DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY, CHHATRAPATI SAMBHAJINAGAR.

NAAC- 'A^{+}' Grade

CIRCULAR NO.SU/Engg./College/NEP/84/2025

It is hereby inform to all concerned that, the syllabus prepared by the Board of Studies and recommended by the Dean, Faculty of Science & Technology, *Academic Council at its meeting held on 09 May 2025 has been accepted* the Revised First Year B. E./ B. Tech. syllabus "Group A" – Mechanical Engineering; Civil Engineering and "Group B"– Computer Science, Computer Engineering, Computer Science and Engineering, AI&ML, Electrical, Artificial Intelligence, Information Technology and Electronics Engineering, Electronics and Telecommunication as per Norms of National Education Policy – 2020 under the Faculty of Science & Technology as appended herewith.

This is effective from the Academic Year 2025-26 and onwards.

All concerned are requested to note the contents of this circular and bring the notice to the students, teachers and staff for their information and necessary action.

University Campus,
Chhatrapati Sambhajinagar
-431 004.
REF.NO. SU/ENGG/2025/ 962-67
Date:- 29/ 05/2025

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Deputy Registrar,
Syllabus Section.

Copy forwarded and necessary action to :-

1] The Principal of all Affiliated Colleges, Dr. Babasaheb Ambedkar Marathwada University

2] The Director, University Network & Information Centre, UNIC, Dr. Babasaheb Ambedkar Marathwada University with a request to upload this Circular on University Website.

3] The Director, Board of Examinations & Evaluation, Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

Copy to :-

1] PA to the Hon'ble Vice-Chancellor,

2] PA to the Pro. Vice-Chancellor,

3] PA to the Registrar,
Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

Dr. Babasaheb Ambedkar Marathwada University

Chhatrapati Sambhajinagar- 431001

Revised Structure and Syllabus of 1st Year

B.E. / B. Tech. Programme

(AS PER NEP-2020)

Group A : Mechanical Engineering and Civil Engineering

Effective from 2025-26

F. Y. B.E./B.Tech Syllabus Structure w.e.f. 2025-26 (NEP 2020 Based Curriculum)

Group A : Mechanical Engineering and Civil Engineering

Semester –I

Sr. No.	Course Category	Course Code	Course Title	Contact Hours per week		Credits		Scheme of Examination		
				Theory	Practical	Theory	Practical	CIA	SEE	Total
1	Basic Science Courses (BSC)	BSCT-1	Theory – 1 (Applied Mathematics-I)	3	----	3	----	40	60	100
		BSCT-2	Theory – 2 (Engineering Physics / Engineering Chemistry)	3	----	3	----	40	60	100
		BSCP-1	Practical Based on BSCT-1	-	2	--	1	20	30	50
		BSCP-2	Practical Based on BSCT-2	-	2	--	1	20	30	50
2	Engineering Science Courses (ESC)	ESCT-1	Theory – 3 (Engineering Graphics)	3	----	3	----	40	60	100
		ESCT-2	Theory – 4 (Engineering Mechanics)	3	----	3	----	40	60	100
		ESCP-1	Practical Based on ESCT-1	-	2	--	1	20	30	50
		ESCP-2	Practical Based on ESCT-2	-	2	--	1	20	30	50
3	Vocational and Skill Enhancement Course (VSEC)	VSECT-1	Theory – 5 (Design Thinking)	1	--	1	--	20	30	50
		VSECP-1	Practical Based on VSECT-1	---	2	--	1	20	30	50
4	Ability Enhancement Course (AEC)	AECT-1	English (Professional Communication Skills)	1	----	1	----	20	30	50
		AECP-1	Practical Based on AECT-1	--	2	----	1	20	30	50
5	Co-curricular Courses (CC)	CCT-1	Theory-5 (Yoga)	1	---	1	--	20	30	50
		CCP-1	Practical Based on CCT-1	----	2	---	1	20	30	50
				15	**14**	**15**	**7**	**360**	**540**	**900**

Group A : Mechanical Engineering and Civil Engineering

Semester –II

Sr. No.	Course Category	Course Code	Course Title	Contact Hours per week		Credits		Scheme of Examination		
				Theory	Practical	Theory	Practical	CIA	SEE	Total
1	Basic Science Courses (BSC)	BSCT-1	Theory – 1 (Applied Mathematics –II)	3	----	3	----	40	60	100
		BSCT-2	Theory – 2 (Engineering Physics/ Engineering Chemistry)	3	----	3	----	40	60	100
		BSCP-1	Practical Based on BSCT-1	-	2	--	1	20	30	50
		BSCP-2	Practical Based on BSCT-2	-	2	--	1	20	30	50
2	Engineering Science Courses (ESC)	ESCT-1	Theory – 3 (Basics of Electrical and Electronics Engineering)	3	----	3	----	40	60	100
		ESCP-1	Practical Based on ESCT-1	-	2	--	1	20	30	50
3	Programme Core Courses (PCC)	PCCT-1	Theory – 4 (Basics and Mechanical / Basics of Civil Engineering)	3	----	3	----	40	60	100
		PCCP-1	Practical Based on PCCT-1	-	2	--	1	20	30	50
4	Vocational and Skill Enhancement Course (VSEC)	VSECT-1	Workshop Practice	---	4	---	2	20	30	50
5	Indian Knowledge System (IKS)	IKS	Theory –5 IKS Course (as per Basket Given by the University)	2	----	2	----	20	30	50
6	Co-curricular Courses (CC)	CCT-1	Theory-6 (Health and Wellness)	1	----	1	---	20	30	50
		CCP-1	Practicals Based on CCT-1	---	2	---	1	20	30	50
				15	**16**	**15**	**7**	**320**	**480**	**800**

Course Code : BSCT-1

Course : Applied Mathematics-I

Total Credits 03 **Total Contact Hours** : 45 Hrs.
Maximum Marks : 100

Learning Objectives of the Course:

i) To develop skills and create interest to use mathematics in Engineering & technology
ii) To know how the real word problems governed by the first order differential equations and calculus.
iii) To understand the importance of differential calculus and differential equations in Engineering & technology.
iv) To learn formation and solving various types of differential equations.

Course Outcomes (COs) :

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

i) Understand the concepts of Taylor's and Maclaurin's series, indeterminate forms, and convergence tests of infinite series.
ii) Apply L'Hospital's Rule and various convergence tests (Comparison, Ratio, and Root) to evaluate limits and determine the convergence of infinite series.
iii) Analyze functions of multiple variables using partial derivatives, Euler's theorem, and Jacobians to solve problems involving maxima and minima.
iv) Evaluate the total derivative and change of variables for functions of two or more variables in multivariable calculus.
v) Solve first-order differential equations including exact, linear, and Bernoulli's equations.
vi) Develop mathematical models for physical systems in electrical circuits and mechanics using first-order differential equations.

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	**Differential Calculus**: Taylor's Series, Maclaurin's Series, Indeterminate Forms: L' Hospital's Rule (Without Proof), Evaluation of Limits. **Infinite Series**: Sequences, Introduction to Infinite Series, Convergence and Divergence of Infinite Series: Comparison Test, D' Alembert's Ratio Test, Cauchy's N^{th} Root Test.	**15 Hrs.**

II	**Partial Differentiation**: Partial Derivatives - Introduction, Homogeneous Functions of Two Variables - Euler's Theorem, Implicit Functions, Total Derivative, Change of Variables. **Applications of Partial Differentiation**: Maxima and Minima of Functions of Two Variables, Jacobians and Its Properties.	**15 Hrs.**
III	**Differential Equations**: Solution of First Order and First Degree Differential Equation: Exact, Linear and Bernoulli's Equation (Reducible to Linear) **Application Of Differential Equations**: Application of First Order and First-Degree Differential Equations: Electrical Circuit, Mechanics	**15 Hrs.**

Text Books:

1. Venkatraman. M.K , " Engineering Mathematics-Volume I ", 4th Edition, National publishing company, Chennai, 2008.
2. Dr. Grewal. B.S., " Higher Engineering Mathematics ", 40th Edition, Khanna Publications, New Delhi, 2007.
3. H. K. Dass., " Advanced EngineeringMathematics ", 18th Edition, S. Chand And Co. Ltd

Reference Books:

1. Louis C. Barrett, Ray Wylie C , " Advanced Engineering Mathematics ", 6th Edition , McGraw-Hill Publishing Company Ltd, New Delhi, 2003
2. Erwin Kreyszig, " Advanced Engineering Mathematics ", 10th Edition , WilleyEastern Ltd. Mumbai .

Course Code : BSCT-2A

Course : Engineering Physics

Total Credits 03 **Total Contact Hours** : 45 Hrs.
Maximum Marks : 100

Learning Objectives of the Course:

i) To let the engineering undergraduates study physical properties, concepts and physical quantities required for the solution of complex engineering problems
ii) To make the engineering undergraduates learn basic principles of Physics and laws of scientific investigation to identify, formulate and analyse complex engineering problems
iii) To equip engineering undergraduates with competencies of scientific methods required in engineering career by upgrading skills on the basis of learning achieved from physical science perspectives.
iv) To engage engineering undergraduatesextensively in scientific investigation for interdisciplinary graduate programs and a wide variety of other lifelong learning opportunities.

Course Outcomes (COs) :

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

i) Recall basics of Optics, Sound and Modern Physics
ii) Explain phenomenon in Optics, Sound and Modern Physics
iii) Apply concepts of Optics, Sound and Modern Physics to solve complex engineering problems
iv) Analyse the concepts of Optics, Sound and Modern Physics
v) Interpret the characteristics of Solar cell, Zener diode, Transistor, Planks constant curve, GM Counter curve
vi) Experiment with Reverberation Time, Energy Band Gap, Wavelength of Light, Dielectric Constant, Specific Rotation, Wavelength of Ultrasonic waves, divergence of the laser beam, and hall coefficient

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	**A:Optics** The wave equation, Introduction to electromagnetic waves and electromagnetic spectrum, Newton's ring, Michelson interferometer, Applications of interference Diffraction of light, diffraction grating, resolving power of grating, Application of diffraction grating in spectroscopic devices **B:Ultrasonics**	**15 Hrs.**

	Properties, Production of ultrasonic waves by piezo-electric and magnetostriction generator, engineering applications of ultrasonic waves.	
II	**A:X-Rays** Basics of X-Rays, Production and Detection of X-Rays, Continuous and characteristics spectrum, Bragg's law of X-ray diffraction, Bragg's spectrometer, Intensity of diffracted Beams, Particle Size Determination by XRD, Precise Lattice Parameter Determination **B:Modern Physics** Black body radiation, Planck' s law, Photoelectric effect, Wave particle duality, De-Broglie's concept of matter wave, Davisson-Germer experiment, Scanning tunneling microscope, Time-dependent and time-independent Schrodinger equation for wave function, Quantum computing.	**15 Hrs.**
III	**A:Introduction to solids** Superconductivity: Superconductivity, effect of temperature and magnetic fields, Meissner effect, type I and II superconductors, BCS theory, Applications. Free electron theory of metals, Fermi level, density of states, Application to white dwarfs and neutron stars, Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands **B:Laser** Einstein's theory of matter radiation interaction and A and B coefficients, Properties of laser, spontaneous and stimulated emission, ruby laser, He-Ne laser, CO_2 laser and semiconductor Laser, applications of lasers in science, engineering and medicine. **C:Fiber Technology** Propagation of light through optical fiber, acceptance angle and cone numerical aperture, Single and Multi-Mode Fibers, applications, sensors	**15 Hrs.**

Text Books:

1. M. N. Avadhanulu P. G. Kshirsagar , " A Text book of Engineering Physics ", 7th Edition, **S. Chand & Co..**

2. R. K. Gaur S. L. Gupta ., " A Text book of Engineering Physics ", 3rd Edition, Dhanpat Rai.

Reference Books:

1. David Halliday, Jearl Walker, and Robert Resnick " Fundamentals of Physics", 6th Edition , Wiley
2. B. D. Cullity , " Elements of X-ray Diffraction ", 1st Edition , Addison-Wesley Metallurgy Series

Course Code : BSCT-2B

Course : Engineering Chemistry

Total Credits 03 **Total Contact Hours** : 45 Hrs.
Maximum Marks : 100

Learning Objectives of the Course:

i) To relate the concepts of Chemistry in all Engineering Disciplines.
ii) To make the engineering undergraduates acquainted with modern techniques in engineering and industrial Chemistry.
iii) To equip engineering undergraduates with the knowledge of advanced and existing Engineering Materials.
iv) To develop the awareness about powering the future using advanced energy Storage Systems.

