optical phenomena
- Kinematics, kinetics, properties of fluids

Course Outcomes: After completion of the course, the students will be able to:

CO	Course Outcomes	BT Level
CO-1	Utilize the fundamental knowledge in Physics about the semiconducting materials, semiconducting devices & it's applications	L3
CO-2	Explain electromagnetic phenomena and its applications.	L2
CO-3	Develop the knowledge about fiber optics and LASER and its applications.	L3
CO-4	Illustrate the optical phenomena	L4
CO-5	Acquire basic concepts of kinematics, kinetics and properties of fluids	L3

Unit I: Fundamental of semiconductors **(6 Hrs.)**

Classification of solids on the basis of band theory, Types of semiconductors, Fermi level in intrinsic semiconductor & its derivation, Electrical conductivity of semiconductor, P-N junction diode, Zener diode, Light Emitting Diode.

Unit II: Electric and magnetic fields **(6Hrs.)**

Motion of electron in uniform transverse electric field and transverse magnetic field, Motion of electron in cross fields, Positive rays & it's properties, Bainbridge Mass Spectrographs, CRO (Block diagram of CRO)

Unit III: Fiber optics and laser **(6 Hrs.)**

Fiber Optics: Propagation of light through optical fiber (Principle & construction of fiber optics), Acceptance angle & Acceptance cone, Numerical Aperture, Classification of optical fiber on the basis of R.I. profile, Attenuation (Definition), Applications and advantages of optical fibers in engineering, LASER: Spontaneous & Stimulated emission, population inversion, LASER beam characteristics, Ruby laser (Construction & Working), Applications of Laser.

Unit IV: Interference and diffraction **(6Hrs.)**

Interference: Fundamental conditions of interference, thin film interference due to reflection of light, Newton's rings; equation for radius of bright and dark rings, determination ofwavelength of sodium light using Newton's ring.

Diffraction: Fresnel & Fraunhoffer class of diffraction, Plane diffraction grating (construction & determination of wavelength of light).

Unit V: Kinematics and kinetics **(6 Hrs.)**

Kinematics: Basic concepts of displacement, velocity and acceleration and its relations, rectilinear motion under variables and constant acceleration

Kinetics: Work-Power -Energy-Work energy equation for rectilinear motion and Impulse momentum equation

Unit VI: Properties of fluids **(6Hrs.)**

Properties of Fluids, Viscosity, Surface tension and capillarity, Continuity equation, Bernoulli's equation and its applications, Stokes law, Stream line and turbulent flow

Total Lecture **36 Hours**

Textbooks:	
1.	M.N. Avadhanulu & P. G. Kshirsagar, TVS Arun Murthy: A Textbook Engineering Physics, S. Chand Pub.and company limited,2022

Reference Books:	
1	R. K. Gaur & S. L. Gupta: Engineering Physics, Dhanpat Rai & Sons.
2	Hitendra K. Malik & A. K. Singh: Engineering Physics, Tata McGraw Hill
3	Mani & Mehta: Mordern Physics, Affiliated East- West Press
4	N. Subrahmanyam, Brijlal, M. N. Avadhanulu: A Text Book of Optics, S. Chand & Company.
5	A.J. Dekkar, Solid State Physics, Mc Millan Publishers.
6	Bhavi Katti,S.S. and Rajashekarappa K.G. ,Engineering Mechanics,New Age international Publishers, Delhi

MOOCs Links and additional reading, learning, video material	
1	https://archive.nptel.ac.in/courses/115/102/115102124/
2	https://archive.nptel.ac.in/courses/115/107/115107095/
3	https://archive.nptel.ac.in/courses/115/105/115105099/

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Dated:- 31/08/2024

Program:	B. Tech. (Mechanical Engineering)			Semester:		II
Course:	Engineering Physics Lab.			Code:		BTMEBS06SH2P
Teaching Scheme				Evaluation Scheme		
Practical	Tutorial	Hours	Credits	INT	EXT	Total
1	-	2	1	30	20	50

Course Objectives: At the end of the course student would be exposed to fundamental knowledge in

- Study semiconducting devices
- To enhance the basic knowledge about the cathode ray oscilloscope.
- Study of optical phenomenon.

