S.Y. B. Tech. Civil Engineering

[Level 5, UG Diploma] Regular Students Semester-III

Sr. No.	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Weightages in %)				
									Theory			Laboratory	
									MSE	TA	ESE	ISE	ESE
01	PCC	CE-24002	Fluid Mechanics	3	0	2	1	4	30	20	50	50	50
02	PCC	CE-24001	Strength of Materials	3	0	2	1	4	30	20	50	50	50
03	PCC	CE-24003	Building Construction and Design	3	0	2	1	4	30	20	50	50	50
04	PCC	--	Engineering Geology	2	0	2	1	3	30	20	50	50	50
04	OE	OEC-24020	Open Elective–I (International Standards)	2	0	0	1	2	30	20	50	--	--
05	HSMC	HS-24005	Design Thinking	1	0	0	1	1	30	20	50	--	--
06	VEC	AS-24001	Environmental Studies	1	0	0	2	1	CIE:100			--	--
07	CEA	AS-24004	Community Engagement Activity (CEA)/Field Project	0	0	4	0	2	--	--	--	CIE:100	
08	HSMC	HS-24004	Principles of Economics	2	0	0	1	2	30	20	50	--	--
			Total	**16**	**00**	**10**	**08**	**23**					

[Level 5, UG Diploma] Regular Students Semester-IV

Sr. No.	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Weightages in%)				
									Theory			Laboratory	
									MSE	TA	ESE	ISE	ESE
01	PCC	CE-24005	Geotechnical Foundation Engineering	3	0	2	1	4	30	20	50	50	50
02	PCC	CE-24006	Concrete Technology	3	0	2	1	4	30	20	50	50	50
03	PCC	CE-24007	Structural Mechanics	3	0	0	1	3	30	20	50	--	--
04	VEC-2	AS-25001	Constitution of India	1	0	0	1	1	CIE:100			--	--
05	OE	OEC-24017	Open Elective – II (Sustainable Finance)	2	0	0	1	2	30	20	50	--	--
06	HSMC	HS-24003	Indian language	1	0	2	1	2	30	20	50	CIE:100	
07	VSEC	CE-24008	Plumbing Practices	2	0	0	2	2	CIE:100				
08	MDM	<tbd>	Multidisciplinary Minor – I	3	0	0	1	3	30	20	50	--	--
09	HSMC	HS-24001	Entrepreneurship	2	0	0	1	2	30	20	50	--	--
			Total	**18**	**00**	**06**	**10**	**23**					

Legends: **L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits**
ISE-In-Semester-Evaluation, ESE-End-Semester-Evaluation, MSE-Mid-Semester-Evaluation, TA-Teachers' Assessment, CIE-Continuous-Internal-Evaluation

Exit option to qualify for UG Diploma:

- Sustainable Construction Practices (3 Credits)
- Construction Management (3 Credits)

S.Y. B. Tech. Civil Engineering

[Level 5, UG Diploma] Lateral Entry Semester-III

Sr. No.	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Weightages in%)				
									Theory			Laboratory	
									MSE	TA	ESE	ISE	ESE
01	PCC	CE-24002	Fluid Mechanics	3	0	2	1	4	30	20	50	50	50
02	PCC	CE-24001	Strength of Materials	3	0	2	1	4	30	20	50	50	50
03	PCC	CE-24003	Building Construction and Design	3	0	2	1	4	30	20	50	50	50
04	PCC	--	Engineering Geology	2	0	2	1	3	30	20	50	50	50
04	OE	CE-24020	Open Elective–I (International Standards)	2	0	0	1	2	30	20	50	--	--
05	HSMC	HS-24005	Design Thinking	1	0	0	1	1	30	20	50	--	--
06	VEC	AS-24001	Environmental Studies	1	0	0	2	1	CIE:100			--	--
07	HSMC	AS-24004	Principles of Economics	2	0	0	1	2	30	20	50	--	--
08	BS	HS-24004	Matrices, Differential Calculus and Probability	3	0	0	1	3	30	20	50	--	--
Total				**19**	**00**	**06**	**08**	**24F**					