Course Outcomes (COs) :

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

i) Recall the basics of advanced Engineering materials: Polymrs, Nanomaterials, Composite materials, etc
ii) Explain the advanced methods to produce engineering materials and soft water for industrial and domestic use
iii) Summarize properties and applications of fuels, lubricants, advanced engineering materials
iv) Apply the knowledge of lubricants, corrosion, advanced energy systems and modern metallurgical processes to solve the engineering problems
v) Analyze the samples for estimating the aggregate impurities in water, coal, metals, and lubricant samples
vi) Examine the synthetic scheme for thermosetting polymers and fundamental nonmaterial

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	**A: Advanced Engineering Materials** **Industrial Polymers**: Thermoplastics (PVC) & Thermosetting polymers (Bakelite), Biodegradable polymers (PVa), Properties, Applications **Nanomaterials**: Preparation of nano materials by Laser method, properties and applications of CNTs. **Composite Materials**: Ceramic matrix composites, carbon- carbon composites **Reinforcements**: Silicon carbide, Fiber glass.	**15 Hrs.**

	B: Water Technology: Water Parameters: Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD), pH, Hardness of water: types and units, Estimation of hardness by EDTA method, numerical on hardness; Boiler troubles: scale, sludge, priming, foaming and caustic embrittlement; Water treatment: Ion exchange process, Ultra filtration, Nano filtration	
II	**A: Fuels and Energy Storage Systems:** Fuels: Gross and net calorific value, Solid fuels: proximate analysis of coal &importance, gaseous fuels: composition properties and application of natural gases- CNG, LNG. Energy Storage Systems: Bio electrochemical batteries, lithium-ion battery, alkaline fuel cell (AFC) **B: Lubricants and Coolants** Lubricants: Introduction, Properties of liquid lubricants: viscosity and viscosity index, flash point and fire point, acid value. Numerical on viscosity index. Coolants: Introduction, properties and uses of water and ethylene glycol as coolant	**15 Hrs.**
III	**A: Corrosion and its prevention** Definition, types, mechanism of dry and wet corrosion, Corrosion testing methods: ultrasonic testing, computed &digital radiography, Prevention of corrosion: Methods- sacrificial anodic protection, Electroplating, Powder coating. **B: Metallurgical processes** Calcination, smelting, ore dressing, roasting, refining of metals, Metalworking processes: casting, forging, rolling, machining, sintering, Laser cladding, 3D printing	**15 Hrs.**

Text Books:

1. Jain & Jain , " Engineering Chemistry ", 16th Edition , Dhanpat Rai Publishing
2. Shashi Chawla, " A Textbook of Engineering Chemistry", 10th Edition , Dhanpat Rai Publishing

Reference Books:

1. B. Siva Shankar , " Engineering Chemistry ", 3rdEdition , Mc Graw Hills Publications
2. Shelly, Oberi and Malik , " Engineering Chemistry ", 1st Edition , Cingage

Publication
3. Odian, G.G, " Principles of Polymerization", 4th Edition , John Wiley & Sons, Inc
4. Malcolm P. Stevens, "Polymer Chemistry", 3rdEdition , Oxford University Press
5. William Callister and V. Raghavan, "Material Science & Engineering", 9th Edition , Wiley

Course Code: BSCP-1
Course: Practical based on Applied Mathematics-I

Total Credits: 01 **Total Contact Hours**: 30 Hrs.
Maximum Marks : 50

Learning Objectives of the Course:

i) Apply Taylor's and Maclaurin's series to approximate and analyze functions in engineering problems.
ii) Solve real-world limit problems involving indeterminate forms using analytical techniques.
iii) Test the behavior of sequences and series for convergence using standard mathematical tools.
iv) Compute and apply partial derivatives and Jacobians in multivariable optimization problems.
v) Model and solve real-life systems using first- and second-order differential equations.

Course Outcomes (COs) :

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

i) Apply Taylor's and Maclaurin's series to expand functions and solve real-world limit problems involving indeterminate forms.
ii) Analyze sequences and series for their convergence or divergence using standard convergence tests such as Comparison, Ratio, and Root tests.
iii) Compute first and second-order partial derivatives and evaluate Euler's theorem for homogeneous functions of two variables.
iv) Evaluate implicit functions, total derivatives, and Jacobians; perform transformations of variables in multivariable functions.
v) Determine the maxima and minima of functions of two variables using conditions for critical points and second-order tests.

vi) Solve first-order differential equations and apply them to model real-world problems in population growth, electrical circuits, and free-fall motion.

Topics / actual contents of the syllabus	Contact Hours
1. Expand functions using Taylor's and Maclaurin's series 2. Solve practical **force-displacement or velocity-time** problems where limits result in **0/0 or** ∞/∞ forms. 3. Analyse the behaviour of Sequences and Their Limits 4. Test the Convergence and Divergence of Infinite Series 5. Compute first-order and second-order partial derivatives Partial Derivatives of Functions 6. Verify Euler's Theorem on Homogeneous Functions 7. Differentiate functions implicitly and compute total derivatives Objective:. 8. Compute Jacobians and apply transformation of variables 9. Find the Maxima and Minima of Functions of Two Variables 10. Solving First-Order Differential Equations 11. Solve Exact Differential Equations 12. Solve linear differential equations with a population growth model 13. Analyze simple electrical circuits using differential equations 14. Apply differential equations to solve a free-fall motion equation	**30 Hrs**
Students should undertake at least 08 to 10 experiments during the semester from above list	

Course Code : BSCP-2A

Course : Practicas based on Engineering Physics

Total Credits: 01 **Total Contact Hours** : 30 Hrs.
Maximum Marks : 50

Learning Objectives of the Course:

i) Explain key principles in modern physics, including black body radiation, semiconductor behaviour, ultrasonic wave propagation, and optical phenomena.
ii) Acquire hands-on experience in using various scientific instruments such as the G.M. Counter, optical gratings, ultrasonic interferometers, and Hall Effect setup.
iii) Understand wave interference and diffraction through experiments like Newton's rings and laser diffraction using gratings.
iv) Determine physical constants like Young's modulus, elastic constants, and dielectric constant using standard experimental methods.
v) Analyze the performance and characteristics of solar cells under various conditions.
vi) Evaluate Planck's constant through both black body radiation and photoelectric effect experiments.
vii) Interpret and analyze experimental data using graphical and mathematical tools.

Course Outcomes (COs) :

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

i) Understand the fundamental principles of modern physics experiments, such as Planck's constant, Hall effect, and energy band gap in semiconductors.
ii) Apply optical methods like Newton's rings and diffraction grating to determine the wavelength of light and LASER sources.
iii) Analyze mechanical properties of materials using techniques such as Searle's method and beam bending.
iv) Measure electrical and electronic properties such as the Hall coefficient, dielectric constant, and characteristics of a solar cell.
v) Determine the velocity of ultrasonic waves and use ultrasonic interferometry for material property analysis.
vi) Demonstrate an understanding of experimental setups like optical fiber light transmission and G.M. Counter functionality, including dead time.

Topics / actual contents of the syllabus	Contact Hours
List of the Experiments 1. Measurement of Planck's constant through Black body radiation.	**30 Hrs.**

2. Determination of ultrasonic wave's velocity in liquid media. 3. Newton's ring: To determine wavelength of monochromatic light 4. G. M. Counter: dead time calculation 5. Grating: To determine wavelength of LASER light. 6. Characteristics of solar cell 7. Ultrasonic interferometer 8. Dielectric constant: to determine dielectric constant. 9. Forbidden gap: To determine forbidden gap of semiconductors. 10. To determine the Hall coefficient of a semiconductor material and then evaluate carrier type and its density of charge carrier. 11. Determination of Planck's Constant 12. To determine the elastic constant of wire Y and n of stainless steel wire by Searle's method. 13. Determination of Young's modulus by bending beam 14. To find the time period of a simple pendulum and determine acceleration due to gravity 15. Experiment: Observation of Light Propagation in Optical Fibre	
Students should undertake at least 08 to 10 experiments during the semester from above list	

Course Code : BSCP-2B

Course : Practical based on Engineering Chemistry

Total Credits 01 **Total Contact Hours** : 30 Hrs.
Maximum Marks : 50

Learning Objectives of the Course:

i) To develop practical skills in chemical analysis and characterization techniques, enabling students to accurately measure and interpret physical and chemical properties of various substances (e.g., water, soil, coal, lubricants).
ii) To enhance understanding of industrially relevant chemical processes and instrumentation, including separation methods, polymer synthesis, corrosion studies, and simulation of modern equipment like 3D printers.

iii) To promote analytical thinking and data interpretation abilities, preparing students to apply chemistry knowledge for solving real-world environmental, industrial, and technological challenges.

Course Outcomes (COs) :

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

i) Analyze physical and chemical parameters of water and soil samples to evaluate their quality and suitability for various applications.
ii) Determine the composition and quality of fuels and industrial materials by estimating moisture, ash, and chloride content.
iii) Synthesize polymers and evaluate their characteristics to understand their industrial relevance.
iv) Examine physical properties of substances such as viscosity, melting/boiling point, and corrosion rate under various conditions.
v) Apply electrogravimetric and chromatographic techniques for separation, estimation, and identification of chemical compounds.
vi) Demonstrate familiarity with modern chemical lab instrumentation and simulations, including 3D printer machine operations.

Topics / actual contents of the syllabus	Contact Hours
1. Analysis of Chemical parameters of water (Lab performance/Virtual performance) 2. Analysis of physical parameters of water 3. Determination of percentage of moisture and ash in given coal sample. 4. Preparation of polymer 5. Electro gravimetric Estimation of Metals (Virtual experiment) 6. Determination of chloride content of water by Mohr's method (Lab performance /Virtual experiment) 7. Determination of melting or boiling point of organic compound. (Virtual experiment) 8. Determination of Viscosity of given specimen. 9. Determination of rate of corrosion in different pH media. (Lab performance /Virtual experiment) 10. Chromatography- Separation technique (Lab performance /Virtual experiment) 11. Determination of acid value of lubricating oil by titration method. 12. Determination of percentage of moisture in given soil sample. 13. Determination of pH in given soil sample.	**30 Hrs.**

14 Separation of chemical compounds by column chromatography technique. (Virtual experiment) 15.Simulation of Cartesian 3D Printer Machine	
Students should undertake at least 08 to 10 experiments during the semester from above list	

Course Code : ESCT-1

Course : Engineering Graphics

Total Credits 03 **Total Contact Hours** : 45 Hrs.
Maximum Marks : 100

Learning Objectives of the Course:

i) Engineering drawing being the principle method of communication for engineers, the objective is to introduce the students, the techniques of constructing the various types of polygons, curves and scales.
ii) The objective is also to visualize and represent the 3D objects in 2D planes with proper dimensioning, scaling etc.