Course Outcomes: After completion of the course, the students will be able to:

CO	Course Outcomes	BT Level
CO-1	Apply the basic knowledge about the semiconducting diode.	L3
CO-2	Acquire the knowledge of Cathode Ray Oscilloscope and its applications	L3
CO-3	Understand the diffraction phenomenon and its applications.	L2
CO-4	Make use of theoretical knowledge of interference and it's application.	L3
CO-5	Relate the principals of optics with the practical knowledge.	L2
CO-6	Interpret the knowledge of electric and magnetic fields and its applications.	L2

General Guidelines: Minimum 08 experiments shall be conducted

Expt. No.	List of Experiments
1	To Study the forward and reverse characteristics of P-N Junction Diode.
2	To Study the reverse characteristics of Zener Diode
3	To Study the forward characteristics of Light Emitting Diode.
4	Study of CRO
5	To determine unknown frequency with the help of CRO and also to measure Voltage across the resistance and current flowing through it.
6	To determine resolving Power of Telescope.
7	To determine the wavelength of monochromatic light by using Newtons Rings.
8	Determination of wavelength of spectral lines using diffraction grating.
9	Determination of grating element of a diffraction grating using LASER beam.
10	Determination of specific charge (e/m) of electron by using Thomson's method (Beyond syllabus)

Reference Books:

1. M.N. Avadhanulu& P. G. Kshirsagar, TVS Arun Murthy: A Textbook Engineering Physics, S. Chand Pub.and company limited,2022
2. N. Subrahmanyam, Brijlal, M.N. Avadhanulu : A Text Book of Optics, S. Chand & company Ltd.

APPROVED in 1A
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Dated:- 31/08/2024

Program:	B.Tech. (All Branches)			Semester:				II
Course:	Basic Electrical Engineering			Course Code:				BTALES05ETZT
Teaching Scheme				Evaluation Scheme				
Lecture	Tutorial	Hours	Credit	TA	MSE-I	MSE-II	ESE	Total
3	-	3	3	10	15	15	60	100

Methods of Teacher Assessment (TA): Attendance, Assignment, Class Test, Viva Voce

Course Objectives:

- Understanding the fundamental concepts of electrical circuits, including AC and DC circuits.
- Gaining knowledge about different types of electrical components and their functions.
- Learning about the operation and working principles of electrical machines such as transformers, motors.
- Understanding the principles of electrical installation and safety procedures.
- Exploring various energy sources used in electrical engineering.

Course Outcomes: After completion of the course, the students will be able to:

CO	Course Outcomes	BT Level
CO-1	To establish fundamental terms in electrical engineering and outline essential electrical laws and various theorems.	L1
CO-2	To understand AC circuits and their applications, including star and delta three-phase AC circuits.	L2
CO-3	To explore magnetic circuits and their practical application in transformers.	L3
CO-4	To explain the operational knowledge and working principles of DC motors and their various types.	L2
CO-5	To understand the concepts of electrical installation and safety.	L2
CO-6	To understand the concept of energy sources in electrical engineering.	L2

Unit I: Basic Fundaments	**(8 Hrs.)**
Basic concept of voltage, current, power and energy, Elementary calculation for energy consumption, Analysis of series and parallel circuit, Ohm's law, Current Division and voltage division, Kirchhoff's law, nodal and mesh analysis, Superposition theorem and Thevenin theorem.	
Unit II: AC Circuit	**(8 Hrs.)**
Representation of sinusoidal waveform, phasor representation, analysis of single-phase ac circuit consisting of R, L, C, RL, RC, RLC combination, Three phase balanced circuit, voltage and current relation in star and delta connection.	
Unit III: Electromagnetism & Transformer	**(4 Hrs.)**
Faraday law, Lenz law, Fleming rule, Statically and dynamically induced emf, Self and mutual induction, Construction and working principle of single-phase transformer, types of transformer, turns ratio.	
Unit IV: DC Motor	**(6 Hrs.)**
Introduction to DC motor, working principle, types and application, Introduction to Three phase induction motor, construction and working, speed control and application.	
Unit V: Electrical Installation and safety	**(5 Hrs.)**
Components of LT switchgear: Switch fuse unit (SFU), MCB, ELCB, MCCB, types of wire and cables, Electrical safety and precaution.	
Unit VI: Energy Sources	**(5 Hrs.)**
Sources of Electrical Power, Introduction to Wind, Solar, Fuel cell, Geothermal, Hydroelectric, Thermal-Steam, diesel, gas nuclear power generation.	
Total Lecture	**36 Hours**