[Level 5, UG Diploma] Lateral Entry Semester-IV

Sr. No.	Course Type	Course Code	Course Name	L	T	P	S	Cr	Evaluation Scheme (Weightages in %)				
									Theory			Laboratory	
									MSE	TA	ESE	ISE	ESE
01	PCC	CE-24005	Geotechnical Foundation Engineering	3	0	2	1	4	30	20	50	50	50
02	PCC	CE-24006	Concrete Technology	3	0	2	1	4	30	20	50	50	50
03	PCC	CE-24007	Structural Mechanics	3	0	0	1	3	30	20	50	--	--
04	VEC-2	AS-25001	Constitution of India	1	0	0	1	1	CIE:100			--	--
05	OE	CE-24017	Open Elective – II (Sustainable Finance)	2	0	0	1	2	30	20	50	--	--
06	HSMC	HS-24003	Indian language	1	0	2	1	2	30	20	50	CIE:100	
07	VSEC	CE-24008	Plumbing Practices	2	0	0	2	2	CIE:100				
08	MDM	<tbd>	Multidisciplinary Minor – I	3	0	0	1	3	30	20	50	--	--
09	HSMC	HS-24001	Entrepreneurship	2	0	0	1	2	30	20	50	--	--
10	HSMC	<tbd>	Communication Skills	1	0	2	0	2	CIE:100			CIE:100	
Total				**21**	**00**	**08**	**10**	**25**					

Legends: **L-Lecture, T-Tutorial, P-Practical, S-Self Study, Cr-Credits**
ISE-In-Semester-Evaluation, ESE-End-Semester-Evaluation, MSE-Mid-Semester-Evaluation, TA-Teachers' Assessment, CIE-Continuous-Internal-Evaluation

Exit option to qualify for UG Diploma:

- Sustainable Construction Practices (3 Credits)
- Construction Management (3 Credits)

Semester III

Fluid Mechanics						
Course Code	CE-24002		**Examination Scheme**			
Teaching Scheme	3-0-2-1		**Theory**	TA: 20	MSE: 30	ESE: 50
Credits	3		**Laboratory**	CIE: 50	ESE: 50	--

Course Outcomes: Students will be able to:

1. Comprehend the physical properties of fluid and the relationship between them.
2. Identify and analyse the hydrostatic forces on submerged object and floating bodies.
3. Analyse fluid motion with and without forces.
4. Quantify water flows through open channel, pipes, Notches and weirs.
5. Determine head loss through pipes and solve pipe network problem.
6. Understand open channel flow and working of turbines and pums.

Unit 1 : Properties of Fluid: **[7 Hrs]**

Physical properties of fluids, Newton's Law of Viscosity, Dynamic and Kinematic viscosity, Classification of fluids, Newtonian and Non Newtonian fluids, Ideal and Real fluids, Compressibility, Cohesion, Adhesion, Surface tension, Capillarity, Vapour pressure.

Unit 2 : Fluid Statics: **[7Hrs]**

The basic equation of hydrostatics, Concept of pressure head, Measurement of pressure datum (absolute, gauge), Application of the basic equation of hydrostatics. Piezometers, Simple and differential manometers, Inclined manometers, Introduction to pressure transducers. Total pressure, Center of pressure for plane and curved surfaces, Pressure Diagrams, Buoyancy and Floatation.

Unit 3 : Fluid Kinematics and Fluid Statics **[7Hrs]**

A) Fluid Kinematics:

Methods of describing fluid motion, Types of flows, Streamlines, Path lines, Streak lines and Stream tubes. Rate of flow, Continuity equation, Velocity potential and stream function, Equipotential lines, Flow net.