Course Outcomes (COs) :

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

i) Understand the principles of orthographic projection and visualize the position of points and lines in different quadrants and planes.
ii) Construct projections of planes inclined to one or both reference planes, and interpret their spatial orientation.
iii) Draw the projections of solid objects like prisms, pyramids, cones, and cylinders with axes inclined to one or both reference planes.
iv) Analyze and draw sectional views of solids cut by a plane inclined to one reference plane, and determine the true shape of the section.
v) Develop orthographic views of simple machine components using first and third angle projection methods.
vi) Create isometric views of objects from given orthographic views using isometric axes, scales, and projections.

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	**A:Projections of Point & Line:** Concept of orthographic projections. Projections of points situated in different quadrants. Projections of a line parallel to one of the reference planes and inclined to the other plane, line inclined to both the reference planes. **B:Projections of Planes:** Projections of a plane perpendicular to one of the reference planes and inclined to the other,	**15 Hrs.**

	Projections of a plane inclined to both the reference planes	
II	**A: Projection of Solids:** Types of solids, projections of solids like cube, Prism, Pyramid, Cone and Cylinder with its axis inclined to one or both the reference planes **B:Section of Solids:** Projections of regular solids like Cube, Prism, Pyramid, Cone and Cylinder cut by cutting plane inclined to one plane. Determination of true shape of section.	**15 Hrs.**
III	**A:Orthographic Projection:** Introduction to orthographic projection, Concept of first and third angle projection method. Drawing of orthographic views of simple machine components from isometric view **B:Isometric Views:** Isometric axes, Isometric lines, Isometric Planes, Isometric scale, Isometric Views, Isometric projections, drawing of isometric views from given orthographic views	**15 Hrs.**

Text Books:

1 Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), Engineering Drawing, Charotar Publishing.

2 Narayana, K.L. & P Kannaiah , "Text book on Engineering Drawing", Scitech Publisher 2008

Reference Books:

1 B Jain, Maheshwari, Gautam , "Engineering Drawing", Tata McGraw-Hill Publishing.2008

2 Shah, M.B. & Rana B.C., "Engineering Drawing and Computer Graphics", Pearson. 2008

3 Agrawal B. & Agrawal C. M. "Engineering Graphics", TMH Publication 2012

Course Code : ESCT-2

Course : Engineering Mechanics

Total Credits 03 **Total Contact Hours** : 45 Hrs.
Maximum Marks : 100

Learning Objectives of the Course:

i) To study the forces and their effects on the bodies in motion or at rest.
ii) To study the mechanics of rigid bodies and deformed bodies.
iii) To study the properties of plane surfaces, analysis of simple trusses and concept of friction.

Course Outcomes (COs) :

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

i) Understand fundamental concepts of force systems, moments, couples, and equilibrium conditions using free-body diagrams and Lami's Theorem.
ii) Analyze statically determinate plane trusses using the method of joints and the method of sections.
iii) Determine centroids and moments of inertia for various plane surfaces using appropriate theorems.
iv) Evaluate particle motion parameters under various conditions using the principles of rectilinear and projectile motion.
v) Apply Newton's second law and D'Alembert's principle to solve problems involving the linear motion of particles.
vi) Analyze the effects of impulse and momentum on particle systems, including central impacts and energy loss during collisions.

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	**A:Force System:** Introduction, Fundamental concept, principle of superposition, fundamental laws of mechanics, coplanar and non-coplanar force system, components, resultant, moment of a force, Varignon's Theorem, couple, Equivalent force couple system. Equilibrium of forces: Introduction, free body diagram, beam, Equilibrium of force system, Lami's Theorem. **B: Plane Trusses:**	**15 Hrs.**

	Introduction, classification of trusses, assumption made in the analysis of truss, Analysis of statically determinate truss by method of joint and method of section	
II	**A:Properties of Plane Surfaces:** Introduction, Centroid, Centre of gravity, Important definitions, Determination of centroid, Positions of centroid, Moment of Inertia, Polar moment of inertia, Radius of gyration, Theorems of moment of inertia **B:Kinematics of Particles:** Introduction, basic terms and definitions, Rectilinear motion of the particles, Motion curves under uniform acceleration, linear motion under gravity, linear motion under variable acceleration, motion curves under variable acceleration, Motion of projectiles, Relative motion.	**15 Hrs.**
III	**A:Kinetics of Particles:** Introduction, important terms and definitions, linear motion of a particle by Newton's second law of motion and D'Alembert's principle **B: Impulse, Momentum and Impact:** Introduction of Impulse and Momentum, important terminologies, principle of impulse and momentum, law of conservation of linear momentum, Recoil of gun, Impact, types of central impact, loss of kinetic energy during impact.	**15 Hrs.**

Text Books:

1 S.S. Bhavikatti, "Engineering Mechanics", 8th Edition , New Age International Publication.
2 R.K.Bansal, "Engineering Mechanics", 4th Edition , Laxmi Publication
3 A.R.Basu, "Engineering Mechanics", 2nd Edition , DhanpatRai
4 B.Prasad "Engineering Mechanics", 9th Edition , Khanna Publications
5 R.S. Khurmi "A Textbook Of Engineering Mechanics", 22nd Edition , S. Chand

Reference Books:

1. Nelson and Mclean, "Engineering Mechanics", 2nd Edition, McGrawHillBook,Inc
2. R.C. Hibbler., "Principles of Statics and Dynamics", 14th Edition Pearson Education.

Course Code : ESCP-1

Course : Practical Based on Engineering Graphics

Total Credits : 01 **Total Contact Hours** : 30 Hrs.
Maximum Marks : 50

Learning Objectives of the Course:

i) Identify and Use Drawing Instruments
ii) Understand and Apply Projection Techniques
iii)Visualize and Represent 3D Objects
iv) Master Orthographic and Isometric Projections
v) Enhance Technical Drawing Skills

Course Outcomes (COs) :

After completion of the course,

i) Identify and correctly use standard drawing instruments for line work, lettering, and dimensioning in technical drawings.
ii) Construct accurate orthographic projections of points, lines, and planes in different orientations using standard projection methods.
iii) Develop the projections of 3D solid objects including cube, prism, pyramid, cone, and cylinder in various orientations.
iv) Analyze and draw sectional views of solids to reveal internal features and determine the true shape of sections.
v) Produce orthographic views of mechanical components from isometric views using first and third angle projection principles.
vi) Create isometric views of objects based on given orthographic views, using correct isometric axes and scale.

Topics / actual contents of the syllabus	Contact Hours
List of the Experiments 1. Drawing Instruments and their uses. Line, Lettering and Dimensioning. 2. Drawing Sheet on Projection of Points. 3. Drawing Sheet on Projection of Lines. 4. Drawing Sheet on Projection of Plane. 5. Drawing Sheet on Projection of Solids. 6. Drawing Sheet on Section of Solids. 7. Drawing Sheet on Orthographic Projection. 8. Drawing Sheet on Isometric Projection.	**30 Hrs**
Students should undertake all 8 experiments during the semester from above list	

Course Code : ESCP-2

Course : Practical based Engineering Mechanics

Total Credits : 01 **Total Contact Hours** : 30 Hrs.
Maximum Marks : 50 / 50

Learning Objectives of the Course:

i) Engineering mechanics learning objectives aim to equip students with a foundational understanding of how forces and motion affect physical systems, enabling them to analyze and predict their behavior.
ii) Key objectives include understanding force systems, equilibrium, friction, and the motion of both particles and rigid bodies.
iii) Students also learn to compute properties of areas, apply work-energy principles, and solve problems related to engineering structures.

Course Outcomes (COs) :

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

i) Apply graphical methods to solve problems involving forces, beam reactions, and pin-jointed trusses.
ii) Identify the mechanical advantage, velocity ratio, and efficiency of simple lifting machines through experimentation
iii) Verify basic force laws including the parallelogram law and Lami's theorem through physical models.
iv) Determine support reactions and internal member forces in beams and trusses using experimental setups.
v) Demonstrate understanding of moment principles using apparatus like the moment of inertia setup and crane models.
vi) Analyze the effect of friction in mechanical systems through experiments on screw jacks and belt friction.

Topics / actual contents of the syllabus	Contact Hours
Part I: Graphical Solutions:(Any Two) 1. Resultant of Concurrent and Non-Concurrent Coplanar Force System 2. Problems on Beam Reaction 3. Problems on Analysis of Pin-jointed Trusses Part-II: Laboratory Experiments:(Any Six) 1. Study of Simple Lifting Machines 2. Study of Law of Machines 3. Parallelogram Law of Forces	**30 Hrs.**

4. Lami's Theorem 5. Beam Reactions 6. Study of the Principle of Moments 7. MemberForcesin Trusses 8. Jib Crane 9. Moment of Inertia of Fly Wheel 10.Simple Screw Jack 11.Differential Axle and Wheel **12.** Belt Friction	
Students should undertake at least 08 to 10 experiments during the semester from above list	

Vocational And Skill Enhancement Course (VSEC)

Course Code : VSECT-1
Course : Design Thinking

Total Credits01 **Total Contact Hours** :15 Hrs.
Maximum Marks : 50

Learning Objectives of the Course:

i) To familiarize students with the fundamental concepts and stages of the Design Thinking process.
ii) To enable students to generate innovative solutions and develop strategic plans for implementing these solutions in real-world engineering contexts.
iii) To equip students with the ability to create and testlow-fidelity prototypes.

Course Outcomes (COs) :

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

i) Understand the fundamentals of design thinking, including its history, benefits, and application in engineering problem-solving.
ii) Apply empathy techniques to identify user needs and construct empathy maps through research and observation.
iii) Formulate clear and actionable problem statements using structured problem identification methods.
iv) Use ideation techniques like brainstorming, mind mapping, and brainwriting to generate innovative solutions.
v) Develop low-fidelity and high-fidelity prototypes using suitable tools and materials to represent potential solutions.
vi) Analyze user feedback and apply iterative testing methods to refine and improve design prototypes.

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction to Design Thinking:** Introduction, history, and benefits, design challenges and opportunities. **Design Thinking process:** General design process, Scope for design, Design thinking process, Relevance to engineering **Empathy:** Identifying customer Needs, Techniques for user research, building empathy map	**5 Hrs.**
II	**Defining problem:** Methods to identify core problems, crafting	**5 Hrs.**

	problem statements **Ideation techniques:** Brainstorming, brainwriting, mind mapping, out-of-box thinking, Brainstorming techniques for generating ideas, Idea selection and evaluation methods.	
III	**Prototyping** Definition and purpose of prototyping, Difference between low-fidelity and high-fidelity prototypes, Benefits of prototyping in iterative design processes, Tools and material used for prototyping. **Testing:** Definition and purpose of testing in the design process, Importance of user feedback in refining prototypes, Testing as an iterative process	**5 Hrs.**

Reference Books:

1. C.L. DymP.Little, "Engineering Design: A Project Based Introduction", 4th Edition, WileyPublication
2. Karl Ulrich., "Project Design & Development", 5th Edition McGraw Hill Publication.
3. Green, W., & Jordan, P. W.., "Human factors in product design: current practice and future trends..", 1st EditionCRC Press 1999

Course Code: VSECP-1

Course: Practical Based on Design Thinking

Total Credits : 01 **Total Contact Hours** : 30 Hrs.

Maximum Marks : 50

Learning Objectives of the Course:

i) Understand the fundamental principles and stages of the design thinking process.
ii) Develop empathy by conducting user research and empathy mapping to identify user needs and challenges.
iii) Formulate clear and concise problem statements based on real-world issues in civil and mechanical domains.
iv) Apply brainstorming and mind mapping techniques to ideate creative solutions.
v) Analyze case studies to gain insight into successful design interventions across various sectors like healthcare, infrastructure, environment, and technology.
vi) Build low-fidelity prototypes and basic 3D models using everyday materials to demonstrate solution concepts.
vii) Evaluate solutions for feasibility, sustainability, and user-centricity.
viii) Collaborate effectively in teams, communicate ideas clearly, and iterate on feedback during the design process.

