DR. BABASAHEB AMBEDKAR MARATHWADA UNIVERSITY,
CHHATRAPATI SAMBHAJINAGAR.

NAAC- 'A $^{+}$' Grade

CIRCULAR NO.SU/Engg./College/NEP/83/2025

It is hereby inform to all concerned that, the syllabi 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 following Syllabi and Second Year Open Elective Basket for B. E. & B. Tech. under the Faculty of Scicncc & Technology as per Norms of National Education Policy – 2020 as appended herewith.

Sr.No.	Syllabi
1.	Second Year B. E./B. Tech. Civil Engineering
2.	Second Year B.E./B.Tech. Mechanical Engineering
3.	Second Year B. E./B. Tech. Information Technology
4.	Second Year B. E./B. Tech. Electronics & Telecommunication Engineering/ Electronics Engineering /Electronics & Communication Engineering.
5.	Second Year B. E./B. Tech. Electrical and Electronics Engineering/ Electrical Engineering/ Electrical, Electronics and Power
6.	Second Year B. E./B. Tech. Computer Science and Engineering/ Computer Science/ Computer Engineering
7.	Second Year B. E./B. Tech. Artificial Intelligence/ Artificial Intelligence and Machine Learning / Artificial Intelligence and Data Science

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/NEP/2025/ 856-61
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.

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Dr. Babasaheb Ambedkar Marathwada University

Chhatrapati Sambhajinagar- 431001

Four Year UG Engineering / Technology Programme
(BE / BTech)

Structure and Syllabus of 2nd Year
B.E. / B. Tech. Programme

(Civil Engineering)

(AS PER NEP-2020)

Effective from 2025-26

Dr. D. G. Regulwar

Semester –III (Second Year Civil Engineering)										
Option 1 : Student can choose option 1 to get B.E./B.Tech with Multidisciplinary Minor (Following structure)										
Sr. No.	**Course Category**	**Course Code**	**Course Title**	**Contact Hours per week**		**Credits**		**Scheme of Examination**		
				Theory	Practical	Theory	Practical	CIA	SEE	Total
1	Program Core Course (PCC)	PCCT-1	Theory – 1 Fluid Mechanics	3	----	3	----	40	60	100
		PCCP-1	Practical Based on PCCT-1 Lab - Fluid Mechanics		2		1	20	30	50
		PCCT-2	Theory – 2 Surveying	2	----	2	----	20	30	50
		PCCP-2	Practical Based on PCCT-2 Lab - Surveying	---	2	--	1	20	30	50
		PCCT-3	Theory – 3 Strength of Material	2	----	2	----	20	30	50
		PCCP-3	Practical Based on PCCT-3 Lab - Strength of Material	---	2	--	1	20	30	50
2	Multidisciplinary Minor (MDM)	MDMT -1	Student will have to choose any one course from the Basket of minor	2	----	2	----	20	30	50
3	Open Elective (OE)	OET-1	Student will have to choose any one course from the open electives basket	2	----	2	----	20	30	50
		OET-2	Student will have to choose any one course from the open electives basket	2	----	2	----	20	30	50
4	Entrepreneurship/ Economics/Management	HSM- I HSM- II HSM- III	Theory -7 One Theory course form the following Basket 1) Engineering Economics 2) Entrepreneurship Development Industrial Management	2	----	2	----	20	30	50
5	Value Education Course (VEC)	VECT- 1	Theory-8 (Universal Human Values/ Environmental Studies)	2	---	2	--	20	30	50
6	Field Project (FP)	FP-1	Field Project	----	4	----	2	20	30	50
				17	**10**	**17**	**5**	**260**	**390**	**650**
Option 2 : Student can choose option 2 to get B.E./B.Tech Honors with Multidisciplinary Minor (above structure + following additional Honors degree course)										
7	Honors Degree Course	PCCT-4	Theory -9 Advanced Surveying	**3**	**—**	**3**	**—**	40	60	100
Please note that the course listed under Sr. No. 7 is optional and specifically designed for students pursuing a Bachelor's Degree Honors with Multidisciplinary Minor. Only those students who have secured a minimum of 7.5 CGPA (equivalent to 75% marks) in their first year will be eligible to opt for this option										
Option 3 : Student can choose option 3 to get B.E./B.Tech with Double Minor (Option 1 structure + following additional Double Minor course)										
8	Double Minor Course	DMT-1	Theory -10 Building Planning and Drawing	**3**	**—**	**3**	**—**	40	60	100
Please note that the courses listed under Sr. No. 8 is optional and specifically designed for students pursuing a Bachelor's Degree with Double Minor. Only those students who have secured a minimum of 7.5 CGPA (equivalent to 75% marks) in their first year will be eligible to opt for this option.										

Semester –IV (Second Year Civil Engineering)										
Option 1 : Student can choose option 1 to get B.E./B.Tech with Multidisciplinary Minor (Following structure)										
Sr. No.	**Course Category**	**Course Code**	**Course Title**	**Contact Hours per week**		**Credits**		**Scheme of Examination**		
				Theory	Practical	Theory	Practical	CIA	SEE	Total
1	Program Core Course (PCC)	PCCT-1	Theory – 1 Concrete Technology	3	----	3	----	40	60	100
		PCCP-1	Practical Based on PCCT-1 Lab - Concrete Technology		2		1	20	30	50
		PCCT-2	Theory – Building, Planning and Design	2	----	2	----	20	30	50
		PCCP-2	Practical Based on PCCT-2 Lab - Building, Planning and Design	---	2	--	1	20	30	50
		PCCT-3	Theory – 3 Theory of Structure	2	----	2	----	20	30	50
		PCCP-3	Practical Based on PCCT-3 Lab - Theory of Structure	---	2	--	1	20	30	50
2	Multidisciplinary Minor (MDM)	MDMT-2	Student will have to choose any one course from the Basket of minor	2	----	2	----	20	30	50
3	Open Elective (OE)	OET-3	Student will have to choose any one course from the open electives	2	----	2	----	20	30	50
4	Vocational and Skill Enhancement Course (VSEC)	VSECP-2	Programme specific Skill lab Python Programming	--	4	--	2	20	30	50
5	Ability Enhancement Course (AEC)	AEC-2	Theory -6 Modern Indian Languages (Marathi, Hindi, Sanskrit, Urdu, Pali, Arabic)	2	----	2	----	20	30	50
6	Entrepreneurship/Economics /Management Courses	HSM- I HSM- II HSM- III	Theory -7 One Theory course form the following Basket 3) Engineering Economics 4) Entrepreneurship Development Industrial Management	2	----	2	----	20	30	50
7	Value Education Course (VEC)	VECT-2	Theory-8 (Universal Human Values/ Environmental Studies)	2	---	2	--	20	30	50
				17	**10**	**17**	**5**	**260**	**390**	**750**
Option 2 : Student can choose option 2 to get B.E./B.Tech Honors with Multidisciplinary Minor (above structure + following additional Honors degree course)										
8	Honors Degree Course	PCCT-4	Theory -9 Advanced Concrete Technology	**3**	—	**3**	—	40	60	100
Please note that the course listed under Sr. No. 8 is optional and specifically designed for students pursuing a Bachelor's Degree Honors with Multidisciplinary Minor. Only those students who have secured a minimum of 7.5 CGPA (equivalent to 75% marks) in their first year will be eligible to opt for this option										
Option 3 : Student can choose option 3 to get B.E./B.Tech with Double Minor (Option 1 structure + following additional Double Minor course)										
9	Double Minor Course	DMT-2	Theory -10 Strength of Material	**3**	—	**3**	—	40	60	100
Please note that the courses listed under Sr. No. 9 is optional and specifically designed for students pursuing a Bachelor's Degree with Double Minor. Only those students who have secured a minimum of 7.5 CGPA (equivalent to 75% marks) in their first year will be eligible to opt for this option.										
Exit Option: Students may choose to exit the program at the end of the second year and be awarded an UG Diploma in the relevant discipline or subject, provided they have earned additional 8 credits through skill-based vocational courses, internships, or mini project undertaken during the summer vacation, after second year.										

List of Multidisciplinary Minors from Civil Engineering which will be available for the students from other discipline

Semester	Course Code	Title of the Course
III	MDMT-1	Engineering Geology
IV	MDMT-2	Rural Technology
V	MDMT-3	Civil Engineering Laws
VI	MDMT-4	Building Maintenance and Repairs
VII	MDMT-5	Engineering Optimization
VIII	MDMT-6	Watershed Management

Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

(Faculty of Science& Technology)

Syllabus of 2nd Year B. E. / B. Tech.

(Civil Engineering)

Semester-III

Course Code : Fluid Mechanics

Total Credits : 03

Total Contact Hours : 45 hs (Three Hours / Week)

Maximum Marks : 100 marks

Learning Objectives of the Course:

The course enables students to understand fluid properties, analyze fluid statics and dynamics, apply Bernoulli's and continuity equations, study pipe flow and energy losses, use dimensional analysis, and explore boundary layer concepts. It develops analytical skills for solving civil engineering problems related to fluid flow in natural and built environments.

Course Outcomes (COs) :

a) Understand and classify properties of fluids, apply foundational concepts such as specific weight, viscosity, and surface tension.

b) Demonstrate comprehension of fluid statics & dynamics, mastery of devices measuring fluid pressure, and fluid motion principles.

c) Apply principles of fluid kinematics to classify fluid flows; use the continuity Equation in multi-dimensional scenarios.

d) Evaluate flow through pipes, perform pipe network analysis, and master the usage of EPANET software for simulation.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	Properties of Fluids: Scope and application, classification of fluids, Rheological diagram, properties of fluids – Specific weight, specific volume, specific gravity, viscosity, compressibility, surface tension and capillarity. Fluid Statics : Pressure at a point, Pascal's Law, measurements of fluid pressure, pressure measurement devices, hydrostatics pressure on plane and curved surfaces, pressure diagram, concept of buoyancy, metacentre, determination of metacentric height, equilibrium of floating bodies. Fluid Kinematics: Classification of fluid flows, steady, unsteady, uniform, non-uniform, laminar, turbulent, Reynolds number, rotational, irrotational flows, path line, streak line, stream line, stream tube. Continuity Equation in two dimension, flow net. Fluid Dynamics: Forces acting on fluid in motion, Euler's equation, Bernoulli's Equation, Measurement of Flow: Venturi meter, Pitot tube, orifices, flow over notches and weirs.	15 Hrs
II	Flow through Pipes: Major and minor losses, laws of friction, hydraulic gradient line and total energy line, flow through pipes, equivalent pipes and branching of pipes, Siphons, Dupits Equation, three reservoir problems under steady state, Pipe Network Analysis, Introduction to EPANET software. Dimensional analysis and similarity: Dimensions of various physical quantities, Rayleigh's method, Buckingham's theorem, types of similarities, distorted and	15 Hrs

	non-distorted models. Flow in open channels: Types of flow in channel, Geometrical properties of channel, velocity distribution in open channels, Basic equation of fluid flow viz. continuity equation, Bernoulli's equation and momentum equation as applied to Channel flow, uniform flow- Chezy's and Manning's equations, specific energy diagram, specific force	
III	Non uniform flow: Energy equation for gradually varied flow (GVF), Basic assumptions and Equations, Flow measurement appurtenances, Rapidly varied flow, phenomenon of hydraulic jump in rectangular channel section, basic equations, classifications and applications of hydraulic jump, conjugate depths and its computation. Water Power Engineering: Centrifugal pumps: Parts of centrifugal pumps, Types, construction and principle of working, Principle of similarity, efficiencies, priming of pumps, cavitations. Reciprocating pumps: Types, working principle, slip, Air vessel and its function Turbines: Classification and types of turbines, impulse and reaction turbines, components and parts, efficiency and characteristics of turbines based on Performance, specific speed, selection criteria for turbines.	**15 Hrs**

Reference Books:

1. 1. Hydraulics and Fluid Mechanics – Modi and Seth, Standard Book House, Delhi
2. 2. Fluid Mechanics and Hydraulic Machines – by R.K. Bansal, Laxmi Publications (P) Ltd., New Delhi.
3. 3. A Textbook of Fluid Mechanics and Hydraulic Machines by Er. R.K.Rajput, S.Chand& Company Ltd.
4. 4. Fluid Mechanics and Fluid Power Engineering by D.S.Kumar, S.K.Katariya and Sons, New Delhi, 7thEdition, 2010
5. 5. Fluid Mechanics and Hydraulic Machines – by V.L.Streeter and E.B.Wylie, McGraw Hill Publications, New York.
6. 6. Fluid Mechanics and Hydraulic Machines – by Douglas J.F, Gasiorek J.M., Swaffield J.A. (2003) Pearson Education (Singapore) Pvt. Ltd.
7. 7. Open Channel Flow- by K. Subramnaya, Tata MacGraw Hill Publishing Ltd., New Delhi.