B) Fluid Dynamics:

Forces acting on fluid mass in motion, Euler's equation of motion along a streamline and its integration, Bernoulli's equation, Momentum equations. Measurement of discharge through Venturi meter, Orifice meter, measurement of velocity through pitot tube.

Unit 4 : Notches and Weirs **[6Hrs]**

A) Notches:

Type of notches, Derivation of discharge equation, velocity approach, Error in measurement of head.

B) Weirs:

Types of weirs, Sharp and Broad crested weirs, calibration of weirs, time require emptying the tank with notches and weirs, Ventilation of weir.

Unit 5 : Flow Through Pipes **[7Hrs]**

Energy losses in pipe flow: Major losses and Minor losses, Darchy Weisbach Equation, Pipes in Series and Parallel, Concept of HGL, TEL and Syphon, Water Hammer.

Unit 6 : Open Channel Flow and Hydraulic Machinery **[7Hrs]**

A) Open Channel flow:

Difference between pipe flow and open channel flow. Types of open channel flow. Concept of specific energy and specific force. Type of channel transition, Continuity Equation and Momentum Equation for open channel flow, Hydraulic Jump.

B) Hydraulic Machinery:

Concept of impact of jet. Jet impinging on a stationary plate, jet impinging on a moving plate (straight and inclined). Jet striking the plates mounted on a circular wheel. Types of Turbines. Types of Pumps and applications.

Self-Study (SS):	
1. Laminar and Turbulent Flow 2. Dimensional and model analysis 3.Fluid Flow around submerged object	
Text Books:	
[1]	"Hydraulics and Fluid Mechanics", Modi, P. N. and S. N. Seth Standard book house, New Delhi
[2]	"Theory and Application of Fluid Mechanics", K.Subramanya, ,TataMcGraw Hill Publishing Co. Ltd.
[3]	"Fluid Mechanics", A. K. Jain, , 4th Edition , Khanna Publishers.
[4]	"Fluid mechanics", F M White, McGraw Hill Education India Private Limited, 2017 8th Edition
[5]	"Fluid Mechanics Through Problems", R. J. Garde and Mirajgaonkar, New Age International.
Reference Books:	
[1]	"Fluid Mechanics ", Streeter V.L. Wylie E. Benjamin, Mc Graw Hil, London, 1998
[2]	"Mechanics of Fluids", Bernard Massey and John Ward Smith, Taylor and Francis, 8 Edition London and New York.
[3]	"Fluid Mechanics" , Douglas J. F. Gaisorek J. M. , Swaffield J. A., Addison-Weisley Harlow.
[4]	"Mechanics of Fluids", Shames I. H., Mc Graw-Hill, New York 1992.
Note:	
[1]	To measure CO1, questions may be of the type- define, identify, state, match, list, name etc.
[2]	To measure CO2, questions may be of the type- explain, describe, illustrate, evaluate, give examples, compute etc.
[3]	To measure CO3, questions will be based on applications of core concepts.
[4]	To measure CO4, questions may be of the type- true/false with justification, theoretical fill in the blanks, theoretical problems, prove implications or corollaries of theorems, etc.
[5]	To measure CO5, some questions may be based on self-study topics and comprehension of unseen passages.

Strength of Materials						
Course Code	CE-24001		**Examination Scheme**			
Teaching Scheme	3-0-2-1		**Theory**	TA: 20	MSE: 30	ESE: 50
Credits	3		**Laboratory**	CIE: 50	ESE: 50	--
Course Outcomes: Students will be able to:						
1. Analyse structural members subjected to axial loads and temperature variations 2. Analyse shafts subjected to combined loading 3. Analyse beams subjected to combined loading 4. Determine the stress distribution inside deformable body 5. Compute the buckling loads for columns						
Unit:1 Simple stresses and strains:						**[5 Hrs]**
Stress and strain (linear, lateral, shear and volumetric), Generalized Hooke's law. Elastic constants and their relationship for isotropic materials. Axial force diagram, stresses, strains and deformation in determinate and indeterminate homogeneous and composite bars under concentrated loads, self-weight and temperature changes.						
Unit:2 Shear Force and Bending Moment Diagrams, Stresses in Beams due to Bending						**[5 Hrs]**
Shear force and bending moment diagrams for determinate beams: Concept and definition of shear force and Bending Moment. Beams under various kinds of loading **Stresses in beams due to bending:** Theory of pure bending, Flexure formula. Bending stress distribution diagram, Moment of resistance and section modulus.						