Course Outcomes (COs) :

After completion of the course,

i) Describe and explain the design thinking process and its relevance to solving real-world problems in various domains.
ii) Apply empathy mapping and user research techniques to gather insights into user needs and behaviors.
iii) Formulate clear problem statements based on observations and user insights using structured methods.
iv) Generate innovative ideas using brainstorming, brainwriting, and mind mapping techniques.
v) Construct low-fidelity prototypes and 3D models using readily available materials to visualize design solutions.
vi) Analyze case studies to evaluate the effectiveness of user-centered and sustainable design strategies in different sectors.

Topics / actual contents of the syllabus	Contact Hours
1. Introduction to Design Thinking Process 2. Empathy Mapping and User Research 3. Case study: Redesigning Public Transport Systems 4. Case study: User-Centered Design in Healthcare	**30 Hrs.**

5. Case study: Revamping Public Libraries for the Digital Age 6. Problem Identification & Statement Crafting 7. Brainstorming & Brain writing 8. Mind Mapping for Idea Generation 9. Case study: Improving Rural Healthcare Accessibility 10. Case study: Enhancing Safety in Construction Sites 11. Creating 3D Models Using Everyday Materials 12. Low-Fidelity Prototyping 13. Case study: Smart Home Automation for Elderly Care 14. Case study: Biodegradable Cutlery & Eco-Friendly Packaging 15. Case study: Eco-Friendly Smart Roads with Solar Panels.	
Students should undertake at least 08 to 10 experiments during the semester from above list	

Course Code : AECT-1
Course : Professional Communication Skills

Total Credits 01 **Total Contact Hours**: 15 Hrs.
Maximum Marks : 50

Learning Objectives of the Course:

i) To apply English parts of speech in day to day communication.
ii) To apply English Tenses in situational communication
iii) To apply transformation of sentences in professional communication
iv) To pronounce English words and sentences accurately
v) To communicate in English effectively by using updated vocabulary

Course Outcomes (COs) :

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

i) Recall and define basic grammatical terms such as parts of speech, tenses, and sentence types.
ii) Explain the use of tenses with timelines and differentiate between active and passive voice in various sentence structures.
iii) Transform sentences between different voices, types (simple, compound, complex), and speech (direct–indirect).
iv) Identify and analyze conditional clauses and errors in pronunciation, stress, and articulation in spoken English.
v) Evaluate the effectiveness of vocabulary usage and pronunciation through peer discussion and feedback.
vi) Develop vocabulary enhancement activities and construct grammatically correct and phonetically sound sentences for various contexts.

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Parts of Speech Tenses with Timeline Transformation Active and passive voice of sentences: Simple, compound and complex Conditional Clauses	5 Hrs.
II	Phonetics and problems in learning and using pronunciation, Vowel sounds & Consonant Sounds, Articulation of Sounds	5 Hrs.
III	Types of Vocabulary	5 Hrs.

	Basic techniques to Enhance Vocabulary Vocabulary Enhancing Activities	

Text Books:

1. A. K. Jain, Pravin, S. R. Bhatia, A. M. Sheikh, "Professional Communication Skills", S. Chand & Company Ltd.
2. Urmila Rai, S. M. Rai, "Business Communication", 9th Edition , Himalya Publishing House
3. Wren and Martin, " English Grammar and Composition ", 1st Edition , S. Chand Publications

Reference Books:

1. Adrian Budday, Ron Ludlow and Fergus' Panton, "The Essence of Effective Communication", Prentice Hall of India-Private Ltd.
2. Meenakshi Raman &Sangeeta Sharma., "Technical Communication- Principles and Practice", 2nd Edition Oxford University Press.
3. J. Sethi, P.V. Dharmatma "A course in Phonetics & Spoken English.", 2nd Edition PHI Publication
4. Sunita Mishra, C. Murli Krishna "Communication Skills for Engineers.", 2nd Edition Pearson Education
5. Dauglas Biber, Geoffrey Leech "Grammar of Spoken and Written English.", 1st Edition Longman

Course Code: AECP-1

Course : Practicals based on Professional Communication Skills

Total Credits : 01 **Total Contact Hours** : 30 Hrs.
Maximum Marks : 50

Learning Objectives of the Course:

i) Understand core grammar concepts including parts of speech, tense usage, and sentence structures.
ii) Apply correct sentence forms in professional and workplace communication.
iii) Improve pronunciation through phonetics, stress patterns, and error correction.
iv) Build a strong vocabulary, including technical and context-based terms.
v) Develop effective writing skills for resumes, emails, and reports.
vi) Enhance speaking skills for group discussions and interviews.

Course Outcomes (COs) :

After completion of the course,

i) Identify and classify parts of speech, tenses, sentence structures, and voice to demonstrate grammatical accuracy in written and spoken communication.
ii) Apply rules of transformation, voice conversion, and conditional clauses to construct grammatically correct and contextually appropriate sentences.
iii) Analyze phonetic features, stress patterns, and pronunciation errors to improve speech clarity and fluency.
iv) Evaluate vocabulary usage across different contexts, including technical and professional settings, using tools like dictionaries and thesauruses.
v) Develop professional documents such as resumes, cover letters, emails, and reports using appropriate vocabulary and tone.
vi) Demonstrate effective communication in group discussions and interviews by integrating grammar, pronunciation, and vocabulary skills.

Topics / actual contents of the syllabus	Contact Hours
1. Identifying and Classifying Parts of Speech 2. Tense Usage in Professional Communication 3. Sentence Transformation: Simple, Compound, and Complex Sentences 4. Active and Passive Voice Conversion 5. Conditional Clauses in Workplace Scenarios 6. Phonetics and Sound Production 7. Word Accent and Stress Patterns 8. Common Pronunciation Errors and Corrections 9. Types of Vocabulary and Their Usage	**30 Hrs.**

10. Context-Based Vocabulary Building 11. Technical and Engineering-Specific Vocabulary Development 12. Dictionary and Thesaurus Usage for Effective Communication 13. Resume and Cover Letter Writing 14. Email and Report Writing 15. Group Discussion and Interview Skills	
Students should undertake at least 08 to 10 experiments during the semester from above list	

Course Code : CCT-1
Course : Yoga

Total Credits 01 **Total Contact Hours** : 15 Hrs.
Maximum Marks : 50

Learning Objectives of the Course:

i) To identity common stressors inherent in today's global marketplace.
ii) To develop an understanding of the impact of stress on physiological, emotional and cognitive processes.
iii) To learn to manage the stress through art of Yoga.

Course Outcomes (COs) :

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

i) Define the concepts of health, stress, and mental well-being, and explain the yogic and physiological perspectives on mental health and stress.
ii) Demonstrate understanding of the symptoms, causes, and consequences of stress and apply yogic concepts and techniques to manage stress.
iii) Analyze the physiological impact of stress on the Autonomic Nervous System, Endocrine system, and Hypothalamus and distinguish between psychic, psychosomatic, somatic, and organic stress responses.
iv) Evaluate the role of meditation and pranayama in regulating stress and improving overall health from a physiological and psychological perspective.
v) Perform and design stress control techniques such as sitting/walking meditation, progressive muscle relaxation, gentle stretches, and massage for personal and therapeutic use.
vi) Examine the preventive and curative effects of yoga on stress-related disorders such as hypertension, asthma, diabetes, and anxiety.

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Mental Health: Meaning and importance; Yogic Perspective of Mental Health, Indicators of Mental Health, Stress: Meaning and Definition; Symptoms, Causes and Consequences of Stress, Meaning of Management- Stress Management, Stress in Modern Cultue & Society. Concept of Stress according to Yoga, Assessing your Stress & Building Resilience	5 Hrs.
II	Physiology of Stress on: Autonomic Nervous System (ANS), Edocrine System, Hypothalamus,Mechanism of Stress related	5 Hrs.

	diseases: Psychic, Psychosomatic, Somatic and Organic phase. Role of Meditation & Pranayama on stress- physiological aspect of meditation, constant stress & strain, anxiety.	
III	Meaning and definition of Health: various dimensions of health (Physical, Mental, Social and Spiritual) Yoga and Health- Yoga as therapy, Physical fitness. Stress control exercise- Sitting meditation, Walking meditation, Progressive muscular relaxation, Gentle stretches and Massage. Preventive and curative effects of Yoga on stress related disorders: Hypertension, Heart problems, Bronchial Asthma, Peptic Ulcer, Diabetes Mellitus, Arthritis, Anxiety Neurosis and Headache	**5 Hrs.**

Text Books:

1 H.R.Nagendra, and R. Nagarathana , " Yoga perspective in stress management ", Swami Vivekananda Yoga Prakashana 2004
2 H.R.Nagendra, and R. Nagarathana , "Yoga practices for anxiety & depression", Swami Sukhabodhanandha Yoga Prakshna 2004
3 K.N.Udupa , " Stress management by Yoga ", Motilal Banaridass Publishers Private Limited 1996.

Reference Books:

1 Linda Wasmer Andrews , " Stress Control for peace of Mind ", Main Street 2005.
2 Vimla Lalvani , " Yoga for stress ", Hamlyn 1998.
3 B.K.S.Lyengar " Light on Yoga .", Thorson

Course Code : CCP-1
Course : Practical Based on Yoga

Total Credits: 01 **Total Contact Hours:** 30 Hrs.
Maximum Marks : 50

Learning Objectives of the Course:

i) Understand the concept and importance of mental health
ii) Explain the concept of stress from a yogic perspective
iii) Describe the physiological effects of stress on the human body
iv) Demonstrate basic techniques of meditation and pranayama for stress management
v) Understand the preventive and curative role of Yoga in managing stress-related disorders

Course Outcomes (COs) :

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

i) Define the concept of mental health and explain its importance along with the indicators from both modern and yogic perspectives.
ii) Apply yogic concepts to recognize and manage stress in daily life, including understanding its causes, symptoms, and consequences in modern society.
iii) Analyze the physiological effects of stress on the Autonomic Nervous System, endocrine system, and hypothalamus, and differentiate between psychic, psychosomatic, somatic, and organic stress phases.
iv) Evaluate the impact of meditation and pranayama on stress reduction, anxiety control, and emotional balance from a physiological standpoint.
v) Apply knowledge of the physical, mental, social, and spiritual dimensions of health in daily life to enhance well-being and prevent stress accumulation.
vi) Design and demonstrate yoga-based preventive and curative practices for managing stress-related disorders such as hypertension, asthma, diabetes, and anxiety neurosis.

Topics / actual contents of the syllabus	Contact Hours
List of the Experiments 1. Practice on Mental Health. 2. Practice on Concept of Stress according to Yoga. 3. Practice on Physiology of Stress. 4. Practice on Meditation & Pranayama. 5. Practice on Physical, Mental, Social and Spiritual. 6. Practice on Preventive and curative effects of Yoga on stress related disorders.	30 Hrs.

Students should undertake all 6 experiments during the semester from above list

SEMESTER II

Course Code : BSCT-1

Course : Applied Mathematics-II

Total Credits 03 **Total Contact Hours** : 45 Hrs.
Maximum Marks : 100

Learning Objectives of the Course:

i) To provide basic ideas of statistics including measures of central tendency and dispersion.
ii) To develop mathematical skills and logical understanding of the subject.
iii) To analyse and find solutions of problems in engineering.
iv) To apply knowledge of mathematics in engineering and technology.