Course Code : Lab - Fluid Mechanics

Total Credits : 01

Total Contact Hours : 30 Hrs

Maximum Marks : 50 marks

Learning Objectives of the Course:

Course Outcomes (COs) :

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

- Understand, experiment and interpret results related to pressure measurement in various fluid mechanics scenarios.
- Develop practical skills to determine the meta-centric height and apply the principles in real-life situations.
- Apply known facts, principles, formulas for designing and demonstrating experiments using Bernoulli's equation.

Topics / actual contents of the syllabus	Contact Hours
List of the Experiments	**30 Hrs**

Students should undertake at least 06 to 08 experiments during the semester from above list

1. Measurement of Pressure
2. Determination of Meta-Centric height
3. Demonstration of Experiment on Bernoulli's Equation
4. Calibration and Determination of coefficients of Venturi meter, Orifice
5. Calibration of Notches
6. Demonstration of Flow Net
7. Demonstration of Hydraulic Jump
8. Determination of Minor losses
9. Demonstration of impact jet
10. Demonstration of Turbines and Pumps

Course Code : Surveying

Total Credits : 02

Total Contact Hours : 30 hrs (two Hours / Week)

Maximum Marks : 50 marks

Learning Objectives of the Course:

This course introduces the methods and instruments for measurement necessary for plotting maps and plans. Topics range from surveying, levelling, theodolite, plane table surveying and tacheometry.

Course Outcomes (COs) :

- Understand and apply various methods of levelling in civil engineering, understand contouring and use level instruments.
- Develop proficiency with theodolites, understand their uses, undertake traversing computations, and perform instrument adjustments.
- Gain proficiency with planning table surveys and minor instruments, understand tacheometry and successfully set out works.
- Learn modern systems in surveying and mapping, use digital tools like total station, GPS and GIS in civil engineering.

ModuleNo.	Topics / actual contents of the syllabus	Contact Hours
I	Levelling: Definition, study of auto level, laser level, digital level, Types of levelling: simple, differential, fly, check, profile, reciprocal etc. Profile levelling- plotting longitudinal section, cross section, levelling difficulties, volume calculations, Contouring: Definition, characteristics, use, methods of locating and interpolating contour lines, Testing and permanent adjustments of Dumpy Level	**8 Hrs**
II	Theodolite: Introduction to vernier theodolite, types of theodolite, principal axes, Uses of theodolite: Measurement of horizontal angle, vertical angle, magnetic bearing, prolonging a line, lining in, measuring deflection angles, direct angles, finding out elevations of objects (base accessible or inaccessible) by trigonometrical observations, Theodolite traversing- Computation of consecutive and independent coordinates, adjustment of a closed traverse, Gale's traverse table, omitted measurements, area by coordinates, Testing and permanent adjustments of Theodolite	**8 Hrs**
III	Plane Table Survey: Introduction, accessories, temporary adjustments, advantages and disadvantages, methods, two point and three point problem and their solution I: Tacheometry: Introduction, instruments, methods, principle of stadia method, determination of tachometric constants, analytic lens, horizontal and inclined sights with vertical staff, Tacheometric contouring Minor Instruments: Study and use of planimeter, Abney level, box sextant, Indian pattern clinometer Curves: Introduction, degree and radius of a curve, Types of curve, Simple	**14 Hrs**

	circular curve- Elements, setting out by linear and angular methods, Introduction to Compound curves- Elements, Transition curve- types, uses, elements of transition curve Setting Out Works: Setting out buildings, culverts, bridges and tunnels Modern Systems in Surveying and Mapping: Electronic distance measurement, Digital theodolite, Total station, Global positioning system, Geographic information system	

ReferenceBooks:

8. 1.Prof. T. P. Kanetkar and Prof. S.V.Kulkarni, Surveying and levelling Vol. I & II, Pune Vidyarthi Griha Prakashan, Pune, 23rd Edition, 1985
9. 2.Dr. A.M.Chandra , Plane surveying, New Age International Publishers New Delhi, Second Edition, 2006
10. 3.Dr. B.C.Punmia , Surveying Vol I & II, Laxmi Publications (P) Ltd. New Delhi, Sixteenth Edition Reprint 2008
11. 4.R. Subramanian, Surveying and Levelling, Oxford University Press, New Delhi, First Edition, 2007

Course Code : Lab - Surveying

Total Credits : 01

Total Contact Hours : 30 Hrs

Maximum Marks : 50 marks

Learning Objectives of the Course:

Course Outcomes (COs) :

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

- ✓ Understand and apply dumpy level and differential levelling to determine elevations of points
- ✓ Acquire skill and knowledge about the use of plane table survey, radiation and intersection methods
- ✓ Operate and make measurements of angles using Theodolite and transit theodolite
- ✓ Measure horizontal distance and elevations; familiarize with planimeter, box sextant, Abney level and Indian pattern clinometer

Topics / actual contents of the syllabus	Contact Hours
List of the Experiments	**30 Hrs**

Students should undertake at least 06 to 08 experiments during the semester from above list

- ✓ Use of dumpy level to determine elevations of points.
- ✓ Differential Levelling to determine elevations of points.
- ✓ Study and use of plane table survey.
- ✓ Radiation and intersection method in plane table survey.
- ✓ Study and use of Theodolite for measurement of angles.
- ✓ Measurement of horizontal and vertical angle using transit theodolite.
- ✓ Computation of horizontal distance and elevations by tacheometry for horizontal and inclined sights.
- ✓ Study and use of planimeter, box sextant, Abney level and Indian pattern clinometer

Course Code : Strength of Materials

Total Credits : 02

Total Contact Hours : 30 hrs (two Hours / Week)

Maximum Marks : 50 marks

Learning Objectives of the Course:

The mechanics of deformable solids or strength of materials or solid mechanics or mechanics of materials, as it is commonly called, is one of the core subject that need to be studied by all engineering students. The course builds on the fundamental concepts of engineering mechanics course. Primary aim of this course is to introduce students to the fundamental concepts and principles applied by engineers - whether civil, mechanical, aeronautical, etc. - in the design of structures of all sorts of sizes and purpose. The course content have been presented in five units so that the students can develop the logic and get insight to analyze beams, trusses and solid circular shafts under various actions.

Course Outcomes (COs) :

- ✓ Develop understanding of stresses, strains, and analyze axial loading conditions.
- ✓ Interpret compound stresses and comprehend two-dimensional stress systems.
- ✓ Apply bending theories to calculate flexural and shear stresses in beams.
- ✓ Evaluate structural performance under torsion, compression, and interpret slope and deflection in beams.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	a)Simple Stresses and Strains Concept of normal stress and shear stress, Concept of normal strain and shear strain, Stress and strain diagram, Hooke's law, Generalised Hook's Law Elastic constants, Volumetric stress and strain, Stresses and strains in uniform and varying sections under axial loading, Saint Venant's principle, Stresses and strains in compound bars under axial loading, Concept of residual stresses, Thermal stresses and strains. b)Compound Stresses Introduction, state of stress at a point, General two dimensional stress system, Principal stresses and principal planes. Mohr's circle of stresses	**8 Hrs**
II	Shear Force and Bending Moment Diagrams of Statically Determinate Beams Introduction to types of beams, supports and loadings. Definition of bending moment and shear force, Sign conventions, relationship between load intensity, bending moment and shear force. Shear force and bending moment diagrams for statically determinate beams subjected to points load, uniformly distributed loads, uniformly varying loads, couple and their combinations. (a)Flexural Stresses in Statically Determinate Beams Theory of pure bending, Elastic flexural formula, Assumptions in the theory of bending, Moment of resistance, Section modulus, Flexural stresses in beams with symmetrical solid, hollow and built-up sections, Bending stress distribution	**10 Hrs**

	(b)Shear Stresses in Statically Determinate Beams Concept of shear stress, Shear stress formula, Shear stresses in beams with prismatic rectangular, circular and built-up sections.	
III	.(a) Torsion of Circular Shafts Concept of torsion, Torsion formula, Assumptions in the theory of pure torsion, , Torsional moment of resistance, Analysis of circular solid and hollow shafts, Shafts with fixed ends, Shafts in series and parallel. (b) Analysis of Columns and Struts: Axially loaded compression members, Crushing load, Buckling or Critical or crippling loads by Euler's theory Assumptions in Euler's theory, Concept of effective length, Effect of different idealized end conditions, slenderness ratio, Limitations of Euler's formula, Rankine's theory. (a) Slope and Deflection of Statically Determinate Beams Concept of slope and deflection, Equation of elastic curve, Slope and deflection of beams subjected to external loads by double integration method, Macaulay's method, moment area method Deflection by principle of superposition. b)Analysis of Statically Determinate Plane Framed Structure Concept of perfect, Deficient and Redundant frames, Analysis of trusses by Method of resolution or Method of joints and Method of sections .	**12 Hrs**

Reference Books:

- ✓ 1.S.Ramamrutham: Strength of Material, Dhanpatrai& Sons, New Delhi.
- ✓ 2.R. K. Rajput: Strength of Material, S. Chand & Company , New Delhi.
- ✓ 3.S. S. Bhavicutti: Strength of Material (3E), Vikas Publishing HousePvt. Ltd. , New Delhi.
- ✓ 4.Ferdinand P. Beer and E. Russell Johnston: Mechanics of Material, McGraw Hill, New Delhi.
- ✓ 5.James M. Gere and S.P. Timoshenko: Mechanics of Material, CBS Publishers, New Delhi.
- ✓ 6.William F. Riley, Leroy D. Struges and Don H. Morris: Mechanics of Material, Jhon Wiley & Sons Inc., New York.
- ✓ 7.E.P. Popov: Introduction to Mechanics of Solids, Prentice Hall of India, New Delhi.
- ✓ 8.S.H. Crandall, N. C. Dahl and T. V. Lardner: Mechanics of Solids: An Introduction, McGraw Hill International, Tokyo.

Course Code : Lab - Strength of Material

Total Credits : 01

Total Contact Hours : 30 Hrs

Maximum Marks : 50 marks

Learning Objectives of the Course:

In this laboratory, students will have the opportunity to apply loads to various materials under different equilibrium conditions. The student will perform tests on civil engineering materials in tension, compression, torsion, bending, and impact. These conditions and/or constraints are designed to reinforce classroom theory by having the student perform required tests, analyze subsequent data ,and present the results in a professionally prepared report. The machines and equipment used to determine experimental data include universal testing machines, torsion equipment, compression testing machine, impact tester, hardness tester, etc. Data will be collected using Dial indicators, extensometers.

Course Outcomes (COs) :

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

- ✓ Students will effectively conduct and analyze tension tests on varied materials, demonstrating knowledge of material strength and deformation.
- ✓ Students will acquire the skills to execute and evaluate bending and compression tests, understanding mechanical properties of steel, wood, and metals.
- ✓ Students will demonstrate proficiency in executing tests related to material hardness, flexure, and structural integrity, interpreting and applying the results.