Unit:3 Stresses in beams due to Shear and Torsion of Circular shaft	**[8 Hrs]**
Stresses in beams due to Shear: Shear stress distribution diagram for common symmetrical sections (with at least one axis of symmetry), maximum and average shear stress, Flitched beams. **Torsion of Circular Shaft:** Stresses, strains and deformation in determinate and indeterminate shafts of hollow and solids sections of homogenous and composite materials subjected to torsion	
Unit:4 Principal planes and stresses	**[5 Hrs]**
Normal and shear stresses on any oblique plane and concept of principal planes and principal stresses by analytical and graphical methods (Mohr's circle of stress 2-D). Combined Effects of axial force, bending moment, shear force and Torsional moment. Theories of failure: Maximum normal stress, Maximum shear stress and Maximum strain energy theory.	
Unit:5. Axially loaded columns and direct and bending stresses	**[7 Hrs]**
Axially loaded columns: Critical load and buckling, Euler's formulae for column with hinged ends, equivalent length for various end conditions. Rankine's formula	
Direct and Bending Stresses: Eccentrically loaded short columns including biaxial cases, retaining walls, dams, chimneys. Core of section for standard symmetrical sections	
Unit:6 Slope and Deflection of Determinate Beams	**[6 Hrs]**
a) Double integration method (McCauley's Method). b) Moment Area Method c) Conjugate Beam Method	
Text Books:	
[1]	Beer and Johnston, "Mechanics of Material", Tata Mc Graw Hill publication
[2]	F. L. Singer and Pytel, "Strength of Material", Harper and Row publication
Reference Books:	
[1]	Gere and Timoshenko, "Mechanics of Materials", CBS publishers.
[2]	J.B. Popov, "Introduction to Mechanics of Solids", Prentice Hall publication
[3]	James M.Gere, "Mechanics of Materials", Brooks/Cole Thomson Learning,(Fifth edition)
[4]	Andrew Pytel and Jaan Kiusalaas, "Mechanics of Materials", Thomson Learning, 511,
Note:	
[1]	To measure CO1, questions may be of the type- define, identify, state, match, list, name etc.
[2]	To measure CO2, questions may be of the type- explain, describe, illustrate, evaluate, give examples, compute etc.
[3]	To measure CO3, questions will be based on applications of core concepts.
[4]	To measure CO4, questions may be of the type- true/false with justification, theoretical fill in the blanks, theoretical problems, prove implications or corollaries of theorems, etc.
[5]	To measure CO5, some questions may be based on self-study topics and comprehension of unseen passages.

Building Construction and Design						
Course Code	CE-24003		**Examination Scheme**			
Teaching Scheme	3-0-2-1		**Theory**	TA: 20	MSE: 30	ESE: 50
Credits	3		**Laboratory**	CIE: 50	ESE: 50	--
Course Outcomes: Students will be able to:						
1. Demonstrate and use the principles and concepts related to building construction techniques and materials. 2. Select materials and apply appropriate construction methods in a given scenario. 3. Plan and design building as per rules, regulations, and acoustical factors. 4. Assess the functional and aesthetic requirements of different building types and propose improvements. 5. Develop integrated, innovative building designs that incorporate sustainable and energy efficient strategies.						