Course Outcomes (COs) :

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

i) Define and explain the concepts of statistics, including measures of central tendency (Mean, Median, Mode) and measures of dispersion
ii) Apply and analyze advanced measures of dispersion and skewness
iii) Apply techniques to trace curves in Cartesian and Polar form, and analyze the rectification of plane curves.
iv) Understand and apply reduction formulae, Beta and Gamma functions, and the relations between them
v) Apply double integration techniques in Cartesian and Polar coordinates, and analyze the change of variables to polar coordinates.
vi) Analyze and create solutions to practical applications using multiple integrals to compute areas, volumes, and surfaces, including the volume of revolutions and triple integrals.

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	**A:Statistics-I** Introduction to Statistics, Measures of central tendency: Mean, Median and Mode. Measures of dispersion: Quartiles, Quartile deviation, Coefficient of Quartile deviation, Mean deviation, Coefficient of Mean deviation **B:Statistics-II** Standard deviation, Variance, Coefficient of variation, Skewness, Measures of Skewness: Karl Pearson's coefficient of skewness, Bowley's coefficient of skewness .	**15 Hrs.**

II	**A:Curve Tracing and Rectification** Tracing of curves in Cartesian form, Tracing of curves in Polar form, Rectification of plane curves (Cartesian and Polar) **B:Integral Calculus** Reduction Formulae, Beta Function, Gamma Function, Relation between Beta and Gamma Function (without proofs)	**15 Hrs.**
III	**A:Multiple Integrals** Double Integration in Cartesian and Polar co-ordinates, Change to polar co-ordinates **B:Applications of Multiple Integrals** Application to areas, volumes, surfaces areas and volume of revolutions, Triple integral	**15 Hrs.**

Text Books:

1. P. N. Wartikar J. N. Wartikar , " A Text Book of Applied Mathematics ", Volume-I , 9th Edition, Pune VidyarthiGrihaPrakashan, Pune .
2. Dr. Grewal. B.S., " Higher Engineering Mathematics ", 40th Edition, Khanna Publications, New Delhi, 2007.
3. H. K. Dass., " Advanced EngineeringMathematics ", 18th Edition, S. Chand And Co. Ltd

Reference Books:

1. Louis C. Barrett, Ray Wylie C , " Advanced Engineering Mathematics ", 6th Edition , McGraw-Hill Publishing Company Ltd, New Delhi, 2003
2. B.V. Ramana , " Higher Engineering Mathematics ", 1st Edition , Tata McGraw-Hill Publishing Co.Ltd..

Course Code : BSCT-2A

Course : Engineering Physics

Total Credits 03 **Total Contact Hours** : 45 Hrs.
Maximum Marks : 100

Learning Objectives of the Course:

i) To let the engineering undergraduates study physical properties, concepts and physical quantities required for the solution of complex engineering problems
ii) To make the engineering undergraduates learn basic principles of Physics and laws of scientific investigation to identify, formulate and analyse complex engineering problems
iii) To equip engineering undergraduates with competencies of scientific methods required in engineering career by upgrading skills on the basis of learning achieved from physical science perspectives.
iv) To engage engineering undergraduatesextensively in scientific investigation for interdisciplinary graduate programs and a wide variety of other lifelong learning opportunities.

Course Outcomes (COs) :

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

i) Recall basics of Optics, Sound and Modern Physics
ii) Explain phenomenon in Optics, Sound and Modern Physics
iii) Apply concepts of Optics, Sound and Modern Physics to solve complex engineering problems
iv) Analyse the concepts of Optics, Sound and Modern Physics
v) Interpret the characteristics of Solar cell, Zener diode, Transistor, Planks constant curve, GM Counter curve
vi) Experiment with Reverberation Time, Energy Band Gap, Wavelength of Light, Dielectric Constant, Specific Rotation, Wavelength of Ultrasonic waves, divergence of the laser beam, and hall coefficient

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	**A:Optics** The wave equation, Introduction to electromagnetic waves and electromagnetic spectrum, Newton's ring, Michelson interferometer, Applications of interference Diffraction of light, diffraction grating, resolving power of grating, Application of diffraction grating in spectroscopic devices **B:Ultrasonics**	**15 Hrs**

	Properties, Production of ultrasonic waves by piezo-electric and magnetostriction generator, engineering applications of ultrasonic waves.	
II	**A:X-Rays** Basics of X-Rays, Production and Detection of X-Rays, Continuous and characteristics spectrum, Bragg's law of X-ray diffraction, Bragg's spectrometer, Intensity of diffracted Beams, Particle Size Determination by XRD, Precise Lattice Parameter Determination **B:Modern Physics** Black body radiation, Planck' s law, Photoelectric effect, Wave particle duality, De-Broglie's concept of matter wave, Davisson-Germer experiment, Scanning tunneling microscope, Time-dependent and time-independent Schrodinger equation for wave function, Quantum computing.	**15 Hrs**
III	**A:Introduction to solids** Superconductivity: Superconductivity, effect of temperature and magnetic fields, Meissner effect, type I and II superconductors, BCS theory, Applications. Free electron theory of metals, Fermi level, density of states, Application to white dwarfs and neutron stars, Bloch's theorem for particles in a periodic potential, Kronig-Penney model and origin of energy bands **B:Laser** Einstein's theory of matter radiation interaction and A and B coefficients, Properties of laser, spontaneous and stimulated emission, ruby laser, He-Ne laser, CO_2 laser and semiconductor Laser, applications of lasers in science, engineering and medicine. **C:Fiber Technology** Propagation of light through optical fiber, acceptance angle and cone numerical aperture, Single and Multi-Mode Fibers, applications, sensors	**15 Hrs**

Text Books:

1. M. N. Avadhanulu P. G. Kshirsagar , " A Text book of Engineering Physics ", 7th Edition, S. Chand & Co.

2. R. K. Gaur S. L. Gupta ., " A Text book of Engineering Physics ", 3rd Edition, Dhanpat Rai.

Reference Books:

1. David Halliday, Jearl Walker, and Robert Resnick " Fundamentals of Physics", 6th Edition , Wiley
2. B. D. Cullity , " Elements of X-ray Diffraction ", 1st Edition , Addison-Wesley Metallurgy Series.

Course Code : BSCT-2B

Course : Engineering Chemistry

Total Credits 03 **Total Contact Hours** : 45 Hrs.
Maximum Marks : 100

Learning Objectives of the Course:

i) To relate the concepts of Chemistry in all Engineering Disciplines.
ii) To make the engineering undergraduates acquainted with modern techniques in engineering and industrial Chemistry.
iii) To equip engineering undergraduates with the knowledge of advanced and existing Engineering Materials.
iv) To develop the awareness about powering the future using advanced energy Storage Systems.

Course Outcomes (COs) :

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

i) Recall the basics of advanced Engineering materials: Polymrs, Nanomaterials, Composite materials, etc
ii) Explain the advanced methods to produce engineering materials and soft water for industrial and domestic use
iii) Summarize properties and applications of fuels, lubricants, advanced engineering materials
iv) Apply the knowledge of lubricants, corrosion, advanced energy systems and modern metallurgical processes to solve the engineering problems
v) Analyze the samples for estimating the aggregate impurities in water, coal, metals, and lubricant samples
vi) Examine the synthetic scheme for thermosetting polymers and fundamental nonmaterial

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	**A: Advanced Engineering Materials** **Industrial Polymers**: Thermoplastics (PVC) & Thermosetting polymers (Bakelite), Biodegradable polymers (PVa), Properties, Applications **Nanomaterials**: Preparation of nano materials by Laser method, properties and applications of CNTs. **Composite Materials**: Ceramic matrix composites, carbon- carbon composites **Reinforcements**: Silicon carbide, Fiber glass.	**15 Hrs.**

	B: Water Technology: Water Parameters: Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Chemical Oxygen Demand (COD), pH, Hardness of water: types and units, Estimation of hardness by EDTA method, numerical on hardness; Boiler troubles: scale, sludge, priming, foaming and caustic embrittlement; Water treatment: Ion exchange process, Ultra filtration, Nano filtration	
II	**A: Fuels and Energy Storage Systems:** Fuels: Gross and net calorific value, Solid fuels: proximate analysis of coal &importance, gaseous fuels: composition properties and application of natural gases- CNG, LNG. Energy Storage Systems: Bio electrochemical batteries, lithium-ion battery, alkaline fuel cell (AFC) **B: Lubricants and Coolants** Lubricants: Introduction, Properties of liquid lubricants: viscosity and viscosity index, flash point and fire point, acid value. Numerical on viscosity index. Coolants: Introduction, properties and uses of water and ethylene glycol as coolant	**15 Hrs.**
III	**A: Corrosion and its prevention** Definition, types, mechanism of dry and wet corrosion, Corrosion testing methods: ultrasonic testing, computed &digital radiography, Prevention of corrosion: Methods- sacrificial anodic protection, Electroplating, Powder coating. **B: Metallurgical processes** Calcination, smelting, ore dressing, roasting, refining of metals, Metalworking processes: casting, forging, rolling, machining, sintering, Laser cladding, 3D printing	**15 Hrs.**

Text Books:

1. Jain & Jain , " Engineering Chemistry ", 16th Edition , Dhanpat Rai Publishing
2. Shashi Chawla, " A Textbook of Engineering Chemistry", 10th Edition , Dhanpat Rai Publishing

Reference Books:

1. B. Siva Shankar , " Engineering Chemistry ", 3rdEdition , Mc Graw Hills Publications
2. Shelly, Oberi and Malik , " Engineering Chemistry ", 1st Edition , Cingage

Publication
3. Odian, G.G, " Principles of Polymerization", 4th Edition , John Wiley & Sons, Inc
4. Malcolm P. Stevens, " Polymer Chemistry", 3rdEdition , Oxford University Press
5. William Callister and V. Raghavan, " Material Science & Engineering", 9th Edition , Wiley

Course Code: BSCP-1
Course: Practical based Applied Mathematics-II

Total Credits : 01 **Total Contact Hours** : 30 Hrs.
Maximum Marks : 50

Learning Objectives of the Course:

i) Understand and apply statistical tools like mean, median, mode, and measures of dispersion to analyze datasets and interpret skewness using Karl Pearson's and Bowley's coefficients.
ii) Analyze and trace curves in Cartesian and polar coordinates, and determine arc lengths.
iii) Evaluate complex integrals using reduction formulae, Beta and Gamma functions.
iv) Solve problems involving multiple integrals in both Cartesian and polar coordinates, including applications to area and volume.
v) Transform coordinate systems and compute triple integrals in engineering contexts.

Course Outcomes (COs) :

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

i) Define and explain the basic statistical measures
ii) Apply and analyze measures of dispersion.
iii) Analyze and sketch curves in Cartesian and Polar forms, and compute the arc length of curves using integration techniques..
iv) Apply reduction formulae and Beta/Gamma functions to evaluate complex integrals in the context of Calculus.
v) Evaluate double integrals in both Cartesian and Polar coordinates and convert double integrals to polar form for problem-solving..
vi) Use multiple integrals to compute areas, volumes, and other applications in three-dimensional geometry, and solve problems involving triple integrals.