Topics / actual contents of the syllabus	Contact Hours
List of the Experiments	**30 Hrs**

Students should undertake at least 06 to 08 experiments during the semester from above list

1)Tension test on Mild steel, High Yield strength deformed and cast iron specimen

2)Cold bend test on Mild and HYSD steel bars.

3)Compression test on metals

4)Compression test on Wood (parallel and perpendicular to grains)

5)Direct shear test (Single, Double) on steel, Copper, brass specimen

6)Punching shear test on thin metallic sheets.

7)Torsion test on circular mild steel bar

8)Izod and Charpy Impact test on metals

9)Study of Buckling of column.

10).Bending test on Timber beam.

11)Flexural test on Concrete Beams

12)Compression tests on concrete cubes

13)Hardness test on metals - Brinnell and Rockwell Hardness Number

14) Testing of structural steel

15)Compression test on helical springs

Course Code : MDMT-I (Engineering Geology)

(This course will be available for the students from other discipline and Civil Engineering students will choose minor course from other discipline)

Total Credits : 02

Total Contact Hours : 30 hrs (two Hours / Week)

Maximum Marks : 50 marks

Learning Objectives of the Course:

This course introduces the elements of Engineering Geology and Earth Science. It also mentions the importance of principles of geology in various stages of civil engineering project. It also describes occurrence and character of common building materials. It explains the structural geology and its importance in the civil engineering. It covers natural hazards like landslide, earthquake and their remedial measures.

Course Outcomes (COs) :

- ✓ Understand and apply concepts of geology, mineralogy, and principles of stratigraphy relevant to civil engineering
- ✓ Analyze geological characteristics and conducts geological investigations for civil engineering sites
- ✓ Evaluate natural phenomena like earthquakes, landslides, and their impacts on civil engineering projects
- ✓ Assess the suitability of building stones, understand the causes and preventive measures for landslides and the stability of hill slopes.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	Geology definition, scope, importance in Civil Engineering, Mineralogy introduction, important rock forming minerals groups. Classification and mineral composition, important igneous rocks Strike, dip, parts and important types of folds, faults, fractures and joints, unconformity, discordant and concordant igneous intrusions, geological works, river rejuvenation, river capture, earthquake, introduction to plate tectonics, principles of stratigraphy, geological time scale, Indian Geology, Physiographic divisions of India, significance of their structural characters in major civil engineering activities.	**10 Hrs**
II	Geological investigations in Civil Engineering sites, significance of stratification strike dip fold faults joints fractures, dykes in the study, surface and subsurface surveys, use of pit trenches, exploratory drilling in the subsurface exploration, preparation of the geological maps and sections, Sub surface water types, water table, porosity, permeability zones, perched water table, occurrence of subsurface water, geological conditions favorable for the natural springs and seepages, depression and contact springs, hot springs and geysers and drill holes	**10 Hrs**
III	Building stones, requirement of good building stones and their dependability on the geological characters of rocks, common building stones, Building stones of	**10 Hrs**

	India, Landslides, angle of repose, causes, stability of hill slopes, relation of dip, amount of slope with stability of hill slopes, preventive measures for landslides. fluctuations in water table levels by geo physical electrical resistivity method	

Reference Books:

1. Gupte R.B. "Text Book of Engineering Geology", P.V.G. Publications, Pune
2. Parbin Singh "A Text Book of Engineering and General Geology", S.K. Kataria & Sons New Delhi
3. M. S. Krishnan, "Geology of India and Burma" CBS Publishers, New Delhi
4. Arthur Holmes, "Physical Geology", ELBS Publication.
5. M. P. Billings, "Structural Geology", Prentice Hall India Learning Private Limited
6. F G H Blyth and De Frietus, "Engineering Geology" Reed Elsevier India Ltd.
7. Bell FG, "Engineering Geology" Butterworth-Heinemann

Entrepreneurship/Economics/Management Courses

Students will have to choose any one theory course form the following Basket. Any One course in 3rd semester and another course in 4th semester

1) Engineering Economics (EEM-I)
2) Entrepreneurship Development (EEM-II)
3) Industrial Management (EEM-III)

Course Code: Engineering Economics (Semester III/ IV)

Total Credits: 2
Contact Hours Theory: 02 Hrs./week, **Total Contact Hours**: 30 hrs
Maximum Marks: 50

Learning Objectives of the Course:

1. Understand the Time Value of Money
2. Evaluate Engineering Alternatives
3. Analyze Public Sector Projects
4. Understand and Apply Depreciation and Taxation
5. Perform Break-even and Sensitivity Analysis
6. Understand Cost Concepts for Decision-Making

Course Outcomes (COs) :

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

1. To evaluate Time Value of Money
2. To enable students to perform economic comparisons between different projects or assets
3. To introduce benefit-cost analysis for evaluating the economic feasibility of projects
4. To apply break-even analysis using both linear and non-linear models
5. To develop skills in cost estimation, cost control, cost reduction, and identify relevant costs for decision-making.

Unit No.	Topics / actual contents of the syllabus	Contact Hours
I	**Time value of money:** Simple and compound interest, Time value equivalence, Compound interest factors, Cash flow diagrams, Calculation, Calculation of time – value equivalences. Present worth comparisons, Comparisons of assets with equal, unequal and infite lives, comparison of deferred investments, Future worth comparison, payback period comparison.	10 Hrs
II	Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Rate of return, Internal rate of return, comparison of IIR with other methods, IRR misconceptions. Analysis of public Projects: Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost effectiveness analysis.	10 Hrs
III	**Depreciation**, Computing depreciation charges, after tax economic comparison, Break-even analysis; linear and non-linear models. Sensitivity analysis: single and multiple parameter sensitivity.	10 Hrs

	Fixed and variable cost, Product and Process Costing, Standard Costing, Cost estimation, Relevant Cost for decision making, Cost estimation, Cost control and Cost reduction Techniques.	

Reference Books:

1. Riggs, J.L., Dedworth, Bedworth, D.B., Randhawa, S.U., "Engineering Economics", Vol. 1, Latest Edition, McGraw Hill International, 1996.
2. James L. Riggs, David D. Bedworth, Sabah U. Randhawa, "Economics for Engineers", Vol. 1, 4th Edition, McGraw-Hill, 2004.
3. Donald Newnan, Ted Eschembach, Jerome Lavelle, "Engineering Economic Analysis", Vol. 1, 8th Edition, Oxford University Press, 2012.
4. John A. White, Kenneth E. Case, David B. Pratt, "Principles of Engineering Economic Analysis", Vol. 1, 6th Edition, John Wiley, 2010.
5. R. Paneerseelvam, "Engineering Economics", Vol. 1, 2nd Edition, PHI, 2008.
6. Michael R. Lindeburg, "Engineering Economics Analysis", Vol. 1, Latest Edition, Professional Publications, 1993.
7. V. Mote, S. Paul, G. Gupta, "Managerial Economics", Vol. 1, Latest Edition, Tata McGraw Hill, 2004.

Course Code: Entrepreneurship Development (Semester III/ IV)

Total Credits: 2
Contact Hours Theory: 02 Hrs./week, **Total Contact Hours:** 30 hrs
Maximum Marks: 50

Learning Objectives of the Course:

1. Understand the fundamentals of entrepreneurship and its significance in engineering.
2. Identify business opportunities and develop innovative ideas.
3. Create a basic business plan and understand key entrepreneurial strategies.

Course Outcomes (COs) :

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

1. Explain the concept of entrepreneurship and its importance in the modern economy.
2. Identify and evaluate business opportunities in engineering and technology sectors.
3. Develop a comprehensive business plan including financial, operational, and marketing strategies.
4. Assess the challenges and risks in entrepreneurship and develop strategies to mitigate them.
5. Demonstrate entrepreneurial thinking through case studies, projects, and presentations.

Unit No.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction to Entrepreneurship** Definition, meaning, and characteristics of an entrepreneur, Evolution of entrepreneurship Types of entrepreneurs, Role of entrepreneurship in economic development, Key traits of successful entrepreneurs.	**10 Hrs**
II	**Opportunity Recognition and Idea Generation** Identifying business opportunities, Creativity and innovation in entrepreneurship, Techniques for idea generation, Feasibility analysis (technical, market, financial).	**10 Hrs**
III	**Business Planning** Components of a business plan, Business models and strategy formulation, Legal requirements for starting a business, Intellectual Property Rights (IPR) and patents.	**10 Hrs**

Reference Books:

1. C.B. Gupta, Srinivasan, "Entrepreneurship Development", Vol. 1, Latest Edition, Sultan Chand & Sons, 2020.
2. Donald F. Kuratko, "Entrepreneurship: Theory, Process, Practice", Vol. 1, Latest Edition, Cengage, Eric Ries, "The Lean Startup", Vol. 1, Latest Edition, Anonymous, 2011.
3. Alexander Osterwalder, Yves Pigneu, "Business Model Generation", Vol. 1, Latest Edition, Wiley, 2011.
4. Peter F. Drucker, "Innovation and Entrepreneurship", Vol. 1, Latest Edition, Taylor & Francis, 2014.

Course Code: Industrial management
(Semester III/ IV)

Total Credits: 2
Contact Hours Theory: 02 Hrs./week, **Total Contact Hours**: 30 hrs
Maximum Marks: 50

Learning Objectives of the Course:

1. To understand concept of management, administration, Organization, Industrials Laws.

Course Outcomes (COs) :

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

1. Understand the fundamental principles of management.
2. Describe different forms of business organizations and organizational structures.
3. Apply theoretical knowledge to real-world management and organizational challenges.
4. Analyze the impact of organizational, environmental factors.
5. Explain the role of economics in management decision-making.

Unit No.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction to Management:** Managing and Manager, organizations and need for management, the managing process, types of managers, the challenge of management, the evolution of Management theory. **Management in the 21st century:** The importance of organizational and natural environment, elements of direct action environment, managing multiple stock holder relationship, elements of the indirect action environment, Natural Environment management 2000 and beyond, social responsibility and ethics, globalization. Evaluation of case studies related to above concept.	10 Hrs
II	**Business Organization** Forms of business organization, individual proprietorship, joint stock company, co-operative enterprise, co-operative enterprise and public sector undertakings. Organization structure in industries, Line organization, functional organization, line and staff organization, committee organization, project organization matrix organization. **Nature and Significance of Economics.** Science, engineering and technology, their relationship with economic development. Basic economic concepts, human wants economic goods, utility value, price cost, wealth and capital. Demand supply, elasticity of demand and supply. Concept of profit and revenues.	10 Hrs
III	**Accidents and safety** Classification of accidents, according to nature of industries; i.e. fatal, temporary, according to event and place. Causes of accidents , psychological, and other industrial hazards. Effects of accidents. Accident-prone workers, accident to be taken incase of accidents with machines, electric shock, road accident fires and erection and construction accidents **Personnel Management:** Man power, sources of recruitment, selection and training, job evaluation, performance appraisal, wages and incentives, self and time management.	10 Hrs

Reference Books:

1. James A. F., "Management", Vol. 1, 6th Edition, PHI.
2. Claude S. George, Jr., "Management for Business and Industry", Vol. 1, Revised Edition, Prentice-Hall of India Private Limited.
3. McConnell, Gupta, "Economics: Principles, Problems, and Policies", Vol. 1, 18th Edition, The McGraw-Hill.
4. T.R. Banga, S.C. Sharma, "Industrial Organisation and Engineering Economics", Vol. 1, Latest Edition, Khanna Publishers, Jan-2006.
5. O.P. Khanna, "Industrial Engineering & Management", Vol. 1, Latest Edition, Dhanpat Rai Publication, Jan-2018.