Introduction to building construction: Superstructure and Substructure	**[9 Hrs]**
Footings and foundation: Bearing capacity of soil and rock, necessity and concept of site investigation, Foundation types – shallow and deep and their suitability, setting out and layout of foundation plan, Damp proof course, basement construction, plinth filling and soling, under pinning. **Masonry Construction:** Stones and stone masonry. Stones – Requirements of good building stones, IS specification and tests on stones; Stone masonry – principal terms, Detailing of constructions – procedure for UCR and CR masonry, Mortar preparation, types of mortar, Pointing – Purpose and types. Brick and block masonry: Characteristics of good building bricks, IS specifications and test; Classification of bricks¬ silica, refractory, fire etc; Brick work – terms, types of bonds – English, Flemish, Stretcher, Header; Construction procedure, supervision, Openings in walls, mortar preparation; Block masonry – Hollow, solid, cavity wall construction; Scaffolding – types.	
Building materials	**[8 Hrs]**
Materials of doors and windows: types, glazing, method of fixing doors and windows, fixtures and fastenings. **Flooring materials tests and IS specifications:** Ground and upper floors; Flooring- functional requirements of flooring material, varieties of floor finishes and their suitability, construction details for concrete, tiles and stone flooring.	
Roofing materials and Protective coatings	**[8 Hrs]**
Roofing materials: GI, AC, fibre sheets, Mangalore tiles; Roof construction – types and their suitability, method of construction, types of trusses, types of shell structures, space and frame structures. **Protective coatings:** Plastering types and application, mortar; Painting and varnishing, types and application; Whitewashing, distempering, oil paints; Wall cladding – materials, methods of fixing, wall papering and glazing work.	
Principles of Building planning and Development Control Rule	**[9 Hrs]**
Principle of planning of Buildings, Principles of Architectural design – form, function, utility, aesthetics. Integrated approach in Built Environment, Building Rules and Byelaws. Necessity of laws, plot sizes, road width, open spaces, floor area ratio (F.A.R.), marginal distances, building line control line, height regulation, room sizes, types of area calculations – built-up area, floor area, carpet area, Rules for ventilation, lighting, drainage, sanitation and parking of vehicles ; Landscape elements and elements of interior decoration.	
Building Types, Layout, and Acoustics	**[8 Hrs]**
Noise and Acoustics: Effect of noise, comfort standards, noise control, sound insulation. Acoustics – reverberation, Sabine's formula, acoustical defects, conditions of good acoustics, sound absorbents, and acoustics for various types of buildings. **Building Types and layout details:** Planning of residential buildings – Load bearing / Framed Structure – (a) Bungalows (b) Row houses, (c) Ownership flats, (d) Apartments. Layout details , Elevation , sectional details.	
Planning of public buildings	**[8 Hrs]**
Functional requirements of public buildings. Following types of public buildings may be considered for planning. Educational Buildings, Hostel building with Rector's and servants' quarters, Lodge/Hotel building, Primary Health center with Hospital-staff quarters, factory building-Administrative block and factory, Bus Stand, Library building, Shopping complex, Health club, Marriage hall, auditorium, multiplex, sports complex, restaurant, vegetable market, post office, bank and any other.	
Text Books:	
[1]	Shah M.G., Kale C.M. and Patki S.Y., "Building drawing an Integrated approach to Built environment", Tata McGraw Hill (Fifth edition).
[2]	Mentt, "Building Design and Constructions", Tata McGraw Hill (Second edition) 3.
Reference Books:	
[1]	Schild E, Casselmann H.F., Dahmen G., Pohlenz R. "Environmental Physics in
[2]	Construction", Granada Publishing, London.