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Textbooks:	
1.	Principle of Electrical Engineering, 4th Edition, Del Toro V., PHI2005
2.	Basic Electrical Engineering, First Ed., Kulshreshtha D.C., TMH-2008.
3.	Fundamentals of Electric Circuits by Charles K. Alexander and Matthew N. O. Sadiku
Reference Books:	
1.	D.P. Kothari and I.J Nagrath, "Basic Electrical Engineering", Tata McGraw Hill, 2010
2.	L.S. Bobrow," Fundamentals of Electrical Engineering", Oxford University Press, 2011
MOOCs (Massive Open Online Courses) Links and additional reading, learning, video material	
1.	**Coursera** • Introduction to Electrical Engineering • Fundamentals of Electrical Engineering
2.	**Udemy** • Electrical Engineering Fundamentals

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Program:	B. Tech. (All Branches)			Semester:		II
Course:	Basic Electrical Engineering Lab.			Course Code:		BTALES06ET2P
Teaching Scheme				Evaluation Scheme		
Practical	Tutorial	Hours	Credit	INT	EXT	Total
01	---	2	01	30	20	50

Course Objectives:

- Developing problem-solving skills related to electrical circuit analysis and design.
- Applying theoretical knowledge to practical applications through laboratory experiments.

Course Outcomes: After completion of the course, the students will be able to:

CO	Course Outcomes	BT Level
CO-1	Utilize fundamental knowledge of current and voltage to verify Kirchhoff's Voltage Law (KVL) and Kirchhoff's Current Law (KCL).	L1
CO-2	Able to verify current and voltage using the superposition theorem and Thevenin's theorem.	L2
CO-3	To analyze the relationship between line voltage, phase voltage, line current, and phase current in star and delta three-phase connections.	L3
CO-4	Demonstrate the working principles and operations of DC motors and transformer through hands-on experiments.	L3
CO-5	Summarize overload and short-circuit conditions in order to observe the tripping mechanism of the MCB.	L3

General Guidelines: Minimum 8 experiments are to be conducted covering Entire syllabus

Expt. No.	List of Experiments
1	To design and verify Kirchhoff's Current Law.
2	To design and verify Kirchhoff's Voltage Law.
3	To design and verify Superposition Theorem.
4	To design and verify Thevenin's Theorem.
5	To verify Vector relation between current and voltage in R-L-C Series circuit.
6	To study the Line voltage and Phase voltage, line current and phase current relation for star three phase connection.
7	To study the Line voltage and Phase voltage, line current and phase current relation for Delta three phase connection.
8	To study working and construction of transformer.
9	To verify relation between armature current and speed of DC motor.
10	To demonstrate the overload and short-circuit conditions to observe the tripping mechanism of the MCB.

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Program:	B. Tech. (All Branches)			Semester:				II
Course:	Programming for Problem Solving			Code:				BTMEES07IT2T
Teaching Scheme				Evaluation Scheme				
Lecture	Tutorial	Hours	Credit	TA	MSE-I	MSE-II	ESE	Total
3	-	3	3	10	15	15	60	100

Methods of Teacher Assessment (TA): Assignments/Quizzes, Attendance, Viva VOCE

Course Objectives: Throughout the course students will be expected to demonstrate their understanding of Programming for Problem Solving by being able to do each of the following:

- To express algorithms and draw flowcharts in a language independent manner.
- To demonstrate how to write modular, efficient and readable C programs.
- To gain knowledge in creating and using Control statements and Loops.
- To implement knowledge in creating and using Arrays of the C data types and Strings.
- To familiarize pointers, functions and recursive functions in C to efficiently solve problems
- To demonstrate creation of derived data types and perform operations on files.