Value Education Courses (VEC)

Students will have to choose any one theory course form the following Basket. Any One course in 3rd semester and another course in 4th semester

1) Universal Human Values (VECT-I)

2) Environmental Students (VECT-II)

Course Code: VECT-I
Course: Universal Human Values
(Semester III/ IV)

Total Credits: 2
Contact Hours Theory: 02 Hrs./week, **Total Contact Hours**: 30 hrs
Maximum Marks: 50

Learning Objectives of the Course:

1. To appreciate the essential complementarities between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings,
2. To facilitate the development to a holistic perspective among students to lead their Personal and professional lives in an ethical way.
3. To highlight plausible implications of such a holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour, and mutually enriching interaction with nature.

Course Outcomes (COs) :

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

1. Define key terms related to human values.
2. Explain the concept of happiness as related to right understanding and relationship.
3. Apply the principles of right understanding in their daily interactions.
4. Analyze the impact of their values on their behaviour and decisions.

Unit No.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction to Value Education and Harmony in the Human Being** • Understanding Value Education • Self-exploration as the Process for Value Education • Continuous Happiness and Prosperity - the Basic Human Aspirations and their fulfillment • Right Understanding, Relationship and Physical Facility • Happiness and Prosperity - Current Scenario • Method to Fulfill the Basic Human Aspirations • Harmony in the Human Being • Understanding Human being as the Co-existence of the Self and the Body • Distinguishing between the Needs of the Self and the Body • the Body as an instrument of the Self • Understanding Harmony in the Self • Harmony of the Self with the Body • Programme to ensure self-regulation and Health.	**10 Hrs**
II	**Harmony in the Family and Society**	**10 Hrs**

	• Harmony in the Family - the Basic Unit of Human Interaction "Trust' - the Foundational Value in Relationship • 'Respect' - as the Right Evaluation Values in Human-to-Human Relationship • Harmony in the Society • Other Feelings, Justice in Human-to-Human Relationship • Understanding Harmony in the Society • Vision for the Universal Human Order	
III	**Harmony in the Nature (Existence) and Implications of the Holistic Understanding** • Understanding Harmony in the Nature • Interconnectedness, self-regulation, and Mutual Fulfillment among the Four Order of Nature • Realizing Existence as Co-existence at All Levels • The Holistic Perception of Harmony. Implications of the Holistic Understanding - a Look at Professional Ethics • Basis for Universal Human Values • Definitiveness of (Ethical) Human Conduct • Professional Ethics in the light of Right Understanding • A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order • Holistic Technologies, Production Systems and Management Models, Typical Case Studies Strategies for Transition towards Value-based Life and Profession.	**10 Hrs**

Reference Books:

1. P.L. Dhar, R.R. Gaur, "Science and Humanism", Vol. 1, 1st Edition, Commonwealth Publishers.
2. Nagaraj, "Jeevan Vidya: Ek Pariehaya", Vol. 1, Latest Edition, Jeevan Vidya Prakashan, Amarkantak, 1999.
3. A.N. Tripathy, "Human Values", Vol. 1, Latest Edition, New Age International Publishers, 2003.
4. E.G. Seebauer, Robert L. Berry, "Fundamentals of Ethics for Scientists & Engineers", Vol. 1, 1st Edition, Oxford University Press.
5. M. Govindrajan, S. Natrajan, V.S. Senthil Kumar, "Engineering Ethics and Human Values", Vol. 1, 1st Edition, Prentice Hall of India Ltd.
6. B.P. Banerjee, "Foundations of Ethics and Management", Vol. 1, Latest Edition, Excel Books, 2005.
7. B.L. Bajpai, "Indian Ethos and Modern Management", Vol. 1, Reprinted Edition, New Royal Book Co., Lucknow, 2008.

E-resources:

1. http://madhyasth-darshan.info/postulations/knowledge/knowledge-of-humane-conduct/
2. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
3. https://youtu.be/OgdNx0X9231
4. https://fdp-si.aicte-india.org/UHV-II%20Practice%20Sessions.php
5. https:/Ifdp-si.aicte-india.org/download.php#1/

Course Code: VECT-I
Course: Environmental Studies
(Semester III/ IV)

Total Credits: 2
Contact Hours Theory: 02 Hrs./week, **Total Contact Hours**: 30 hrs
Maximum Marks: 50

Prerequisites:
Understanding of the Concept of Environment

Learning Objectives of the Course:

1. To study the environment and ecosystems.
2. To study different types of natural resources.
3. Knowledge and concept of biodiversity and its conservation.
4. Basic knowledge and concept of causes, effects, and control of different types of Environmental pollution.
5. To study population growth and its impact on the environment

Course Outcomes (COs) :

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

1. Define key environmental terms and concepts (e.g., ecosystem, biodiversity, pollution).
2. Explain the causes and effects of major environmental problems.
3. Apply environmental principles to analyze real-world scenarios.
4. Differentiate between various types of pollution and their impacts.

Unit No.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction to environmental studies and natural resources:** Definition, scope and Importance and need for public awareness. Natural resources: Forest resources: Use and over-exploitation, deforestation. Timber extraction. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using Mineral resources Food, energy, and land resources: Food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems water logging, salinity. Energy resources: Growing energy needs, renewable and non-renewable energy sources, and use of alternate energy sources. Land resources: Land as a resource, land degradation, man-induced landslides, soil erosion, and desertification.	**10 Hrs**
II	**Ecosystems and Biodiversity and its conservation** **Ecosystems:** Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers, and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs, and ecological pyramids. Introduction, types, characteristic features, structure, and function of the following ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem, and Aquatic ecosystems (ponds, streams, lakes, rivers, Oceans, estuaries) **Biodiversity and its conservation:** Introduction Definition: genetic, species, and Ecosystem diversity. Bio geographical classification of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife	**10 Hrs**

	conflicts. Endangered and endemic species of India Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity	
III	**Environmental Pollution and Social issues and the Environment** Environmental Pollution: Definition, Cause, effects, and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards, Role of an individual in the prevention of pollution. Social issues and the Environment: From Unsustainable to sustainable development Urban problems related to energy. Climate change, global warming, acid rain, ozone layer depletion Environment Protection Act. Public awareness.	**10 Hrs**

Reference Books:

1. Agarwal K.C., "Environmental Biology", Vol. 1, Latest Edition, Nidi Puhl Ltd., Bikaner, 2001.
2. Bharucha Erach, "The Biodiversity of India", Vol. 1, First Edition, Mapin Publishing Pvt. Ltd., Ahmedabad.
3. Heywood V.H., Waston, "Global Biodiversity Assessment", Vol. 1, Latest Edition, Cambridge University Press, 1995.
4. Jadhav H., Bhosale V.M., "Environmental Protection and Laws", Vol. 1, First Edition, Himalaya Publishing House, Delhi.
5. Odum E.P., "Fundamentals of Ecology", Vol. 1, First Edition, W.B. Saunders Co., USA.
6. Miller T.G. Jr., "Environmental Science", Vol. 1, First Edition, Wadsworth Publishing Co.

Course Code : Lab - Field Project

Total Credits : 02

Total Contact Hours : 60 Hrs (4 hours / week)

Maximum Marks : 50 marks (CIA = 20 + ESE = 30)

Learning Objectives of the Course:

Course Outcomes (COs) :

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

- ✓ Gain hands-on experience in drawing, planning and estimation through a comprehensive site visit of a 4 BHK bungalow.
- ✓ Understand various civil engineering aspects required in airport infrastructure including runway, tower, building and maintenance work.
- ✓ Develop understanding of project planning, drawings, estimation, execution steps in Multi-storey buildings through on-site exposure.

Topics / actual contents of the syllabus	Contact Hours
List of the Experiments	**60 Hrs**
Students should undertake at least 06 to 08 experiments during the semester from above list	

1. Visit to Bungalow (4 BHK) site and learn drawing, planning and estimate.
2. Visit to Multi-storey resident building (ten storey or more) and learn project planning, drawings, estimate, execution steps.
3. Visit to Airport and learn civil engineering aspect required in airport, runway, tower, building and maintenance work.
4. Visit to Railway Station and learn civil engineering aspect required in railway station, rail network, signaling, and maintenance work.
5. Visit to Commercial complex and learn civil engineering aspect required in project planning, resource management, estimate and execution steps.
6. Visit to Port and learn civil engineering aspect required in ship port, runway and rusting of ship model.

Honors Degree Course

Please note that this course is optional and specifically designed for students pursuing a Bachelor's Degree Honors with Multidisciplinary Minor. Only those students who have secured a minimum of 7.5 CGPA (equivalent to 75% marks) in their first year will be eligible to opt for this option

Course Code : Advanced Surveying

Total Credits : 03

Total Contact Hours : 45 hrs (three Hours / Week)

Maximum Marks : 100 marks (CIA = 40 + ESE = 60)

Learning Objectives of the Course:

Every civil project involves collection, presentation and interpretation of data for execution works. Diploma civil engineer should acquire competencies to undertake linear measurements, angular measurements and understand the concept of digital mapping. This basic technology level course aims at imparting skills in identifying and making the of basic survey instruments to undertake survey works required for different civil engineering projects.

Course Outcomes (COs) :

- ✓ Understand the principles and applications of transit vernier theodolite and plane table in surveying.
- ✓ Know the technology and practical applications of Global Positioning System in civil engineering.
- ✓ Apply the principles of Geographic Information System including its components and functions for data interpretation and manipulation.
- ✓ Master the application of photogrammetry in aerial and terrestrial data capture, interpretation and certain calculations.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	Introduction to Theodolite and Plane Table Survey A) Uses of theodolite, sketch and parts of transit vernier theodolite, reading of main scale and vernier scale on horizontal and vertical plate. Temporary adjustments of a theodolite , definition and various technical terms, methods of measuring horizontal and vertical angles. B) Principle of plane table survey, accessories of plane table and their uses , setting of plane table, Orientation of plane table, Methods of plane table survey, merits and demerits of plane table survey.	**15 Hrs**
II	Introduction to Global Positioning System (GPS)	**15 Hrs**

	Introduction to GPS, Overview Of GPS, GPS segments, Applications of GPS in civil engineering. Introduction to Geographic Information System (GIS) Introduction, Definition, Objectives, components and functions. Introduction to Remote Sensing Introduction, Definition, Necessity, Importance and use. Drone Surveying	
III	Photogrammetry Introduction, types, types of photograph, Terrestrial photogrammetry. Photo theodolite, principle of terrestrial photogrammetry, Aerial photogrammetry: technical terms, scale, ground coordinates, relief displacement, flying height, computation of length and height from photograph, flight planning, Stereoscopic vision, fusion, stereoscope, parallax in aerial stereoscopic views, difference in elevation by stereoscopic parallax, Photographic interpretation, applications of photogrammetry.	**15 Hrs**

Reference Books:

1. Prof. T. P. Kanetkar and Prof. S.V.Kulkarni, Surveying and levelling Vol. I & II, Pune Vidyarthi Griha Prakashan, Pune, 23rd Edition, 1985
2. Dr. A.M.Chandra , Plane surveying, New Age International Publishers New Delhi, Second Edition, 2006
3. Dr. B.C.Punmia , Surveying Vol I & II, Laxmi Publications (P) Ltd. New Delhi, Sixteenth Edition Reprint 2008
4. R. Subramanian, Surveying and Levelling, Oxford University Press, New Delhi, First Edition, 2007

Double Minor Course

(This course will be available for the students from other discipline and Civil Engineering students will choose double minor course from other discipline)

Please note that this course is optional and specifically designed for students pursuing a Bachelor's Degree with Double Minor. Only those students who have secured a minimum of 7.5 CGPA (equivalent to 75% marks) in their first year will be eligible to opt for this option.