[3]	National Building Code of India 2005, Bureau of Indian Standard, New Delhi
[4]	Jain V.K. "Fire safety in Buildings" new Age International Publisher
[5]	Barrid, "Building Construction" Tata McGraw Hill, New Delhi
[6]	Ghosh, "Materials of Construction" Tata McGraw Hill
[7]	CBRI, Roorkee, "Building Construction manual '.
[8]	TTTI Chandigrah, "Civil Engineering Materials", Tata McGraw Publication
[9]	Callender," Times Savers Standards of Architectural Design Data", Tata McGraw Hill.
[10]	Unified Development Control and Promotion Regulation (UDCPR), 2020

Note:

[1] To measure CO1, questions may be of the type- define, identify, state, match, list, name etc.
[2] To measure CO2, questions may be of the type- explain, describe, illustrate, evaluate, give examples, compute etc.
[3] To measure CO3, questions will be based on applications of core concepts.
[4] To measure CO4, questions may be of the type- true/false with justification, theoretical fill in the blanks, theoretical problems, prove implications or corollaries of theorems, etc.
[5] To measure CO5, some questions may be based on self-study topics and comprehension of unseen passages.

Engineering Geology						
Course Code	CE-21003		**Examination Scheme**			
Teaching Scheme	2-0-1-1		**Theory**	TA: 20	MSE:30	ESE:50
Credits	3		**Laboratory**	CIE: 60	ESE: 40	--

Course Outcomes: Students will be able to:

1. Know the fundamental concepts leading to formation of the Earth; Rocks and Minerals
2. Develop the ability to perform basic engineering geological assessments and analysis.
3. Understand the relevance of Engineering Geology in complex projects which will strengthen their practical understanding of the subject.
4. Develop a native construction plan incorporating all relevant aspects of geology
5. To know the various types of Geological and Natural hazards.

Unit 1. General Geology & Physiographic **[6 Hrs]**

Introduction, Object, Scope & Sub-divisions, General Geology, Surface features, External & Internal Agents modifying the earth, weathering, decomposition, earth movements, metamorphism, General principles of stratigraphy, Age of the earth and divisions of the Geological time. Physiographic divisions of India and their characteristics. Geological history of Peninsula. Study of formations in Peninsula and the significance of their structural characters in major Civil engineering activities. Rock and minerals. Silicate and non-silicate minerals, rock forming minerals, primary and secondary minerals, essential and accessory minerals.

Unit 2. Petrology **[6 Hrs]**

Mineral composition of Igneous Rocks, Textures & textural variation, conditions of cooling of plutonic, hypabyssal and volcanic rocks. Classification of igneous rocks. Secondary Rocks processes and products of decomposition and disintegration. Transport and deposition, Classification of Sedimentary Rocks. Agents of transportation. Welding and cementation. Grain size classification. Agents and types of metamorphism,

Metamorphic textures, Contact cataclastic, dynamothermal and plutonic metamorphism. Study of common rock types of Igneous, Sedimentary, Metamorphic rocks as prescribed in practical work.

Unit 3. Geomorphology andStructural Geology	**[6 Hrs]**

Geological action of running water, river valley development, normal cycle of river erosion, Regional cycle of river erosion, waterfalls, ox-bow lakes, flood plain deposits, delta, Rejuvenation and Resulting features such as canyons, river terraces and incised meanders, Economic minerals. Outcrop. Dip and strike. Conformable series. Unconformity and overlap. Different types of Faults and folds in rocks. Inlier and Outlier. Modes of occurrence of igneous rocks. Joints Fractures and their engineering characters. Mountains-Mountain building activity, orogenic and epirogenic processes

Unit 4. Ground water, Building Stones and Stability of Slopes	**[4Hrs]**

Types of Ground water, Water table and depth zones of saturation. Influence of textures and Structures of rocks on groundwater storage and movement, Pervious and impervious rocks. Geological work of groundwater, effects of solution and deposition.

Requirements of good building stone. Dependence of strength, durability, Ease of dressing, availability of blocks of suitable size and appearance on mineral composition Textures and field structures. Suitability of common rocks as building stone.