Course Outcomes: On completion of the course students will be able to

CO	Course Outcome	BT Level
CO-1	Write, compile and debug programs in C language.	L3
CO-2	Use different data types in a computer program.	L3
CO-3	Design programs involving decision structures, loops, arrays and functions.	L6
CO-4	Identify the difference between call by value and call by reference.	L2
CO-5	Use pointers to understand the dynamics of memory.	L3
CO-6	Create file and perform different operations on it.	L6

Unit I: Introduction to Problem Solving **(6 Hrs.)**

Introduction to functional components of a computer system, Number System: Binary, Decimal, Octal and Hexadecimal, Conversion of numbers, binary arithmetic operations, Idea of Algorithm: Representation of Algorithm, Flowchart and its components, Pseudo code with examples

Unit II: C Programming Basics **(6 Hrs.)**

Structure of C program, C program execution lifecycle (preprocessor, assembler, compiler, interpreter, loader and linker), writing and executing the first C program. Components of C language: Identifiers, Data Types, Variables, Constants. Standard I/O in C (printf(), scanf() etc),Format Specifiers, Operators (Arithmetic, relational, logical, bitwise etc.), Expressions, Precedence and Associatively, Expression Evaluation, Type conversions.

Unit III: Control Constructs **(6 Hrs.)**

Control Statements: Decision making: if, if-else, nested if, if-else-if ladder and switch statements, ternary operator and its Examples
Looping statements: for, while and do-while statements and its examples
Jump statements: go to, break, continue and its examples.

Unit IV: Arrays & Strings **(6 Hrs.)**

Arrays: Array notation and representation, manipulating array elements, multi-dimensional arrays. Searching &Basic Sorting Programs (Linear Search, Binary Search, Bubble Sort).

Strings: Concepts of Strings, String Input / Output functions, string manipulation functions

Unit V: Functions & Pointers **(6 Hrs.)**

Functions: Introduction, types of functions, functions with array, passing parameters to functions, call by value, call by reference, recursive functions.
Pointers: Introduction, declaration, pointer examples, pointer arithmetic, pointer to pointer. Introduction to dynamic memory allocation (malloc, calloc, realloc, free), Introduction to structures and unions

Unit VI: File I/O **(6 Hrs.)**

File I/O: Concept of a file, streams, text files and binary files, Differences between text and binary files, State of a file, Opening and Closing files, file input / output functions (standard library input / output functions for files), command-line arguments, introduction to macros.

Total Lecture **36 Hours**

Textbooks:	
1.	Computer Concepts and Programming in C, E Balaguruswami, McGraw Hill
2.	Let Us C By Yashwant P. Kanetkar
3.	Computer Fundamentals & Programming in C, Pradeep Day & Manas Ghosh

Reference Books:	
1.	Mastering in C , K R Venugopal and S R Prasad
2.	Schaum's Outline of Programming with C by Byron Gottfried , McGraw-Hill
3.	Computer Science: A Structured Programming Approach Using C, B.A.Forouzan and R.F. Gilberg, Third Edition, Cengage Learning.
4.	Computer Basics and C Programming by V.Rajaraman , PHI Learning Pvt. Limited, 2015

MOOCs Links and additional reading, learning, video material	
1.	C Programming | moocs.org|:https://www.edx.org/learn/c-programming?hs_analytics_source=referrals
2.	Swayam |:https://onlinecourses.nptel.ac.in/noc22_cs40/preview
3.	C Programming Tutorial for Beginners | freecodecamp.org|: https://www.youtube.com/watch?v=KJgsSFOSQv0

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Program:	B. Tech. (All Branches)			Semester:		II
Course:	Programming for Problem Solving Lab			Code:		BTMEES08IT2P
Teaching Scheme				Evaluation Scheme		
Practical	Tutorial	Hours	Credit	INT	EXT	Total
2	-	2	1	30	20	50

Course Objectives: Throughout the course, students will be expected to demonstrate their understanding of Programming for Problem Solving by being able to do each of the following:

- To express algorithms and draw flowcharts in a language independent manner.
- To demonstrate how to write modular, efficient and readable C programs.
- To gain knowledge in creating and using Control statements and Loops.
- To implement knowledge in creating and using Arrays of the C data types and Strings.
- To familiarize pointers, functions and recursive functions in C to efficiently solve problems
- To demonstrate creation of derived data types and perform operations on files.