Course Code : Building Planning and Drawing

Total Credits : 03

Total Contact Hours : 45 hrs (three Hours / Week)

Maximum Marks : 50 marks

Learning Objectives of the Course:

This course introduces the elements of building planning, design and construction. This course forms the foundation of the Civil Engineering, in which he will be able to decide on the requirements of various types of buildings and its components along with the standard dimensions. He will be able to plan design and draw the drawings which are required to be submitted to the various authorities for permissions. The drawings prepared by the engineers are also used by the site engineer and hence the reading, understanding and execution of work as per drawings form a major part of this course.

Course Outcomes (COs) :

- ✓ Understand basic principles of building planning, design, and local building byelaws.
- ✓ Develop skills in one and two point perspectives, enhancing architectural visualization.
- ✓ Evaluate specific requirements of various public buildings and guidelines for respective planning.
- ✓ Master techniques of building construction &finishes, and implement effective solutions for damp proofing and fire protection.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Building Byelaws and design Principles of Buildings:** Relative functions and Role of Owner, Architect, Structural Engineer and Contractor, Building byelaws, Principles of planning, Functions of local authority, Site selection and its criteria, Classification of buildings, area and height limitations, Preparation of Submission and working Drawings. RERA	12 Hrs
II	**Perspective drawing:** Terminology and definitions used, One point and Two point Perspective, Development of Perspective . General requirements of different Public buildings: Buildings for Health, Education, Industrial buildings. Residential buildings, Apartments.	15 Hrs

III	**Construction Techniques:** Formwork, Damp proofing, termite proofing and Fire protections, Shoring, scaffolding. **Building Finishes:** - Plastering, Pointing, Painting, Waterproofing Treatment, Plumbing services, Sound insulation, Air conditioning. Visit to Construction site (multi-storey building)	**18 Hrs**

Reference Books:

1. Dr. B.C. Punmia, "Building Construction" Laxmi Publications Pvt. Ltd., New Delhi, Edition, 1998
2. S.P.Arora and S.P.Bindra, "A Text Book of Building Construction", Dhanpat Rai& Sons, Delhi, Edition 1996
3. M.G. Shah, C.M.Kale, S.Y. Patki, "Building Drawing with an Integrated Approach to Built Environment", Tata McGraw Hill Education Private Limited, New Delhi, Third Reprint 2012.
4. National Building Code of India, S.P. 7 ISI
5. Y.S.Sane, "Planning and Designing Buildings", Engineering Book Publishing Co., Pune-16, Edition 1996

Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar.

(Faculty of Science& Technology)

Syllabus of S.Y. B. E. / B. Tech.

(Civil Engineering)

Semester-IV

Course Code : Concrete Technology

Total Credits : 03
Total Contact Hours : 45 hrs (three Hours / Week)
Maximum Marks : 100 marks

Learning Objectives of the Course:

The course provides and understanding the concept of concrete and to learn the techniques of incorporating to produce the concerts and various methods for the design of concrete has been thoroughly discussed. It will help the students in designing the structures.

Course Outcomes (COs) :

- ✓ Understand the properties, production and benefits of different types of cement and cementitious materials
- ✓ Analyze and differentiate between the properties of fine aggregates, coarse aggregates, and special concrete types
- ✓ Evaluate the process of concrete production units and examine the properties of fresh concrete
- ✓ Assess the properties of hardened concrete, methods of measurement, and testing techniques

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Cement and Cementitious Materials:** **a) Cement:** Types, Production, Chemical composition, Setting time, hydration of cement, physical and chemical properties and standard Specifications of cement. **b) Cementitious Materials:** Types, Chemical composition, properties and their role behavior of concrete. **c) Concrete Mix Proportioning:** Nominal and design mix concrete, Principles of mix designs, Data for Concrete mix proportioning, Indian Standard method of concrete mix proportioning of Ordinary and Standard grades of concrete.	**8 Hrs**
II	**a) Fine Aggregate:** Natural and manufactured sand, particle size distribution, fineness modulus, grading curves, specific gravity, moisture content, bulking of sand, water absorption, bulk density and standard specifications. **b) Coarse Aggregate:** Types, particle size distribution, fineness modulus, grading curves, moisture content, specific gravity, absorption, bulk density, flakiness index, elongation index, crushing value, impact value, abrasion and attrition and standard specifications.	**10 Hrs**

	c) Water: Properties of water for making concrete and standard specifications **d) Special Concrete:** Light weight concrete, High density concrete, Fiber reinforced concrete, Self-compacting concrete, Air entrained concrete etc.: Materials, production and properties in the fresh and hardened state	
III	**a) Unit Production of Concrete:** Batching, Mixing, Transporting, Placing, Compaction, Curing, **b)Properties of Fresh Concrete:** Cohesiveness, Segregation, Bleeding, Setting Time. Placing conditions, Workability and methods of its Measurements. Plasticizer and superplasticizer **c)Properties of Hardened Concrete:** Compressive strength, Tensile strength Flexural Strength, Modulus of elasticity, Poisson's Ratio, Permeability and durability, Standard tests their measurement. Destructive and non-destructive testing methods	**12 Hrs**

Reference Books:

1. A M Neville, Properties of Concrete, 4th edition, 2006, ELBS with Longman, UK
2. M L Gambhir, Concrete Technology, 3rd edition, 2006, Tata McGraw Hill, New Delhi
3. M S Shetty, Concrete Technology, 2008, S. Chand & Co., New Delhi
4. S.K. Duggal, Building Material Oxford & IHB Publishing Co. Ltd. New Delhi 2000.

Course Code : Lab - Concrete Technology

Total Credits : 01

Total Contact Hours : 30 Hrs (two hours / weekly)

Maximum Marks : 50 marks (CIA = 20 + ESE = 30)

Learning Objectives of the Course:

Objective of this course is to provide insight about the behavior of the concrete.

Course Outcomes (COs) :

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

- ✓ Understand the properties of ingredients of concrete
- ✓ Evaluate the properties of concrete in fresh and hardened state
- ✓ Design and prepare concrete of required properties

Topics / actual contents of the syllabus	Contact Hours
List of the Experiments	**30 Hrs**
Students should undertake at least 06 to 08 experiments during the semester from above list	

Cement Test

1. Fineness by Air permeability Test
2. Standard consistency
3. Initial and Final Setting time
4. Soundness
5. Compressive strength.

Fine Aggregate

1. Sieve analysis
2. Water absorption, moisture content and specific gravity
3. Bulking of sand
4. Deleterious Material Test

Coarse Aggregate

1. Sieve analysis
2. Water absorption, moisture content and specific gravity
3. Flakiness and Elongation Index of aggregates
4. Impact and Crushing Value .

Test On Fresh Concrete

1. Workability of concrete by slump test
2. Workability of concrete by compaction factor test
3. Workability of concrete by Vee-Bee consisto meter
4. Workability of concrete by flow test

Test On Hardened Concrete

1.Compression Test

2. Flexure strength Test.

3.Spilt Tension Test

4. Rebound hammer test.

5. Ultrasonic pulse velocity test

Concrete mix proportioning as per IS 10262-2019

Visit to construction site

Course Code : Building, Planning and Design

Total Credits : 02

Total Contact Hours : 30 hrs (Two Hours / Week)

Maximum Marks : 50 marks

Learning Objectives of the Course:

This course introduces the elements of building planning, design and construction. This course forms the foundation of the Civil Engineering, in which he will be able to decide on the requirements of various types of buildings and its components along with the standard dimensions. He will be able to plan design and draw the drawings which are required to be submitted to the various authorities for permissions. The drawings prepared by the engineers are also used by the site engineer and hence the reading, understanding and execution of work as per drawings form a major part of this course.

Course Outcomes (COs) :

- ✓ Understand basic principles of building planning, design, and local building byelaws.
- ✓ Develop skills in one and two point perspectives, enhancing architectural visualization.
- ✓ Evaluate specific requirements of various public buildings and guidelines for respective planning.
- ✓ Master techniques of building construction &finishes, and implement effective solutions for damp proofing and fire protection.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Building Byelaws and design Principles of Buildings:** Relative functions and Role of Owner, Architect, Structural Engineer and Contractor, Building byelaws, Principles of planning, Functions of local authority, Site selection and its criteria, Classification of buildings, area and height limitations, Preparation of Submission and working Drawings. RERA	**8 Hrs**
II	**Perspective drawing:** Terminology and definitions used, One point and Two point Perspective, Development of Perspective . General requirements of different Public buildings: Buildings for Health, Education, Industrial buildings. Residential buildings, Apartments.	**10 Hrs**
III	**Construction Techniques:** Formwork, Damp proofing, termite proofing and Fire protections, Shoring, scaffolding. **Building Finishes:** - Plastering, Pointing, Painting, Waterproofing Treatment, Plumbing services, Sound insulation, Air conditioning.	**12 Hrs**

Reference Books:

6. Dr. B.C. Punmia, "Building Construction" Laxmi Publications Pvt. Ltd., New Delhi, Edition, 1998

7. S.P.Arora and S.P.Bindra, "A Text Book of Building Construction", Dhanpat Rai& Sons, Delhi, Edition 1996
8. M.G. Shah, C.M.Kale, S.Y. Patki, "Building Drawing with an Integrated Approach to Built Environment", Tata McGraw Hill Education Private Limited, New Delhi, Third Reprint 2012.
9. National Building Code of India, S.P. 7 ISI
10. Y.S.Sane, "Planning and Designing Buildings", Engineering Book Publishing Co., Pune-16, Edition 1996

Course Code : Lab - Building, Planning and Design

Total Credits : 01

Total Contact Hours : 30 Hrs (two hours / weekly)

Maximum Marks : 50 marks

Learning Objectives of the Course:

Objective of this course is to provide an insight and inculcate the essentials of Building Planning and Design. Civil engineers plan, design, build, execute and maintain infrastructure projects such as public and private utility buildings, satisfying the societal needs. This course introduces the elements of building planning, design. This course forms the foundation of the Civil Engineering, in which students will be able to decide on the requirements of various types of buildings and its components along with the standard dimensions.

Before preparing drawings, students are expected to visit different sites and study different aspects and peculiarities of structures.

Course Outcomes (COs) :

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

- ✓ Apply the principles of planning, design to develop measured drawings of a residential complex including site visit.
- ✓ Ability to create comprehensive line plans for large-scale public facilities
- ✓ Design advanced planning and design of complex public building projects

Topics / actual contents of the syllabus	Contact Hours
List of the Experiments	**30 Hrs**

Students should undertake at least 06 to 08 experiments during the semester from above list

1. Study of Building Bye-laws and IS Codes
   a) NBC norms for residential and public buildings
   b) Setbacks, FAR, room dimensions, ventilation standards
2. Manual Drawing Exercises
   a) Line plan of a single-room residential building
   b) Detailed floor plan, elevation, and sectional drawing of a two-bedroom house
   c) Site plan preparation with setbacks and orientation
3. Public Building Planning
   a) Layout plans and line drawings of:
      i. School building
      ii. Hospital or hostel
      iii. Office or shopping complex
   b) Emphasis on circulation and functional zoning
4. Staircase and Toilet Design
   a) Detailed drawings showing dimensions and fixtures
   b) Plan, elevation, and section
5. CAD Lab Sessions (AutoCAD or equivalent)

a) Introduction to CAD interface and drawing commands
   i. Digital drafting of a residential building:
   ii. Floor plan
   iii. Elevation and section
b) Plotting and layout management

6. Mini Project / Design Task
   a) Comprehensive planning and presentation of a residential/public building
   b) Including site plan, floor plans, elevation, and sections using CAD tools

Course Code : Theory of Structure

Total Credits : 02
Total Contact Hours : 30 hrs (two Hours / Week)
Maximum Marks : 50 marks

Learning Objectives of the Course:

The mechanics of deformable solids or strength of materials or solid mechanics or mechanics of materials, as it is commonly called, is one of the core subject that need to be studied by all engineering students. The course builds on the fundamental concepts of engineering mechanics course. Primary aim of this course is to introduce students to the fundamental concepts and principles applied by engineers - whether civil, mechanical, aeronautical, etc. - in the design of structures of all sorts of sizes and purpose. The course content have been presented in five units so that the students can develop the logic and get insight to analyze beams, trusses and solid circular shafts under various actions.