Causes, Role of water, stability of slopes in consolidated material, influence of dip and slope, safe and unsafe slopes, Prevention of landslides, keeping slopes free from water, retaining walls Vegetation, slope treatment, Precautions to be taken while aligning roads etc. across hills and making cuts in hill slides. Case histories

Unit 5. Preliminary Geological Explorations& Rock Mechanics	**[8Hrs]**

Verification of surface data by subsurface exploration- Drill holes, test pits, trenches, exploratory tunnels, shafts, adits, drifts, etc. Compilation and interpretation of information obtained from these, Correlation of surface data with results of subsurface exploration. Limitations of drilling. Comparative reliability of data obtained by drilling and excavation. Engineering significance of Geological structures such as stratification, dips, folds, faults, joints, Fractures, crush zones, fault zones, dykes, etc. Case histories.

Introduction to Rock Mechanics in Engineering Geology, Classification of Rocks and Rock Masses Strength and deformability of jointed rock mass, Stability of rock slopes

Unit 6. Tunneling, Dams, Reservoirs, Bridges and Remote Sensing	**[8 Hrs]**

Influence of geological conditions on design and construction methods, Preliminary Geological investigations for tunnels. Unlined tunnels. Case histories. Dependence of strength, stability and water tightness of foundation rocks and their physical Characters and Geological structures. Influence of geological condition on the choice of type and design of dams. Preliminary geological work on dam sites. Favorable and unsuitable Geological conditions for locating a dam. Case histories Precaution to be taken to counteract unsuitable Condition, Treatment of leaky rocks faults, dykes, crush zones, joints, fractures, unfavorable Dips, etc. Preliminary geological work on Bridge sites. Favorable and unsuitable Geological conditions for locating a Bridge.

Preliminary geological work on Reservoir sites. Dependence of water tightness on physical properties and structure of rocks. Geological Conditions suitable and unsuitable for reservoir sites. Conditions likely to cause leakage through reservoir rims. Importance of

ground water studies and effects of raising of the water table. Case histories. Earth movements, Earthquakes, Earth quakes in regions of dams, Interior of the Earth, earthquake zones, Geological considerations for choosing sites of building in seismic area.	
Textbooks:	
[1]	R.B. Gupte: A Text Book of Engineering Geology (New Edition) ISBN:8185825033. – P.V.G. Publications, Pune
[2]	N. Chenna Kesavulu: A Text book of Engineering Geology. 2nd Edition, Macmillan Publishers India Ltd, 2009.
[3]	Parbin B Singh: Engineering and General Geology. 7thedition, S K Kataria & Sons. New Delhi, 2010.
[4]	G.B. Mahapatra: Text book of Physical Geology. CBS Publishers and Distributors India Pvt Ltd 2018.
Reference Books:	
[1]	R. Legget: Geology and Engineering – McGraw Hill Book Co., London
[2]	FGH Blyth, and M.H. De Freitas, Geology for Engineers, ELBS. ISBN 9780415502917
[3]	Engineering Geology and Construction; Fred G. Bell ;1st Edition2004 Taylor & Francis London.
[4]	Fundamentals of Rock Mechanics, Fourth Edition, April 2007; John Conrad Jaeger, Neville G. W. Cook, Robert Zimmerman ISBN: 978-0-632-05759-7 April 2007 Wiley-Blackwell.

International Standards						
Course Code	OEC-24020		**Examination Scheme**			
Teaching Scheme	2-0-0-1		**Theory**	TA: 20	MSE: 30	ESE: 50
Credits	2		**Laboratory**	CIE: 50	ESE: 50	--

Course Outcomes: Students will be able to:

1.Understand and Compare between Standards and specifications, standardization meaning & Standardization Bodies with their Frameworks

2. Identify core international standardization organizations and their roles.

3. Analyze how standards impact global trade, product design, and regulatory compliance.
4. Apply knowledge of standards in real-world case studies and quality management systems.