Course Outcomes: On completion of the course students will be able to

CO	Course Outcome	BT Level
CO-1	Write, compile and debug programs in C language.	L3
CO-2	Use different data types in a computer program.	L3
CO-3	Design programs involving decision structures, loops, arrays and functions.	L6
CO-4	Identify the difference between call by value and call by reference.	L2
CO-5	Use pointers to understand the dynamics of memory.	L3
CO-6	Create and perform different file operations.	L6

General Guidelines: Take any 2 or 3 programs from each section.
(Note: The programs are provided for reference. Course teacher can modify it as per his/her perspective)

Section 1

1. Write a c program that accepts the marks of 5 subjects and finds the sum and percentage marks obtained by the student.
2. Write a c program that calculates the simple interest and compound interest. The principal, amount, rate of interest and time are entered through the keyboard.
3. Write a c program to calculate the area and circumference of a circle.
4. Write a c program that accepts the temperature in centigrade and converts into Fahrenheit using the formula c/5=(f-32)/9.
5. Write a c program that swap values of two variables using a third variable.
6. Write a c program that checks whether the two numbers entered by the user are equal or not.

Section 2

1. Write a c program to find the greatest of three numbers.
2. Write a c program that finds whether a given number is even or odd.
3. Write a c program that tells whether a given year is a leap year or not.
4. Write a c program that accepts marks of five subjects and finds percentage and prints grades according to the following
5. Criteria:

a. Between 90-100%----------print 'a'
b. 80-90%----------print 'b'
c. 60-80%----------print 'c'
d. Below 60%----------print 'd'

6. Write a c program that takes two operands and one operator from the user and perform the operation and prints the result by using switch statement.
7. Write a c program to print the sum of all numbers up to a given number.
8. Write a c program to find the factorial of a given number.
9. Write a c program to print sum of even and odd numbers from 1 to n numbers.
10. Write a c program to print the Fibonacci series.
11. Write a c program to check whether the entered number is prime or not.
12. Write a c program to find the sum of digits of the entered number.

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13. Write a c program to find the reverse of a number.

Section 3

1. Write a c program that simply takes elements of the array from the user and finds the sum of these elements.
2. Write a c program that inputs two arrays and saves sum of corresponding elements of these arrays in a third array and Prints them.
3. Write a c program to find the minimum and maximum element of the array.
4. Write a c program to search an element in a array using linear search.
5. Write a c program to sort the elements of the array in ascending order using bubble sort technique.
6. Write a c program to add and multiply two matrices of order n x n.
7. Write a c program that finds the sum of diagonal elements of a m x n matrix.

Section 4

1. Write a c program to find cube of any number using function.
2. Write a c program to find diameter, circumference and area of circle using functions.
3. Write a c program to find maximum and minimum between two numbers using functions.
4. Write a c program to check whether a number is even or odd using functions.
5. Write a c program to implement strlen (), strcat (),strcpy () using the concept of functions.
6. Write a c program to create, initialize, assign and access a pointer variable.
7. Write a c program to swap two numbers using pointers.
8. Write a c program to change the value of constant integer using pointers.
9. Write a c program to print a string using pointer.
10. Write a c program to count vowels and consonants in a string using pointer.

Section 5

1. Write a c program to read name and marks of n number of students and store them in a file.
2. Write a c program to read name and marks of n number of students from and store them in a file. If the file previously exits, add the information to the file.
3. Write a c program to write all the members of an array of structures to a file using fwrite(). Read the array from the file and display on the screen.
4. Write a c program to compare the contents of two files and determine whether they are same or not.
5. Write a c program to check whether a given word exists in a file or not. If yes then find the number of times it occurs.