Course Outcomes (COs) :

- ✓ Understand and apply principles of simple stresses and strains, including Hooke's law and thermal stresses/strains in varying sections.
- ✓ Analyse the state of stress at a point under a general two dimensional stress system and utilize Mohr's circle for such analysis.
- ✓ Develop knowledge and skills to calculate and interpret torsional moments of resistance, and analyze columns and struts under buckling conditions.
- ✓ Determine the slope and deflection of beams under varying external loads and analyze statically determinate plane framed structures

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**a) Simple Stresses and Strains** Concept of normal stress and shear stress, Concept of normal strain and shear strain, Stress and strain diagram, Hooke's law, Generalised Hook's Law Elastic constants, Volumetric stress and strain, Stresses and strains in uniform and varying sections under axial loading, Saint Venant's principle, Stresses and strains in compound bars under axial loading, Concept of residual stresses, Thermal stresses and strains. **b) Compound Stresses** Introduction, state of stress at a point, General two dimensional stress system, Principal stresses and principal planes. Mohr's circle of stresses	8 Hrs
II	Shear Force and Bending Moment Diagrams of Statically Determinate Beams Introduction to types of beams, supports and loadings. Definition of bending moment and shear force, Sign conventions, relationship between load intensity, bending moment and shear force. Shear force and bending moment diagrams for statically determinate beams subjected to points load, uniformly distributed loads, uniformly varying loads, couple and their combinations. **(a)Flexural Stresses in Statically Determinate Beams**	12 Hrs

	Theory of pure bending, Elastic flexural formula, Assumptions in the theory of bending, Moment of resistance, Section modulus, Flexural stresses in beams with symmetrical solid, hollow and built-up sections, Bending stress distribution **(b)Shear Stresses in Statically Determinate Beams** Concept of shear stress, Shear stress formula, Shear stresses in beams with prismatic rectangular, circular and built-up sections.	
III	**(a) Torsion of Circular Shafts** Concept of torsion, Torsion formula, Assumptions in the theory of pure torsion, , Torsional moment of resistance, Analysis of circular solid and hollow shafts, Shafts with fixed ends, Shafts in series and parallel. **(b) Analysis of Columns and Struts:** Axially loaded compression members, Crushing load, Buckling or Critical or crippling loads by Euler's theory Assumptions in Euler's theory, Concept of effective length, Effect of different idealized end conditions, slenderness ratio, Limitations of Euler's formula, Rankine's theory. **(a) Slope and Deflection of Statically Determinate Beams** Concept of slope and deflection, Equation of elastic curve, Slope and deflection of beams subjected to external loads by double integration method, Macaulay's method, moment area method Deflection by principle of superposition. **b)Analysis of Statically Determinate Plane Framed Structure** Concept of perfect, Deficient and Redundant frames, Analysis of trusses by Method of resolution or Method of joints and Method of sections .	**10 Hrs**

Reference Books:

1. S.Ramamrutham: Strength of Material, Dhanpatrai & Sons, New Delhi.
2. R. K. Rajput: Strength of Material, S. Chand & Company , New Delhi.
3. S. S. Bhavicutti: Strength of Material (3E), Vikas Publishing House Pvt. Ltd. , New Delhi.
4. Ferdinand P. Beer and E. Russell Johnston: Mechanics of Material, McGraw Hill, New Delhi.
5. James M. Gere and S.P. Timoshenko: Mechanics of Material, CBS Publishers, New Delhi.
6. William F. Riley, Leroy D. Struges and Don H. Morris: Mechanics of Material, Jhon Wiley & Sons Inc., New York.
7. E.P. Popov: Introduction to Mechanics of Solids, Prentice Hall of India, New Delhi.
8. S.H. Crandall, N. C. Dahl and T. V. Lardner: Mechanics of Solids: An Introduction, McGraw Hill International, Tokyo.

Course Code : Lab - Theory of Structure

Total Credits : 01
Total Contact Hours : 30 Hrs (two hours / weekly)
Maximum Marks : 50 marks

Learning Objectives of the Course:

In this laboratory, students will have the opportunity to apply loads to various materials under different equilibrium conditions. The student will perform tests on civil engineering materials in tension, compression, torsion, bending, and impact. These conditions and/or constraints are designed to reinforce classroom theory by having the student perform required tests, analyze subsequent data ,and present the results in a professionally prepared report. The machines and equipment used to determine experimental data include universal testing machines, torsion equipment, compression testing machine, impact tester, hardness tester, etc. Data will be collected using Dial indicators, extensometers.

Course Outcomes (COs) :

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

- ✓ Understand and analyze the tension dynamics in different materials such as Mild steel, High Yield strength deformed and cast iron specimen.
- ✓ Acquire the ability to execute and scrutinize different types of compression tests, including metals and wood, emphasizing directionality
- ✓ Demonstrate competence in conducting various material hardness tests and comprehending the implications of the results in structural engineering

Topics / actual contents of the syllabus	Contact Hours
List of the Experiments	**30 Hrs**
Students should undertake at least 06 to 08 experiments during the semester from above list	

1) Tension test on Mild steel, High Yield strength deformed and cast iron specimen
2) Cold bend test on Mild and HYSD steel bars.
3) Compression test on metals
4) Compression test on Wood (parallel and perpendicular to grains)
5) Direct shear test (Single, Double) on steel, Copper, brass specimen
6) Punching shear test on thin metallic sheets.
7) Torsion test on circular mild steel bar
8) Izod and Charpy Impact test on metals
9) Study of Buckling of column.
10) Bending test on Timber beam.
11) Flexural test on Concrete Beams
12) Compression tests on concrete cubes
13) Hardness test on metals - Brinnell and Rockwell Hardness Number
14) Testing of structural steel
15) Compression test on helical springs

Course Code : MDMT-II Rural Technology

(This course will be available for the students from other discipline and Civil Engineering students will choose minor course from other discipline)

Total Credits : 02

Total Contact Hours : 30 hrs (two Hours / Week)

Maximum Marks : 50 marks (CIA = 20 + ESE = 30)

Learning Objectives of the Course:

Rural Technology explores the application of engineering principles and technological innovations to address challenges and enhance living standards in rural communities. The course covers a wide range of topics including renewable energy, agriculture technology, water management, infrastructure development, and appropriate technology solutions.

Course Outcomes (COs) :

- ✓ Understand the role of technology in rural development and the importance of rural industries.
- ✓ Apply knowledge of renewable energy sources for rural electrification and micro-grid systems design.
- ✓ Evaluate modern agricultural techniques and their impact on rural communities, including smart irrigation and precision agriculture.
- ✓ Design effective water management and sanitation solutions for rural areas, promoting community-based water conservation.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	Introduction to Rural Technology Overview of rural communities and their characteristics (Panchayat Raj System, its specific objectives, Functions, Sources of incomes of Village Panchayat. ✓ Importance of technology in rural development ✓ Challenges faced by rural populations ✓ Role of engineers in rural technology development ✓ Need for rural industries, objectives and scope, Relation between agriculture and industry Renewable Energy in Rural Areas ✓ Introduction to renewable energy sources (solar, wind, biomass, etc.) ✓ Applications of renewable energy in rural electrification ✓ Components, Advantages, Challenges, Design and implementation of off-grid and micro-grid systems ✓ Case studies of successful renewable energy projects in rural settings	**10 Hrs**
II	Agriculture Technology Different modern agricultural techniques and their impact on rural communities ✓ Smart Irrigation System ✓ Vermi Technology	**10 Hrs**

	✓ Genetic Engineering and Bio technology ✓ Precision agriculture and its benefits for small-scale farmers ✓ Mechanization and automation in farming practices Innovations in crop storage, processing, and value addition	
III	Water Management and Sanitation ✓ Challenges related to water access and sanitation in rural areas ✓ Technologies for efficient water harvesting and management ✓ Design of low-cost sanitation solutions ✓ Community-based approaches to water conservation and hygiene promotion Infrastructure and Connectivity ✓ Importance of infrastructure for rural development ✓ Design considerations for rural roads, bridges, and transportation systems ✓ ICT solutions for improving connectivity in remote areas ✓ Case studies of innovative infrastructure projects in rural communities	**10 Hrs**

Reference Books:

✓ 1."Rural Technology: A Transformative Tool for Development" by Anil Kumar, Springer, 2018.

✓ 2."Renewable Energy Technologies for Rural Development" by R.K. Pandey, CRC Press, 2019.

✓ 3."Agricultural Technology Adoption: Issues for Consideration" edited by Roger Day and M.G. Cook, CABI, 2020.

✓ 4."Water, Sanitation, Hygiene and Energy in Rural Areas: Challenges and Innovations" edited by P. Bhattacharya et al., Elsevier, 2021.

✓ 5."Infrastructure Development in Rural Areas: Strategies and Case Studies" edited by N.K. Suryadevara et al., IGI Global, 2019.

Course Code: VSECT-2
Lab - Python Programming

Total Credits : 02
Total Contact Hours : 60 Hrs (four hours / weekly)
Maximum Marks : 50 marks (CIA = 20 + ESE = 30)

Learning Objectives of the Course:

Python is a language with a simple syntax, and a powerful set of libraries. It is an interpreted language, with a rich programming environment, including a robust debugger and profiler. While it is easy for beginners to learn, it is widely used in many scientific areas for data exploration. This course is an introduction to the Python programming language for students without prior programming experience.

Course Outcomes (COs) :

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

- ✓ Gain proficiency in Python fundamentals including variables, operators, and file handling while understanding syntax errors and exceptions.
- ✓ Master the use of Python's built-in functions, modules and user-defined functions and develop the ability to create complex conditions and loops.
- ✓ Develop expertise in advanced Python programming concepts like strings, lists, tuples, sets and dictionaries, including their methods and manipulations.

Topics / actual contents of the syllabus	Contact Hours
List of the Experiments	**60 Hrs**

Students should undertake at least 06 to 08 experiments during the semester from above list

Introduction:

Introduction and history, Features, Setting up and Installation, Working with Python, Understanding Python Variables and Operators, Understanding python blocks. Understanding Python Data Types, Working with Operators1/0 and File Handling using function like read, write, write lines etc., Errors & Exception Syntax Errors, Exceptions, Handling Exceptions, User Defined Exceptions, Clean-up actions.

Data Types, Variables, Operators and other Conditional blocks:

Python Numbers- integer, float and complex. Conditional blocks using if-else and elif. Simple for loops in python, for loop using ranges, Use of while loops in python, Loop manipulation using pass, continue, break and else, Programming using Python conditional and loops block Functions: Built in Functions, Invoking built-in function, Modules-Importing entire module or selected object using from statement. Functions from Math, random. Time & date. Composition, User defined functions - Defining. Invoking, Passing Parameters

Strings and Tuples in Python:

Python Strings slicing strings, modify strings, concatenate strings, format strings, escape characters, sting methods. Python Booleans. Python List Access list items, change list items, add list items, remove list items, loop lists, list comprehension, sort lists, copy list, join list, list methods. Python Tuples-Access, Update and unpack tuple, Loop tuple, Join tuple, Tuple methods. Python Sets Access, add and remove set items, loop sets, join sets, se methods. Python Dictionaries Access, change, add, remove items, loop dictionaries, copy dictionaries, nested dictionaries.