Topics / actual contents of the syllabus	Contact Hours
1. Compute and interpret mean, median, and mode for a dataset 2. Compute Quartiles and Quartile Deviation for a dataset 3. Compute Mean Deviation and Coefficient of Mean Deviation for a dataset 4. Compute Standard Deviation and Variance for a dataset 5. Compute & Compare dispersion using the coefficient of variation for a two or more dataset 6. Measure skewness using Karl Pearson's method 7. Measure skewness using Bowley's method 8. Analyse and sketch curves in Cartesian form &Polar Form 9. Compute the arc length of a curve using integration 10. Apply Reduction Formulae for Evaluating the Integration 11. Apply Beta and Gamma Functions to compute problematic integration	**30 Hrs.**

12. Evaluate Double Integration in Cartesian and Polar Coordinates. 13. Convert double integrals to polar form 14. : Compute areas using double integrals 15. Compute volume of a solid region using triple integrals	
Students should undertake at least 08 to 10 experiments during the semester from above list	

Course Code : BSCP-2A

Course : Practical based on Engineering Physics

Total Credits: 01 **Total Contact Hours** : 30 Hrs.
Maximum Marks : 50

Learning Objectives of the Course:

i) Explain key principles in modern physics, including black body radiation, semiconductor behaviour, ultrasonic wave propagation, and optical phenomena.
ii) Acquire hands-on experience in using various scientific instruments such as the G.M. Counter, optical gratings, ultrasonic interferometers, and Hall Effect setup.
iii) Understand wave interference and diffraction through experiments like Newton's rings and laser diffraction using gratings.
iv) Determine physical constants like Young's modulus, elastic constants, and dielectric constant using standard experimental methods.
v) Analyze the performance and characteristics of solar cells under various conditions.
vi) Evaluate Planck's constant through both black body radiation and photoelectric effect experiments.
vii) Interpret and analyze experimental data using graphical and mathematical tools.

Course Outcomes (COs) :

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

i) Understand the fundamental principles of modern physics experiments, such as Planck's constant, Hall effect, and energy band gap in semiconductors.
ii) Apply optical methods like Newton's rings and diffraction grating to determine the wavelength of light and LASER sources.
iii) Analyze mechanical properties of materials using techniques such as Searle's method and beam bending.
iv) Measure electrical and electronic properties such as the Hall coefficient, dielectric constant, and characteristics of a solar cell.
v) Determine the velocity of ultrasonic waves and use ultrasonic interferometry for material property analysis.
vi) Demonstrate an understanding of experimental setups like optical fiber light transmission and G.M. Counter functionality, including dead time

Topics / actual contents of the syllabus	Contact Hours
List of the Experiments 1. Measurement of Planck's constant through Black body radiation.	**30 Hrs.**

2. Determination of ultrasonic wave's velocity in liquid media. 3. Newton's ring: To determine wavelength of monochromatic light 4. G. M. Counter: dead time calculation 5. Grating: To determine wavelength of LASER light. 6. Characteristics of solar cell 7. Ultrasonic interferometer 8. Dielectric constant: to determine dielectric constant. 9. Forbidden gap: To determine forbidden gap of semiconductors. 10. To determine the Hall coefficient of a semiconductor material and then evaluate carrier type and its density of charge carrier. 11. Determination of Planck's Constant 12. To determine the elastic constant of wire Y and n of stainless steel wire by Searle's method. 13. Determination of Young's modulus by bending beam 14. To find the time period of a simple pendulum and determine acceleration due to gravity 15. Experiment: Observation of Light Propagation in Optical Fibre	
Students should undertake at least 08 to 10 experiments during the semester from above list	

Course Code : BSCP-2B

Course : Practical based on Engineering Chemistry

Total Credits 01 **Total Contact Hours** : 30 Hrs.
Maximum Marks : 50

Learning Objectives of the Course:

i) To develop practical skills in chemical analysis and characterization techniques, enabling students to accurately measure and interpret physical and chemical properties of various substances (e.g., water, soil, coal, lubricants).
ii) To enhance understanding of industrially relevant chemical processes and instrumentation, including separation methods, polymer synthesis, corrosion studies, and simulation of modern equipment like 3D printers.
iii) To promote analytical thinking and data interpretation abilities, preparing students to apply chemistry knowledge for solving real-world environmental, industrial, and technological challenges.

Course Outcomes (COs) :
After completion of the course, students will be able to -

i) Analyze physical and chemical parameters of water and soil samples to evaluate their quality and suitability for various applications.
ii) Determine the composition and quality of fuels and industrial materials by estimating moisture, ash, and chloride content.
iii) Synthesize polymers and evaluate their characteristics to understand their industrial relevance.
iv) Examine physical properties of substances such as viscosity, melting/boiling point, and corrosion rate under various conditions.
v) Apply electrogravimetric and chromatographic techniques for separation, estimation, and identification of chemical compounds.
vi) Demonstrate familiarity with modern chemical lab instrumentation and simulations, including 3D printer machine operations

Topics / actual contents of the syllabus	Contact Hours
1. Analysis of Chemical parameters of water (Lab performance/Virtual performance) 2. Analysis of physical parameters of water 3. Determination of percentage of moisture and ash in given coal sample. 4. Preparation of polymer 5. Electro gravimetric Estimation of Metals (Virtual experiment)	**30 Hrs.**

6. Determination of chloride content of water by Mohr's method (Lab performance /Virtual experiment) 7. Determination of melting or boiling point of organic compound. (Virtual experiment) 8. Determination of Viscosity of given specimen. 9. Determination of rate of corrosion in different pH media. (Lab performance /Virtual experiment) 10. Chromatography- Separation technique (Lab performance /Virtual experiment) 11. Determination of acid value of lubricating oil by titration method. 12. Determination of percentage of moisture in given soil sample. 13. Determination of pH in given soil sample. 14 Separation of chemical compounds by column chromatography technique. (Virtual experiment) 15.Simulation of Cartesian 3D Printer Machine	
Students should undertake at least 08 to 10 experiments during the semester from above list	

Course Code : ESCT-1

Course : Basics of Electrical and Electronics Engineering

Total Credits 03 **Total Contact Hours** : 45 Hrs.
Maximum Marks : 100

Learning Objectives of the Course:

i) To introduce fundamental concepts, various laws-principles, and Basic knowledge of Electrical quantities
ii) To impart knowledge related to electromagnetism for understanding basics of electrical machines.
iii) To provide knowledge of some electronic devices and rectifier circuits.
iv) To expose the students to working of digital circuits, transducers and their application

Course Outcomes (COs) :

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

i) Define and explain the basic concepts of AC and DC circuits, including current, emf, potential difference, resistance, power, and energy, and understand the laws governing them, such as Ohm's Law and Kirchhoff's Laws.
ii) Apply Ohm's Law and Kirchhoff's Laws to solve problems in series and parallel resistor combinations and analyze AC and DC circuits using phase, frequency, amplitude, and power factor concepts.
iii) Understand and apply the principles of magnetism, electromagnetic induction, and use Faraday's laws, Lenz's law, and Fleming's rules to analyze electromagnetic systems and devices. .
iv) Apply knowledge of electrical machines, including transformers and induction motors, to analyze their construction, working principles, and applications in industrial settings.
v) Understand the fundamentals of electronics, including semiconductor materials, diodes, transistors, and basic components in power supplies, and apply these principles to analyze and design circuits.
vi) Design and analyze digital circuits, including logic gates, Boolean algebra, and combinational and sequential circuits, using number systems and IC configurations to solve real-world problems.

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	**A: AC and DC Fundamentals** Current, emf, Electric Potential, potential difference, Resistance, Work, power, Energy. Laws of resistance, resistivity, Concept of AC and DC, Ohms law Series and parallel	**15 Hrs.**

	combination of resistance, Kirchhoff's laws, Definition of Cycle, Time period, Frequency, Amplitude, Phase and Phase difference, Average value, R.M.S. value, and Power Factor. Advantages of three phases over single-phase **B: Magnetism & Electromagnetic Induction** Flux, flux density, magnetic field strength, mmf, reluctance, permeability. Comparison between electric and magnetic circuits. Faraday's laws of electromagnetic induction, Lenz's law, Flemings's right-hand rule for Generators, Fleming's left-hand rule for motors.	
II	**A: Electrical Machines** Construction, working and classification of the transformer, Significance of Emf equation (no derivation) Voltage ratio, three-phase induction motor Construction, types of Alternator: - construction and working principle and application. Single-phase Induction motors: Construction, applications of a) Split phase induction motor b) Capacitor start capacitor run induction motor, Universal motor **B: Fundamentals of Electronics:** Active & Passive components, Electronics materials, Semiconductor and its types, PN Junction Diode, Zener Diode, LED: Construction, Symbol, Characteristics; **BJT & JFET:**Types, construction, Symbols, Configurations, characteristics and Applications; Basic blocks of Regulated Power Supply: Transformers, Rectifiers, Filters & 3 terminal Fixed Regulators: Definition, Types, Circuits, Waveforms; Ripple factor, Efficiency, PIV & Comparison	**15 Hrs.**
III	**A: Fundamentals of Digital Circuit:** Analog And Digital Signals, Number Systems-Decimal, Binary, Octal, Hexadecimal & their conversion, Logic Gates-Types, Symbols& truth tables, IC Pin Configurations, Boolean algebra, De Morgan's Theorem, Introduction to	**15 Hrs.**

	Combinational &Sequential Circuits, Multiplexer, De-multiplexer **B: Transducers:** Definition, Classification of Transducers, Operation & applications of Transducers – Temperature Measurement - RTD, Thermocouple, Thermistor, Pressure measurement - Strain Gauge, Displacement measurement - LVDT	

Text Books:

1 B.L.Thereja and A.K.Thereja, "ABC of Electrical Engineering",1st Edition S.Chand.
2 J.B. Gupta , " Basic Electrical Engineering ",14th Edition,S.K. Kataria& sons.
3 V.K.Mehta , " Basic Electrical Engineering ",2nd Edition, S.Chand
4 V.K.Mehta , "Principles of Electronics",12th Edition, S.Chand

Reference Books:

1. R.P.Jain , " Modern Digital Electronics ",3rd Edition, TataMc-Graw Hill,
2. H. S. Kalsi., " Electronics Instrumentation ", 2nd Edition TataMc-Graw Hill

Course Code : ESCP-1
Course: Practical based on Basics of Electrical and Electronics Engineering

Total Credits : 01 **Total Contact Hours** : 30 Hrs.
Maximum Marks : 50

Learning Objectives of the Course:

i) Equip students with practical skills through hands-on laboratory exercises, enabling them to construct, test, and troubleshoot real-world electrical and electronic systems.

Course Outcomes (COs) :

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

i) Define and explain key electrical concepts such as phase, neutral, earthing, and electrical safety, and understand the importance of these in household wiring and electrical installations..

ii) Apply Ohm's Law and analyze its verification through experimental setups, understanding the relationship between current, voltage, and resistance in electrical circuits.

iii) Understand and demonstrate household wiring systems, such as single-lamp and staircase wiring, and apply this knowledge in practical circuits..

iv)Design and implement circuits such as amplifiers and power supplies on a breadboard, creating working models of basic electronic systems.

v) Analyze the performance of semiconductor devices like diodes and transistors, and apply their characteristics in constructing and testing rectifier circuits

vi)Evaluate the efficiency of a transformer and the calculation of household energy tariffs, and create solutions for energy-efficient electrical systems..

List of the Experiments	Contact Hours
1. To study the accessories to be used in household wirings and awareness of electric safety 2. To understand the concept of Phase, Neutral & Earthling in Electrical Installation. 3. Single Lamp controlled by single switch circuit. 4. To study & Demonstrate Staircase Wiring. 5. To study &understand the importance of Series Lamp. 6. To Verify Ohm's Law. 7. To verify the Voltage Ratio of Single-Phase Transformer. 8. Tariff Calculation of household Energy Meter 9. To study characteristics of Semiconductor diode. 10. To study Half Wave Rectifier. 11. To study Full Wave Rectifier. 12. To plot the characteristics of BJT in CE configuration. 13. To study logic gates 14. To study temperature measurement using RTD/Thermocouple	**30 Hrs.**

15. Implementation and testing of circuits like amplifier, Power supply on bread board.	
Students should undertake at least 08 to 10 experiments during the semester from above list	

Course Code : PCCT-1A

Course : Basics of Mechanical Engineering

Total Credits 03 **Total Contact Hours** : 45 Hrs.
Maximum Marks : 100

Learning Objectives of the Course:

i) To study the fundamental principles and laws of heat transfer and to explore the implications of these principles for system behavior.
ii) To study, analyse and design heat transfer systems through the application of these principles.
iii) To develop the problem-solving skills essential to good engineering practice of heat transfer in real-world applications.