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Program:	B. Tech. (Mechanical Engineering)			Semester:	II	
Course:	Mechanical Joining Processes Lab.			Code:	BTMEES09ME2P	
Teaching Scheme				Evaluation Scheme		
Practical	Tutorial	Hours	Credit	INT	EXT	Total
2	-	2	1	30	20	50

Course Objectives: To study and understand different types of mechanical joining/welding processes with their parameters and demonstrate the moderate skill to perform these operations.

Course Outcomes: After completion of the course, the students will be able to:

CO	Course Outcomes	BT Level
CO-1	Classify various mechanical joining processes.	L2
CO-2	Outline conventional and advanced welding processes.	L2
CO-3	Illustrate the gas welding process	L4
CO-4	Summarize resistance welding processes, inspection and testing of weld join	L2

Expt. No.	List of Experiments
1	One job on Arc welding process
2	One job on Tungsten Inert Gas (TIG) welding process
3	One job on Metal Inert Gas (MIG) welding process
4	One job on gas welding process
5	One job on Resistance welding process
6	Demonstration of gas cutting process
7	Demonstration of soldering process
8	One Sheet on types of Threads, Types of joint in riveting and welding
9	One group activity (5 students) making job using multi processes.

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Program:	B. Tech. (Mechanical Engineering)			Semester:		II
Course:	Fundamentals of Computer Graphics Lab			Code:		BTMEVS03ME2P
Teaching Scheme				Evaluation Scheme		
Practical	Tutorial	Hours	Credit	INT	EXT	Total
2	-	2	1	50	--	50

Course Objective: To understand the fundamentals of CAD by studying the solid modeling techniques and gaining knowledge of geometric transformation in CAD Software.

Course Outcomes: After completion of the course, the students will be able to:

CO	Course Outcomes	BT Level
CO-1	Interpret the concept of CAD.	L2
CO-2	Construct a 2D model using CAD Software.	L3
CO-3	Construct a 3D model using CAD Software.	L3
CO-4	Develop an assembly using CAD modeling Software.	L6

Expt. No.	List of Experiments
1	Study of all the basic tools, layouts and drafting environment in AutoCAD software. (Written record will include all the tools with their definitions & applications.)
2	Study of coordinate systems, drafting and dimensioning commands and Auto CAD software customization. (Written record will include all the commands with their definitions & applications.)
3	Drafting of basic geometrical shapes in AutoCAD software. (Print of any ten basic shapes to be attached with the written drafting process.)
4	Drafting of basic 2D geometrical shapes using AutoCAD software. (Print of given three 2D components to be attached with the written drafting process.)
5	Drafting of basic 3D geometrical shapes using AutoCAD software. (Non-mandatory) (Print of any three given 3D isometric components to be attached with the written drafting process.)
6	Creation of assembly of a basic 3D component in AutoCAD software. (Non-mandatory) (Print of the given component assembly to be attached with the written drafting process.)

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Program:	B. Tech. (Mechanical Engineering)			Semester:			II	
Course:	Mechanical Joining Processes			Code:			BTMEPC01ME2T	
Teaching Scheme				Evaluation Scheme				
Lecture	Tutorial	Hours	Credit	TA	MSE - I	MSE-II	ESE	Total
2	-	2	2	10	15	15	60	100

Methods of Teacher Assessment (TA): Attendance, Assignment, Group Activity, Viva

Course Objectives: To study and understand different types of mechanical joining / welding processes with its parameter and demonstrate the moderate skill to perform these operations.

Course Outcomes: After completion of the course, the students will be able to:

CO	Course Outcomes	BT Level
CO-1	Classify various mechanical joining processes.	L2
CO-2	Compare conventional and advance welding processes.	L2
CO-3	Illustrate gas welding process	L4
CO-4	Summarize resistance welding processes, inspection and testing of weld join.	L2