Course Code : Modern Indian Languages

Total Credits : 02
Total Contact Hours : 30 hrs (three Hours / Week)
Maximum Marks : 100 marks

Learning Objectives of the Course:

Course Outcomes (COs) :

Basket of Modern Indian Languages is available on University Website

Direct link for syllabus:

http://www.bamu.ac.in/Portals/0/nep-common-AEC-course-sem-I-24-25.pdf

Or
Visit
http://www.bamu.ac.in/NEP-Curriculum.aspx#2024

Entrepreneurship/Economics/Management Courses

Students will have to choose any one theory course form the following Basket. Any One course in 3rd semester and another course in 4th semester

4) Engineering Economics (EEM-I)

5) Entrepreneurship Development (EEM-II)

6) Industrial Management (EEM-III)

Course Code: Engineering Economics (Semester III/ IV)

Total Credits: 2
Contact Hours Theory: 02 Hrs./week, **Total Contact Hours**: 30 hrs
Maximum Marks: 50

Learning Objectives of the Course:

7. Understand the Time Value of Money
8. Evaluate Engineering Alternatives
9. Analyze Public Sector Projects
10. Understand and Apply Depreciation and Taxation
11. Perform Break-even and Sensitivity Analysis
12. Understand Cost Concepts for Decision-Making

Course Outcomes (COs) :

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

6. To evaluate Time Value of Money
7. To enable students to perform economic comparisons between different projects or assets
8. To introduce benefit-cost analysis for evaluating the economic feasibility of projects
9. To apply break-even analysis using both linear and non-linear models
10. To develop skills in cost estimation, cost control, cost reduction, and identify relevant costs for decision-making.

Unit No.	Topics / actual contents of the syllabus	Contact Hours
I	**Time value of money:** Simple and compound interest, Time value equivalence, Compound interest factors, Cash flow diagrams, Calculation, Calculation of time – value equivalences. Present worth comparisons, Comparisons of assets with equal, unequal and infite lives, comparison of deferred investments, Future worth comparison, payback period comparison.	10 Hrs
II	Use and situations for equivalent annual worth comparison, Comparison of assets of equal and unequal life. Rate of return, Internal rate of return, comparison of IIR with other methods, IRR misconceptions. Analysis of public Projects: Benefit/ Cost analysis, quantification of project, cost and benefits, benefit/ cost applications, Cost effectiveness analysis.	10 Hrs
III	**Depreciation**, Computing depreciation charges, after tax economic comparison, Break-even analysis; linear and non-linear models. Sensitivity analysis: single and multiple parameter sensitivity. **Fixed and variable cost,**	10 Hrs

	Product and Process Costing, Standard Costing, Cost estimation, Relevant Cost for decision making, Cost estimation, Cost control and Cost reduction Techniques.	

Reference Books:

8. Riggs, J.L., Dedworth, Bedworth, D.B., Randhawa, S.U., "Engineering Economics", Vol. 1, Latest Edition, McGraw Hill International, 1996.
9. James L. Riggs, David D. Bedworth, Sabah U. Randhawa, "Economics for Engineers", Vol. 1, 4th Edition, McGraw-Hill, 2004.
10. Donald Newnan, Ted Eschembach, Jerome Lavelle, "Engineering Economic Analysis", Vol. 1, 8th Edition, Oxford University Press, 2012.
11. John A. White, Kenneth E. Case, David B. Pratt, "Principles of Engineering Economic Analysis", Vol. 1, 6th Edition, John Wiley, 2010.
12. R. Paneerseelvam, "Engineering Economics", Vol. 1, 2nd Edition, PHI, 2008.
13. Michael R. Lindeburg, "Engineering Economics Analysis", Vol. 1, Latest Edition, Professional Publications, 1993.
14. V. Mote, S. Paul, G. Gupta, "Managerial Economics", Vol. 1, Latest Edition, Tata McGraw Hill, 2004.

Course Code: Entrepreneurship Development
(Semester III/ IV)

Total Credits: 2
Contact Hours Theory: 02 Hrs./week, **Total Contact Hours:** 30 hrs
Maximum Marks: 50

Learning Objectives of the Course:

4. Understand the fundamentals of entrepreneurship and its significance in engineering.
5. Identify business opportunities and develop innovative ideas.
6. Create a basic business plan and understand key entrepreneurial strategies.

Course Outcomes (COs) :

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

6. Explain the concept of entrepreneurship and its importance in the modern economy.
7. Identify and evaluate business opportunities in engineering and technology sectors.
8. Develop a comprehensive business plan including financial, operational, and marketing strategies.
9. Assess the challenges and risks in entrepreneurship and develop strategies to mitigate them.
10. Demonstrate entrepreneurial thinking through case studies, projects, and presentations.

Unit No.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction to Entrepreneurship** Definition, meaning, and characteristics of an entrepreneur, Evolution of entrepreneurship Types of entrepreneurs, Role of entrepreneurship in economic development, Key traits of successful entrepreneurs.	**10 Hrs**
II	**Opportunity Recognition and Idea Generation** Identifying business opportunities, Creativity and innovation in entrepreneurship, Techniques for idea generation, Feasibility analysis (technical, market, financial).	**10 Hrs**
III	**Business Planning** Components of a business plan, Business models and strategy formulation, Legal requirements for starting a business, Intellectual Property Rights (IPR) and patents.	**10 Hrs**

Reference Books:

5. C.B. Gupta, Srinivasan, "Entrepreneurship Development", Vol. 1, Latest Edition, Sultan Chand & Sons, 2020.
6. Donald F. Kuratko, "Entrepreneurship: Theory, Process, Practice", Vol. 1, Latest Edition, Cengage, Eric Ries, "The Lean Startup", Vol. 1, Latest Edition, Anonymous, 2011.
7. Alexander Osterwalder, Yves Pigneu, "Business Model Generation", Vol. 1, Latest Edition, Wiley, 2011.
8. Peter F. Drucker, "Innovation and Entrepreneurship", Vol. 1, Latest Edition, Taylor & Francis, 2014.

Course Code: Industrial management
(Semester III/ IV)

Total Credits: 2
Contact Hours Theory: 02 Hrs./week, **Total Contact Hours**: 30 hrs
Maximum Marks: 50

Learning Objectives of the Course:

2. To understand concept of management, administration, Organization, Industrials Laws.

Course Outcomes (COs) :

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

6. Understand the fundamental principles of management.
7. Describe different forms of business organizations and organizational structures.
8. Apply theoretical knowledge to real-world management and organizational challenges.
9. Analyze the impact of organizational, environmental factors.
10. Explain the role of economics in management decision-making.

Unit No.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction to Management:** Managing and Manager, organizations and need for management, the managing process, types of managers, the challenge of management, the evolution of Management theory. **Management in the 21st century:** The importance of organizational and natural environment, elements of direct action environment, managing multiple stock holder relationship, elements of the indirect action environment, Natural Environment management 2000 and beyond, social responsibility and ethics, globalization. Evaluation of case studies related to above concept.	10 Hrs
II	**Business Organization** Forms of business organization, individual proprietorship, joint stock company, co-operative enterprise, co-operative enterprise and public sector undertakings. Organization structure in industries, Line organization, functional organization, line and staff organization, committee organization, project organization matrix organization. **Nature and Significance of Economics.** Science, engineering and technology, their relationship with economic development. Basic economic concepts, human wants economic goods, utility value, price cost, wealth and capital. Demand supply, elasticity of demand and supply. Concept of profit and revenues.	10 Hrs
III	**Accidents and safety** Classification of accidents, according to nature of industries; i.e. fatal, temporary, according to event and place. Causes of accidents , psychological, and other industrial hazards. Effects of accidents. Accident-prone workers, accident to be taken incase of accidents with machines, electric shock, road accident fires and erection and construction accidents **Personnel Management:** Man power, sources of recruitment, selection and training, job evaluation, performance appraisal, wages and incentives, self and time management.	10 Hrs

Reference Books:

6. James A. F., "Management", Vol. 1, 6th Edition, PHI.
7. Claude S. George, Jr., "Management for Business and Industry", Vol. 1, Revised Edition, Prentice-Hall of India Private Limited.
8. McConnell, Gupta, "Economics: Principles, Problems, and Policies", Vol. 1, 18th Edition, The McGraw-Hill.
9. T.R. Banga, S.C. Sharma, "Industrial Organisation and Engineering Economics", Vol. 1, Latest Edition, Khanna Publishers, Jan-2006.
10. O.P. Khanna, "Industrial Engineering & Management", Vol. 1, Latest Edition, Dhanpat Rai Publication, Jan-2018.

Value Education Courses (VEC)

Students will have to choose any one theory course form the following Basket. Any One course in 3rd semester and another course in 4th semester

1) Universal Human Values (VECT-I)

2) Environmental Students (VECT-II)

Course Code: VECT-I
Course: Universal Human Values
(Semester III/ IV)

Total Credits: 2
Contact Hours Theory: 02 Hrs./week, **Total Contact Hours**: 30 hrs
Maximum Marks: 50

Learning Objectives of the Course:

4. To appreciate the essential complementarities between 'VALUES' and 'SKILLS' to ensure sustained happiness and prosperity, which are the core aspirations of all human beings,
5. To facilitate the development to a holistic perspective among students to lead their Personal and professional lives in an ethical way.
6. To highlight plausible implications of such a holistic understanding in terms of ethical human conduct, trustful and mutually fulfilling human behaviour, and mutually enriching interaction with nature.

Course Outcomes (COs) :

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

5. Define key terms related to human values.
6. Explain the concept of happiness as related to right understanding and relationship.
7. Apply the principles of right understanding in their daily interactions.
8. Analyze the impact of their values on their behaviour and decisions.

Unit No.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction to Value Education and Harmony in the Human Being** • Understanding Value Education • Self-exploration as the Process for Value Education • Continuous Happiness and Prosperity - the Basic Human Aspirations and their fulfillment • Right Understanding, Relationship and Physical Facility • Happiness and Prosperity - Current Scenario • Method to Fulfill the Basic Human Aspirations • Harmony in the Human Being • Understanding Human being as the Co-existence of the Self and the Body • Distinguishing between the Needs of the Self and the Body • the Body as an instrument of the Self • Understanding Harmony in the Self • Harmony of the Self with the Body • Programme to ensure self-regulation and Health.	**10 Hrs**
II	**Harmony in the Family and Society**	**10 Hrs**

	• Harmony in the Family - the Basic Unit of Human Interaction "Trust' - the Foundational Value in Relationship • 'Respect' - as the Right Evaluation Values in Human-to-Human Relationship • Harmony in the Society • Other Feelings, Justice in Human-to-Human Relationship • Understanding Harmony in the Society • Vision for the Universal Human Order	
III	**Harmony in the Nature (Existence) and Implications of the Holistic Understanding** • Understanding Harmony in the Nature • Interconnectedness, self-regulation, and Mutual Fulfillment among the Four Order of Nature • Realizing Existence as Co-existence at All Levels • The Holistic Perception of Harmony. Implications of the Holistic Understanding - a Look at Professional Ethics • Basis for Universal Human Values • Definitiveness of (Ethical) Human Conduct • Professional Ethics in the light of Right Understanding • A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order • Holistic Technologies, Production Systems and Management Models, Typical Case Studies Strategies for Transition towards Value-based Life and Profession.	**10 Hrs**

Reference Books:

8. P.L. Dhar, R.R. Gaur, "Science and Humanism", Vol. 1, 1st Edition, Commonwealth Publishers.
9. Nagaraj, "Jeevan Vidya: Ek Pariehaya", Vol. 1, Latest Edition, Jeevan Vidya Prakashan, Amarkantak, 1999.
10. A.N. Tripathy, "Human Values", Vol. 1, Latest Edition, New Age International Publishers, 2003.
11. E.G. Seebauer, Robert L. Berry, "Fundamentals of Ethics for Scientists & Engineers", Vol. 1, 1st Edition, Oxford University Press.
12. M. Govindrajan, S. Natrajan, V.S. Senthil Kumar, "Engineering Ethics and Human Values", Vol. 1, 1st Edition, Prentice Hall of India Ltd.
13. B.P. Banerjee, "Foundations of Ethics and Management", Vol. 1, Latest Edition, Excel Books, 2005.
14. B.L. Bajpai, "Indian Ethos and Modern Management", Vol. 1, Reprinted Edition, New Royal Book Co., Lucknow, 2008.