Course Outcomes (COs) :

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

i) Define and explain the basic concepts of thermodynamics, including the scope and applications, thermodynamic systems, processes, and properties, and understand the laws governing energy and heat transfer.
ii) Apply and analyze the thermodynamic principles in practical scenarios such as measuring temperature and pressure, calculating work, and understanding modes of heat transfer.
iii) Understand the operation of energy systems like boilers, steam turbines, refrigeration, air conditioning systems, and internal combustion engines, and apply this knowledge to real-world engineering problems.
iv) Analyze and select appropriate engineering materials based on their classification, properties, and applications, and create solutions for material selection in engineering designs.
v) Understand the principles and functions of machine tools (lathe, milling machine, etc.), and apply this knowledge to select and operate machines for various manufacturing processes.
vi) Apply and analyze the function of power transmission elements (gears, belts, pulleys, bearings, etc.) in mechanical systems, and select appropriate components for specific engineering applications.

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Scope & applications of thermodynamics, Macroscopic and microscopic description of matter, Pure and working substance, Thermodynamic system and its types,	15 Hrs.

	Thermodynamic state of the system, Thermodynamic properties, Thermodynamic processes and its types, Thermodynamic equilibrium, Zeroth law of thermodynamics Temperature and its measurement , Pressure and its measurement, Numerical on pressure measurement and temperature measurement. Introduction to forms of energy and non-conventional energy sources, Thermodynamic definition of work, types of work, quasi static process, P.dV work for different processes, Definition of heat, specific heat, Modes of heat transfer, Laws governing the modes of heat transfer, Comparison between heat & work, Statement of First law of thermodynamics for open and closed systems, Numerical on types of work and modes of heat transfer	
II	Classification of boiler, Boiler mountings and accessories (location, and applications only), Construction and Working and of 2 stroke and 4 stroke engines, Refrigerator, Air conditioner and air cooler, Basic working principle of Steam Turbine and Compressor Engineering Materials (Introduction, Classification, Properties, Selection, and application only), Basic heat treatment Processes (Introduction to Annealing, Normalizing and Hardening only), Metal Forming and Metal Joining Processes (Introduction and Brief description of types only)	**15 Hrs.**
III	**A:** Machine Tools: - Lathe Machine Milling Machine, Drilling Machine, Shaper Machine, Grinding Machine (All machine tools to be studied with respect to Working principle, Block diagram, Specification and Different operations performed), Introduction to NC/CNC machines) **B:** Power Transmission Elements: - Belt, Pulleys, Gears, Bearings, Keys and Coupling: Clutches (All power transmission elements to be studied with respect to brief description of their types only)	**15 Hrs.**

Text Books :

1 R.K. Rajput ," Thermal Engineering ",10th Edition, Laxmi Publications .

2 D.S. Kumar," Engineering Thermodynamics (Principle and Practices)",2nd Edition, Katsons Publications .

3 HajraChoudhary , " Workshop Technology ",4th Edition, Media Promotors
4 Amitabha Ghosh & Malik , " Manufacturing Science ", 2nd Edition, East West Press
5 S.K. Garg, "Comprehensive Workshop Technology", 3rd Edition, Laxmi Publications

Reference Books:

1. P.K. Nag , " Fundamentals of Classical Thermodynamics ",8th Edition, TataMc-Graw Hill
2. Y. Cengel& M Boles ., " Thermodynamics An Engineering Approach ", 5th Edition McGraw Hill
3. P.N. Rao , " Manufacturing Technology ",4th Edition, TataMc-Graw Hill

Course Code : PCCT-1B

Course : Basics of Civil Engineering

Total Credits 03 **Total Contact Hours** : 45 Hrs.
Maximum Marks : 100

Learning Objectives of the Course:

i) To get knowledge of various building materials and structural members.
ii) To create awareness and knowledge in students about basic civil engineering terminologies and techniques which will be helpful in their day to day life
iii) To understand concept of surveying and leveling.

Course Outcomes (COs) :

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

i) Define and explain the properties and uses of civil engineering materials such as bricks, cement, sand, and aggregates, and understand their importance in construction..
ii) Apply knowledge of different types of foundations (isolated, combined, cantilever, and pile foundations) to determine their suitability for various construction projects
iii) Understand the principles of brick masonry and its various bond types (header, stretcher, English, Flemish) and apply this knowledge in construction and repair projects.
iv) Analyze the types of lintels, doors, and windows in buildings, and create solutions for selecting the appropriate materials and construction methods for different architectural designs..
v) Understand the design and components of roofs (trussed roofs, king post, queen post) and floors (RCC floors), and apply this knowledge in practical construction scenarios
vi) Apply surveying techniques, including length, angular, and level measurements, using tools like metallic tapes, prismatic compasses, and dumpy levels to gather data for construction projects.

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	**A:Civil Engineering Materials:** Study of properties & use of civil engineering materials namely bricks, rubble, cement, sand, coarse aggregate, etc. **B:Foundation:** Introduction to foundation and types, isolated footing, combined footing, cantilever footing, Pile foundation - types	**15 Hrs.**
II	**A:Masonry:** Introduction to brick masonry and bonds in brick, header bond, stretcher bond, English and Flemish bond	**15 Hrs.**

	B:Lintels, Doors and Window: Types of lintels, definition of technical terms of doors and windows, study of battened, ledged and braced doors casement windows, glazed window, and metal windows	
III	**A:Roofs and Floors:** Trussed roofs, king post roof truss and queen post roof truss, flat RCC roof, components of floor, material for construction of floor **B:Surveying and Leveling:** i) Surveying: Length measurement, use of metallic tape and chain (20m & 30m). ii) Angular Measurements: Use of prismatic compass, simple problems. iii) Level measurements: Use of dumpy level, simple problems on calculation of reduced levels	**15 Hrs.**

Text Books:

1 S.K. Duggal ," Building Materials ",5th Edition, New Age International Publishers.
2 B.C. Punmia ," Building Construction ",11th Edition, Laxmi Publication .
3 R. Agor , " A Text Book of Surveying & Levelling ",5th Edition, Khanna Publishers Amitabha Ghosh & Malik , " Manufacturing Science ", 2nd Edition, East West Press

Reference Books:

1. N.N. Basak , " Surveying And Levelling ",16th Edition, TataMc-Graw Hill

Course Code : PCCP-1A

Practical based on Basic Mechanical Engineering

Total Credits : 01 **Total Contact Hours** : 30 Hrs.
Maximum Marks : 50

Learning Objectives of the Course:

i) Understand the working principles and operations of fundamental mechanical machines
ii) Demonstrate knowledge of internal combustion engines and their classifications
iii) Gain practical exposure to thermal systems and mechanical power transmission devices
iv) Identify and classify various engineering materials used in mechanical system
v) Understand the principles and working of conventional and non-conventional power generation systems

Course Outcomes (COs) :

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

i) Understand and recall the basic working principles and operations of Centre Lathe, Milling, Drilling, and Grinding Machines, as well as their applications in manufacturing.
ii) Apply the theoretical knowledge of 2-stroke and 4-stroke internal combustion engines to perform practical demonstrations, and analyze their working mechanisms in petrol and diesel variants.
iii) Understand the working principles of thermal machines such as compressors, refrigerators, and demonstrate their operations, applying knowledge to analyze their efficiency and performance.
iv) Analyze the operation of different types of clutches, brakes, and gears, and create practical applications to demonstrate their function in mechanical systems.
v) Understand and apply the study of steels and cast iron materials, analyzing their properties for appropriate selection in engineering designs and construction.
vi) Evaluate renewable and non-renewable energy sources, and create solutions for efficient energy utilization in industrial and power generation systems, including steam and nuclear power plants.

Topics / actual contents of the syllabus	Contact Hours
1. Study and operations on Centre Lathe Machine. 2. Study and operations on Milling Machine. 3. Study and operations on Drilling Machine. 4. Study and operations on Grinding Machine. 5. Study and Demonstration of I.C. Engines 2 stroke petrol and diesel	**30 Hrs.**

engine. 6. Study and Demonstration of I.C. Engines 4 stroke petrol and diesel engine. 7. Study and Demonstration of Thermal Machines Compressor. 8. Study and Demonstration of Single plate and Multi plate clutches. 9. Study and Demonstration of types of brakes. 10. Study and Demonstration of types of gears. 11. Study and Demonstration of Thermal Machines Refrigerator. 12. Study of Steels and Cast Iron. 13. Study on Renewable and non-Renewable energy sources 14. Study on Principles and working of – Steam Power Plant 15. Study on Principles and working of – Nuclear Power Plant	
Students should undertake at least 08 to 10 experiments during the semester from above list	

Course Code : PCCP-1B

Course : Practical based on Basics of Civil Engineering

Total Credits : 01 **Total Contact Hours** : 30 Hrs.
Maximum Marks : 50 / 50

Learning Objectives of the Course:

i) The primary learning objectives of basic civil engineering focus on equipping students with fundamental knowledge and skills necessary for understanding and participating in the design, construction, and maintenance of civil infrastructure.
ii) This includes understanding key concepts like structural mechanics, materials science, surveying, and basic engineering design principles.

Course Outcomes (COs) :

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

i) Understand and recall the components involved in a typical two-BHK residential building plan, including footings (isolated and combined), framed structures, and building components.
ii) Apply knowledge of material properties to perform tests on bricks, cement, and aggregates, and analyze the results to determine their suitability for construction.
iii) Analyze and create detailed cross-sections for pavements (flexible, rigid, and composite), and assess their structural performance in real-world applications. .
iv) Apply surveying techniques such as plane table surveying, chain surveying, and traverse surveys to gather data and analyze land topography for construction projects.
v) Understand the principles and operations of a water treatment plant and create flow charts to illustrate the treatment process, along with designing rainwater harvesting systems for residential buildings.
vi) Evaluate the effectiveness of watershed management structures and create solutions to optimize water conservation and management in various terrains.

Topics / actual contents of the syllabus	Contact Hours
1. Typical single line plan of a Two BHK residential building(with suitable scale) 2. Plan and section of footings(Isolated and combined footings) 3. Cross-section of a framed structure building 4. Study of Building Component	**30 Hrs**

5. Brick Testing 6. Cement Testing 7. Aggregate Testing 8. Study of Plane Table Surveying 9. Instruments used in chain surveying (Chain, peg, arrow, ranging rod, etc.) 10. Traverse survey using prismatic compass 11. Determination of reduced levels (Simple leveling method) 12. Cross-section of different types of pavements (Flexible, rigid, and composite types) 13. Section/flow chart of a water treatment plant for a city 14. Detailed drawing for proposed rainwater harvesting for a residential building 15. Structures used in watershed management system (Any two)	
Students should undertake at least 08 to 10 Drawings during the semester from above list	

Course Code: VSECT-1

Course : Workshop Practice (Lab)

Total Credits : 02 **Total Contact Hours** : 60 Hrs.

Maximum Marks : 50

Learning Objectives of the Course:

i) To provide hands-on experience in basic manufacturing processes.
ii) To understand the tools, materials, and operations involved in fitting, blacksmithy, sheet metal, and carpentry.
iii) To develop practical skills required for basic fabrication and assembly tasks.
iv) To introduce safety procedures and proper handling of tools and equipment.