Unit II: Introduction to basic joining processes	**(06 Hrs.)**
Introduction to various joining processes, Permanent (Riveting, Welding, Soldering, Brazing, Adhesive bonding), Types of welding joints and positions. Temporary (Nut bolt, Screws). Types of threads in Nut bolts, Screws	
Unit II: Arc and Modern Welding Processes	**(06 Hrs.)**
Introduction to various welding processes, Arc welding principle & working, electrodes, polarity, shielding gas, flux, TIG, MIG Introduction to special welding processes submerged arc welding, Electro slag welding, Electron beam welding, Laser beam welding, Ultrasound welding, Thermit welding, Friction welding and Friction stir welding.	
Unit III: Fundamental of Gas Welding Processes	**(06 Hrs.)**
Gas welding, principle, working, various gas combinations, filler rods, types of flames used. Details of soldering, Brazing, Braze welding, Material used Heat supplements.	
Unit IV: Resistance Welding Processes & Parameters	**(06 Hrs.)**
Resistance welding process Spot, Flash, Butt, Seam, Upset and Projection. Testing and inspection of weld joints, Welding defect types, causes and remedies, Standards and codes/symbols used in welding.	
Total Lectures	**24 Hrs.**

Textbooks:

1. "Elements of workshop technology, Manufacturing processes" Volume I, by S. K. Hajra Choudhary, A. K. Hajra Choudhary, Nirjhar Roy 6th edition, Media promoters and publishers pvt. Ltd. Mumbai.
2. "A course in workshop technology, Volume I, Manufacturing processes", by B S Raghuwanshi 9th Edition, Dhanpat rai & co.pvt. ltd, New Delhi.
3. P.N.Rao – Manufacturing Technology (Foundry, Forming, welding), 4th Edition, McGraw hill education (India) private limited, New Delhi.

Reference Books:

1. Roy A Lindberg – Processes and materials of manufacture, 4th Edition, Prentice Hall of India Pvt. ltd, New Delhi
2. J P Kaushish – Manufacturing processes, 2nd Edition, PHI learning pvt. ltd. New Delhi
3. Serope Kalpakjian, Steven R Schmid – Manufacturing engineering and technology, 8th Edition, Pearson

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Program:	B. Tech. (All Branches)			Semester:	II			
Course:	Indian Knowledge System			Code:	BTALIK01SH2T			
Teaching Scheme				Evaluation Scheme				
Lecture	Tutorial	Hours	Credit	TA	MSE-I	MSE-II	ESE	Total
2	--	2	2	50	--	--	-	50

Methods of Teacher Assessment (TA): Quiz, Assignment & Viva, Case Study, Attendance

Course Objectives:
To create awareness amongst students of Engineering about Indian Knowledge System.

Course Outcomes: After completion of the course, the students will be able to:

CO	Course Outcomes	BT Level
CO-1	Understanding Indian Knowledge System through ancient history.	L2
CO-2	Recognize the role and importance of governance with public administration by the use of Viduraniti.	L1
CO-3	Analyze the Historical Number Systems and its features.	L4
CO-4	Aware with Indian Mathematics and Contributions of Indian Mathematicians	L2

Unit I: Overview of Indian Knowledge System	**(6 Hrs.)**
Importance of ancient knowledge, defining IKS, IKS classification framework, Historicity of IKS, Some unique aspects of IKS.	
Unit II: Governance and Public Administration	**(6 Hrs.)**
Ramayana on grate attributes, Dos and Don'ts of a King, Vidura niti-Advice to a King, The administrative set up, Public Administration perspectives from epics.	
Unit III: Number Systems and Units of Measurement	**(6 Hrs.)**
Number systems in India – Historical evidence, Salient features of the Indian Numeral System, Unique approaches to represent numbers, Measurements for time, distance, and weight, Pingala and the binary system.	
Unit IV: Mathematics	**(6 Hrs.)**
Unique aspects of Indian Mathematics, Great Mathematicians and their Contributions, Algebra, Geometry, Trigonometry, Binary mathematics and combinatorial problems in Chandah Sastra of Pingala, Magic squares in India.	
Total Lecture	**24 Hours**

Textbooks:

1.	B. Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana R. N.: Introduction to Indian Knowledge System: Concepts & Applications, PHI, 2022

Reference Books:

1.	Indian Knowledge System Introduction & Prospects, Acharya Shreyas Charudatta Kurhekar

MOOCs Links and additional reading, learning, video material

1.	Swayam NPTEL: Indian Knowledge System (IKS)-Concepts and Applications in Science

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