E-resources:

6. http://madhyasth-darshan.info/postulations/knowledge/knowledge-of-humane-conduct/
7. https://www.youtube.com/channel/UCQxWr5QB_eZUnwxSwxXEkQw
8. https://youtu.be/OgdNx0X9231
9. https://fdp-si.aicte-india.org/UHV-II%20Practice%20Sessions.php
10. https:/fdp-si.aicte-india.org/download.php#1/

Course Code: VECT-I
Course: Environmental Studies
(Semester III/ IV)

Total Credits: 2
Contact Hours Theory: 02 Hrs./week, **Total Contact Hours:** 30 hrs
Maximum Marks: 50

Prerequisites:
Understanding of the Concept of Environment

Learning Objectives of the Course:

6. To study the environment and ecosystems.
7. To study different types of natural resources.
8. Knowledge and concept of biodiversity and its conservation.
9. Basic knowledge and concept of causes, effects, and control of different types of Environmental pollution.
10. To study population growth and its impact on the environment

Course Outcomes (COs) :

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

5. Define key environmental terms and concepts (e.g., ecosystem, biodiversity, pollution).
6. Explain the causes and effects of major environmental problems.
7. Apply environmental principles to analyze real-world scenarios.
8. Differentiate between various types of pollution and their impacts.

Unit No.	Topics / actual contents of the syllabus	Contact Hours
I	**Introduction to environmental studies and natural resources:** Definition, scope and Importance and need for public awareness. Natural resources: Forest resources: Use and over-exploitation, deforestation. Timber extraction. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dam's benefits and problems. Mineral resources: Use and exploitation, environmental effects of extracting and using Mineral resources Food, energy, and land resources: Food resources: world food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems water logging, salinity. Energy resources: Growing energy needs, renewable and non-renewable energy sources, and use of alternate energy sources. Land resources: Land as a resource, land degradation, man-induced landslides, soil erosion, and desertification.	**10 Hrs**
II	**Ecosystems and Biodiversity and its conservation** **Ecosystems:** Concept of an ecosystem. Structure and function of an ecosystem. Producers, consumers, and decomposers. Energy flow in the ecosystem. Ecological succession. Food chains, food webs, and ecological pyramids. Introduction, types, characteristic features, structure, and function of the following ecosystems: Forest ecosystem, Grassland ecosystem, Desert ecosystem, and Aquatic ecosystems (ponds, streams, lakes, rivers, Oceans, estuaries) **Biodiversity and its conservation:** Introduction Definition: genetic, species, and Ecosystem diversity. Bio geographical classification of India. Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife	**10 Hrs**

	conflicts. Endangered and endemic species of India Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity	
III	**Environmental Pollution and Social issues and the Environment** Environmental Pollution: Definition, Cause, effects, and control measures of Air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, nuclear hazards, Role of an individual in the prevention of pollution. Social issues and the Environment: From Unsustainable to sustainable development Urban problems related to energy. Climate change, global warming, acid rain, ozone layer depletion Environment Protection Act. Public awareness.	**10 Hrs**

Reference Books:

7. Agarwal K.C., "Environmental Biology", Vol. 1, Latest Edition, Nidi Puhl Ltd., Bikaner, 2001.
8. Bharucha Erach, "The Biodiversity of India", Vol. 1, First Edition, Mapin Publishing Pvt. Ltd., Ahmedabad.
9. Heywood V.H., Waston, "Global Biodiversity Assessment", Vol. 1, Latest Edition, Cambridge University Press, 1995.
10. Jadhav H., Bhosale V.M., "Environmental Protection and Laws", Vol. 1, First Edition, Himalaya Publishing House, Delhi.
11. Odum E.P., "Fundamentals of Ecology", Vol. 1, First Edition, W.B. Saunders Co., USA.
12. Miller T.G. Jr., "Environmental Science", Vol. 1, First Edition, Wadsworth Publishing Co.

Honors Degree Course

Please note that this course is optional and specifically designed for students pursuing a Bachelor's Degree Honors with Multidisciplinary Minor. Only those students who have secured a minimum of 7.5 CGPA (equivalent to 75% marks) in their first year will be eligible to opt for this option

Course Code : Advanced Concrete Technology

Total Credits : 03
Total Contact Hours : 45 hrs (three Hours / Week)
Maximum Marks : 100 marks

Learning Objectives of the Course:

The course provides and understanding the concept of concrete and to learn the techniques of incorporating to produce the concerts and various methods for the design of concrete has been thoroughly discussed. It will help the students in designing the structures.

Course Outcomes (COs) :

- ✓ Understand the properties, production and benefits of different types of cement and cementitious materials
- ✓ Analyze and differentiate between the properties of fine aggregates, coarse aggregates, and special concrete types
- ✓ Evaluate the process of concrete production units and examine the properties of fresh concrete
- ✓ Assess the properties of hardened concrete, methods of measurement, and testing techniques

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	**Cement and Cementitious Materials:** Materials- Cement, Aggregates, mixing water soundness of aggregate- Fresh and hardened concrete: Admixtures- types of admixtures- purposes of using admixtures- chemical composition- effect of admixtures on fresh and hardened concretes- Natural admixtures. **Concrete Mix Proportioning:** Nominal and design mix concrete, Principles of mix designs, Data for Concrete mix proportioning, Indian Standard method of concrete mix proportioning of Ordinary and Standard grades of concrete.	15 Hrs
II	**Durability of concrete** - Alkali aggregate reaction, reinforcement corrosion, freezing and thawing, etc. **Fiber-reinforced concrete-** Properties of constituent materials- Mix proportions, mixing and casting methods-Mechanical properties of fiber	15 Hrs

	reinforced concrete- applications of fibre reinforced concretes. Light weight concrete- Introduction- properties of light weight concrete- No fines concrete- design of light weight concrete **High strength concrete,** Mass concrete, Roller compacted concrete, high early strength, Self-compacting concrete, Nondestructive Testing Evaluation	
III	**a) Unit Production of Concrete:** Batching, Mixing, Transporting, Placing, Compaction, Curing, **b)Properties of Fresh Concrete:** Cohesiveness, Segregation, Bleeding, Setting Time. Placing conditions, Workability and methods of its Measurements. Plasticizer and superplasticizer **c)Properties of Hardened Concrete:** Compressive strength, Tensile strength Flexural Strength, Modulus of elasticity, Poisson's Ratio, Permeability and durability, Standard tests their measurement. Destructive and non-destructive testing methods	**15 Hrs**

Reference Books:

5. A M Neville, Properties of Concrete, 4th edition, 2006, ELBS with Longman, UK
6. M L Gambhir, Concrete Technology, 3rd edition, 2006, Tata McGraw Hill, New Delhi
7. M S Shetty, Concrete Technology, 2008, S. Chand & Co., New Delhi
8. S.K. Duggal, Building Material Oxford & IHB Publishing Co. Ltd. New Delhi 2000.

Double Minor Course

(This course will be available for the students from other discipline and Civil Engineering students will choose double minor course from other discipline)

Please note that this course is optional and specifically designed for students pursuing a Bachelor's Degree with Double Minor. Only those students who have secured a minimum of 7.5 CGPA (equivalent to 75% marks) in their first year will be eligible to opt for this option.

Course Code : Strength of Materials

Total Credits : 03

Total Contact Hours : 45 hrs (three Hours / Week)

Maximum Marks : 100 marks

Learning Objectives of the Course:

The mechanics of deformable solids or strength of materials or solid mechanics or mechanics of materials, as it is commonly called, is one of the core subject that need to be studied by all engineering students. The course builds on the fundamental concepts of engineering mechanics course. Primary aim of this course is to introduce students to the fundamental concepts and principles applied by engineers - whether civil, mechanical, aeronautical, etc. - in the design of structures of all sorts of sizes and purpose. The course content have been presented in five units so that the students can develop the logic and get insight to analyze beams, trusses and solid circular shafts under various actions.

Course Outcomes (COs) :

- ✓ Develop understanding of stresses, strains, and analyze axial loading conditions.
- ✓ Interpret compound stresses and comprehend two-dimensional stress systems.
- ✓ Apply bending theories to calculate flexural and shear stresses in beams.
- ✓ Evaluate structural performance under torsion, compression, and interpret slope and deflection in beams.

Module No.	Topics / actual contents of the syllabus	Contact Hours
I	a)Simple Stresses and Strains Concept of normal stress and shear stress, Concept of normal strain and shear strain, Stress and strain diagram, Hooke's law, Generalised Hook's Law Elastic constants, Volumetric stress and strain, Stresses and strains in uniform and varying sections under axial loading, Saint Venant's principle, Stresses and strains in compound bars under axial loading, Concept of residual stresses, Thermal stresses and strains. b)Compound Stresses Introduction, state of stress at a point, General two dimensional stress system, Principal stresses and principal planes. Mohr's circle of stresses	**12 Hrs**
II	Shear Force and Bending Moment Diagrams of Statically Determinate Beams Introduction to types of beams, supports and loadings. Definition of bending	**15 Hrs**

	moment and shear force, Sign conventions, relationship between load intensity, bending moment and shear force. Shear force and bending moment diagrams for statically determinate beams subjected to points load, uniformly distributed loads, uniformly varying loads, couple and their combinations. (a)Flexural Stresses in Statically Determinate Beams Theory of pure bending, Elastic flexural formula, Assumptions in the theory of bending, Moment of resistance, Section modulus, Flexural stresses in beams with symmetrical solid, hollow and built-up sections, Bending stress distribution (b)Shear Stresses in Statically Determinate Beams Concept of shear stress, Shear stress formula, Shear stresses in beams with prismatic rectangular, circular and built-up sections.	
III	.(a) Torsion of Circular Shafts Concept of torsion, Torsion formula, Assumptions in the theory of pure torsion, , Torsional moment of resistance, Analysis of circular solid and hollow shafts, Shafts with fixed ends, Shafts in series and parallel. (b) Analysis of Columns and Struts: Axially loaded compression members, Crushing load, Buckling or Critical or crippling loads by Euler's theory Assumptions in Euler's theory, Concept of effective length, Effect of different idealized end conditions, slenderness ratio, Limitations of Euler's formula, Rankine's theory. (a) Slope and Deflection of Statically Determinate Beams Concept of slope and deflection, Equation of elastic curve, Slope and deflection of beams subjected to external loads by double integration method, Macaulay's method, moment area method Deflection by principle of superposition. b)Analysis of Statically Determinate Plane Framed Structure Concept of perfect, Deficient and Redundant frames, Analysis of trusses by Method of resolution or Method of joints and Method of sections .	**18 Hrs**

Reference Books:

- ✓ 1.S.Ramamrutham: Strength of Material, Dhanpatrai& Sons, New Delhi.
- ✓ 2.R. K. Rajput: Strength of Material, S. Chand & Company , New Delhi.
- ✓ 3.S. S. Bhavicutti: Strength of Material (3E), Vikas Publishing HousePvt. Ltd. , New Delhi.
- ✓ 4.Ferdinand P. Beer and E. Russell Johnston: Mechanics of Material, McGraw Hill, New Delhi.
- ✓ 5.James M. Gere and S.P. Timoshenko: Mechanics of Material, CBS Publishers, New Delhi.
- ✓ 6.William F. Riley, Leroy D. Struges and Don H. Morris: Mechanics of Material, Jhon Wiley & Sons Inc., New York.
- ✓ 7.E.P. Popov: Introduction to Mechanics of Solids, Prentice Hall of India, New Delhi.
- ✓ 8.S.H. Crandall, N. C. Dahl and T. V. Lardner: Mechanics of Solids: An Introduction, McGraw Hill International, Tokyo.