Course Outcomes (COs) :

After completion of the course,

i) Understand and recall different fitting tools and their operations, including chipping, filing, scraping, and tapping, with a focus on male-female fitting techniques.
ii) Apply knowledge of blacksmithing tools and processes, such as forging operations, to prepare a job involving the transformation of a round cross-section into a square bar..
iii) Understand sheet metal tools and operations like shearing, bending, and joining, and apply these techniques to prepare a sheet metal job involving cutting, bending, and joining through folding..
iv) Analyze carpentry tools, wood types, and carpentry operations, and create a job involving the making of carpentry joints such as marking, sawing, and chiseling..
v) Apply various workshop techniques in fitting, blacksmithing, sheet metal working, and carpentry to complete jobs accurately, and evaluate the quality and precision of the finished work.Maintain a detailed workshop diary including sketches, process descriptions, and job documentation.
vi) Create comprehensive sketches and descriptions of fitting, smithy, sheet metal, and carpentry tools, and evaluate the practical applications and improvements in these workshop operations..

Topics / actual contents of the syllabus	Contact Hours
I Fitting Study of different tools of fitting & processes involved in fitting. Introduction of Tools & operations, Types of Marking tools & their uses, Types of fitting cutting tool & their uses, fitting	**60 Hrs.**

operations such as chipping, filing, scraping, grinding, sawing, marking, Drilling, tapping. Workshop Diary – Draw sketches and description of fitting tools and sketches of the job. Practical - One composite job involving simple fitting operation like sawing, marking, filling & tapping operation: minimum one job. (Male – female fitting) **II Black Smithy.** Study of different smithy tools & processes. Black Smithy: Introduction of forging tools and it's operations. Workshop diary – Draw sketches and description of smithy tools and sketches of the job. Practical - Preparation of one job making round cross section to square bar. **III. Sheet metal working** Study of different sheet metal tools. Introduction of Tools like hammers, stakes, scissors etc, & operations like shearing, bending, joining. Types of Sheet metal joints and applications. Workshop diary - Sketches and description of sheet metal tools and sketches of the job. Practical - One job involving development of surfaces, marking on sheet metal cutting, bending, joint preparation by folding. **IV. Carpentry** Study of different Carpentry tools. Introduction of Tools & operations, Types of woods & their applications, Types of Carpentry hardware and their uses, Carpentry Joints, carpentry operations such as marking, sawing, planning, chiseling, grooving, boring, joining, types of woods and carpentry hardware. Workshop diary - Sketches and description of Carpentry tools and sketches of the job. Practical – One job involving making of any one type of carpentry joint.	
Students should undertake any 3 sections during the semester from above list	

Course Code : IKS

Course : Indian Knowledge System

Total Credits 02 **Total Contact Hours** : 30 Hrs.
Maximum Marks : 50

Learning Objectives of the Course:

i) To explain the historicity of Indian Knowledge System, key features of Indian Numeral System and appreciate the key role it has played in the advancement of Science & Technology.
ii) To develop familiarity with the science, engineering & technology heritage of ancient and medieval India..

Course Outcomes (COs) :

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

i) Understand and recall the significance of Indian Knowledge Systems (IKS), its history, organization, and salient aspects, and why it is important to preserve and study.
ii) Analyze the different types of historical architectural heritage in Marathwada, and evaluate their importance in understanding the region's history and cultural significance.
iii) Understand the key concepts in the Vedas and Vedangas, and apply the knowledge of Vedic texts to analyze the messages conveyed in the four Vedas.
iv) Understand the key concepts in the Vedas and Vedangas, and apply the knowledge of Vedic texts to analyze the messages conveyed in the four Vedas.
v) Apply knowledge of Indian Mathematics, including algebra, geometry, and trigonometry, to solve mathematical problems and create examples of magic squares.
vi) Understand Indian contributions to astronomy, including celestial coordinate systems and the Panchanga calendar, and evaluate the role of astronomical instruments like Yantras and Jantar Mantar in ancient India.

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	**A:** Introduction to Indian Knowledge System (IKS):What is IKS, why do we need IKS, Organization, Historicity and salient aspects of IKS. Understanding Historic architectural Heritage in Marathwada a. What is historical heritage? b. Type of historic heritage c. Importance of historic architectural heritage to understand history of Marathwada **B:** Historic architectural Heritage in Marathwada a. Religious Architecture – Hindu, Buddhist, and Jain	**10 Hrs.**

	b. Mughal Architecture c. Non-religious historic architectural heritage.	
II	**A:** Introduction to Vedas : Introduction to Vedas, a Synopsis of four Vedas and their sub-classification, messages in Vedas and introduction to Vedangas. **B:** Number Systems and Unit of Measurement: Number systems in India-Historical evidence, Salient aspects of Indian Mathematics Bhūta-Saṃkhyā system, Kaṭapayādi system, Measurements for time, distance, and weight, Piṅgala and the Binary system.	**10 Hrs.**
III	**A:** Mathematics: Introduction to Indian Mathematics, Unique aspects of Indian Mathematics, Indian Mathematicians and their Contributions. Algebra, Geometry, Trigonometry, Magic squares in India **B:** Astronomy: Introduction to Indian astronomy, Indian contributions in astronomy, The celestial coordinate system, Elements of the Indian calendar, Notion of years and months. Panchanga- The Indian calendar system, Astronomical Instruments (Yantras), JantarMantar of Rājā Jai Singh Sawai	**10 Hrs.**

Text Books:

1 Mahadevan, B., Bhat, VinayakRajat, NagendraPavana R.N." Introduction to Indian Knowledge Systems: Concepts and Applications ",1st Edition, PHI Learning Pvt. Ltd..

2 Kapil Kapoor, Avadhesh Kumar Singh ," Indian Knowledge Systems ",1st Edition, D. K. PrintworldPvt. Ltd..

Reference Books:

1. A. K. Bag , "History of Technology in India Vol. 1", Indian National Science Academy, New Delhi 1997
2. S. N. Sen and K. S. Shukla, "History of Astronomy in India", 2nd Edition Indian National Science Academy, New Delhi 1997
3. D.N. Bose, S.N. Sen and B. V. Subbarayappa, "A Concise History of Science in India. ", Indian National Science Academy, 1st Edition New Delhi 1997

OR

Students can choose any one course from the IKS Basket available on the University website

Course Code : CCT-1

Course : Health and Wellness

Total Credits: 01 **Total Contact Hours** :15 Hrs.
Maximum Marks : 50

Learning Objectives of the Course:

i) To make aware about the concept of health and wellness with respect to physical, mental, social and emotional also to detail about the lifestyle of an individual with hypo-kinetic diseases.
ii) To clear the idea about the nutritional aspects viz. balance diet, malnutrition and harmful effects of ergo-genic aids.
iii) To make aware about obesity, overweight, underweight etc. and how to deal with these problems.
iv) To make the students apply the theoretical knowledge into practicality through the assignments and practical projects.

Course Outcomes (COs) :

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

i) Define and explain the aims, objectives, and importance of health and wellness, including the physical, mental, social, and emotional dimensions of wellness.
ii) Analyze modern concepts of health and wellness and evaluate the impact of modern lifestyles and hypo-kinetic diseases on physical, mental, social, and emotional well-being..
iii) Understand the role of nutrition in maintaining health and wellness, and apply knowledge of balanced diets, caloric requirements, and nutritional value to design healthy eating habits.
iv) Analyze causes of malnutrition and obesity, and apply knowledge to prevent and treat these conditions through appropriate dietary adjustments and lifestyle changes.
v) Evaluate the concept of weight management, including the use of BMI and WHR, and create weight management plans that incorporate balanced diets and physical activity.
vi) Understand the relationship between physical activity and health benefits, and evaluate the role of exercise in preventing and managing lifestyle diseases.

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	**Concept of Health and Wellness:** Definition, Aims and Objectives of Health (Physical, Mental, Social and Emotional) and Wellness; Importance and Scope of Health (Physical, Mental, Social and Emotional) and wellness; modern concept of Health	**5 Hrs.**

	(Physical, Mental Social and Emotional) and Wellness; Dimensions of Health and Wellness; **Wellness and Lifestyle:** Fitness-Understanding of Wellness; Modern Lifestyle and Hypo Kinetic Diseases – Prevention and Management; Physical Activity and Health (Physical, Mental, Social and Emotional) Benefits.	
II	Introduction to nutrition , and types of nutrition: proteins, carbohydrates, fats, vitamins, minerals, water; balanced diet, daily caloric requirement and expenditure; Nutritional Value and requirement of food in relation to exercise, Malnutrition and obesity causes, effect, prevention and treatment	**5 Hrs.**
III	Weight management, meaning and concept, concept of BMI (Body Mass Index), WHR (Waist-Hip Ratio) Obesity, meaning, definition and types of obesity, causes and solutions of or over coming obesity; weight gain and weigh loss diets; Steps of planning of weight management	**5 Hrs.**

Text Books :

1 Swami SatyedraSaraswati,"Asana Pranayam mudra bandha ", yoga publication trust, 1997

2 Swami Vivekanand ," Patanjaliyog Sutra ", Geeta press Gorakhpur.

3 Swami Ramdev," PranayamRahasya", DivyaPrakashanPatanjaliyogpith, Haridwar, 2009

4 "Yoga professionals official guide book for level 1.", Quality council of India, Excel booksNew Delhi, 2016.

5 Swami satyanand, "Suryanamaskar, Saraswati", Bihar School of yoga, Munger, 2006.

6 Brahmachari Swami Dhirendra "YogikSukshmvyayam",Dhirendra yoga publications, New Delhi, 1986

Reference Books:

1. B.K.S. lyengar , " Light on yoga ", Harper Collins publisher, New Delhi, 2005.

Course Code: CCP-1

Course: Practical based on Health & Wellness

Total Credits : 01 **Total Contact Hours** : 30 Hrs.

Maximum Marks : 50

Learning Objectives of the Course:

i) To promote awareness of personal health and well-being.
ii) To understand fitness measurements such as BMI and WHR and their implications.
iii) To encourage development of personalized fitness and wellness plans.
iv) To highlight the impact of lifestyle choices on health and stress.
v) To recognize the role of diet, posture, and exercise in maintaining overall wellness..

Course Outcomes (COs) :

After completion of the course,

i) Measure and interpret BMI and WHR to assess fitness and obesity levels of individuals..
ii) Design customized diet plans for different groups such as young children and working women, considering their nutritional needs and lifestyle.
iii) Develop a personal wellness plan integrating exercise, nutrition, sleep, and daily habits to improve overall health..
iv) Analyze the consequences of poor posture and physical inactivity, and evaluate their link to hypo-kinetic diseases.
v) Understand the relationship between stress and health, and apply stress management techniques for better emotional well-being..
vi) Develop a personalized health plan for weight management through balanced diet and regular physical activity, and evaluate its effectiveness over time.

Topics / actual contents of the syllabus	Contact Hours
1. Visit personally to any gym (or) ground (or) sports club where people come for regular exercises and fitness and calculate the BMI of minimum 20 members 2. Calculate the WHR (Weight-Hip-Ratio) and BMI of your family members and friends (minimum 10 people) 3. Prepare a diet plan for healthy life style of young children 4. Prepare a personal wellness plan which include daily routine, diet, exercise and sleep goals 5. Observation and practice of good posture habits. (standing and sitting the right way) 6. Understanding the impact of physical inaction leading to hypokinetic disease. 7. Prepare a diet plan for healthy lifestyle of working women. 8. Study of obesity and it's impact on health and wellness.	**30 Hrs.**

9. Measurement of BMI to identity risk of obesity. 10. Study on stress levels among students and methods of stress management. 11. Understanding the role of nutrition on exercise in healthy weight control. 12. Practical approach to maintain idea body weight through lifestyle choices 13. Make a survey on health and lifestyle of person who is suffering from occupation hazards corporate sector 14. A study on health weight loss through diet and exercise. 15. Develop a personalized plan for health weight loss/gain	
Students should undertake at least 08 to 10 experiments during the semester from above list	