Introduction to Standardization & Standardization Bodies with their Frameworks **[6 Hrs]**

Introduction to Standards and Standardization: Definition and purpose of standards, Types of standards: voluntary vs. mandatory, History and evolution of standardization, Importance in trade and industry Definitions: Standards vs. specifications, Importance: Safety, quality, interoperability, trade facilitation. ISO: structure, committees, e.g., ISO/TCs, IEC, EN (European standards), ASME, AMISA, BIS (India) International Classification for Standards & International Standardization Bodies **:** ISO (International Organization for Standardization), IEC (International Electrotechnical Commission), ITU (International Telecommunication Union), ASTM International, IEEE ,etc., Role of WTO and TBT Agreement

ISO Standards Overview & Core International Standards **[6 Hrs]**

ISO 9000 series (Quality Management Systems), ISO 14000 series (Environmental Management Systems), ISO/IEC 27001 (Information Security), ISO 45001 (Occupational Health and Safety), Case studies and applications, ISO 128 – Technical drawing conventions , ISO 10303 (STEP) – Product data modeling/exchange , EN standards (EN ISO series): e.g., mechanical, medical devices,ASME B5 – machine tool tolerances and components, BIS role in harmonizing Indian standards with global benchmarks.

Standards Development Process of standardization **[6 Hrs]**

Stages of standard development (proposal, drafting, approval), Stakeholders in the standardization process, National participation and harmonization with global standards, Technical Committees and Working Groups, Mapping standards in subjects: e.g., technical drawings (ISO 128 in Engineering, Graphics), CAD/CAM (ISO 10303 in CAD), IS Codes in Civil Engineering, Laboratory applications: standard-guided experimentation and measurement. From proposal to publication: committee roles, drafts, ballots, Revision cycles—case studies: e.g., ISO 128's updates.

Application in Industry & Compliance **[6 Hrs]**

Implementing standards in product design, manufacturing, documentation, Compliance tools: certificates, audits, conformity assessment. Use of standards in manufacturing, IT, health, energy, etc., Quality assurance and standard compliance, Risk management and legal implications, Emerging trends in standardization (digital standards, sustainability, etc.)

Text Books:

[1]	Quality Management Systems: A Practical Guide to Standards Implementation by Ray Tricker.
[2]	ISO 9001, ISO 14001, and New Management Standards edited by Iñaki Heras-Saizarbitoria et al.

Reference Books:

[1]	Standardization: A New Discipline by Lal C. Verman, Original edition (1973), **ISBN-10:** 0208012850 , **ISBN-13:** 9780208012852,

[2]	Handbook of Quality System, Accreditation and Conformity Assessment – edited by Anuj Bhatnagar, Sanjay Yadav, Venugopal Achanta, et al.
[3]	Integrated Management System: Combining other standards with ISO 9001 by Frede Jensen.
[4]	International Standards for Design and Manufacturing by Nick Rich & F. Tegwen Malik.

Note:

[1] To measure CO1, questions may be of the type- define, identify, state, match, list, name etc.
[2] To measure CO2, questions may be of the type- explain, describe, illustrate, evaluate, give examples, compute etc.
[3] To measure CO3, questions will be based on applications of core concepts.
[4] To measure CO4, questions may be of the type- true/false with justification, theoretical fill in the blanks, theoretical problems, prove implications or corollaries of theorems, etc.
[5] To measure CO5, some questions may be based on self-study topics and comprehension of unseen passages.

Japanese

Course Code	**AS(HS)-24005**		**Examination Scheme**			
Teaching Scheme	2-0-0-1		**Theory**	TA: 20	MSE: 30	ESE: 50
Credits	02		**Laboratory**			--

Course Outcomes: Students will be able to:

1. Demonstrate an understanding of Design Thinking principles, experiential learning styles, and frameworks to identify and define real-world problems using user-centered research tools.
2. Apply structured inquiry and analysis techniques to define clear problem statements and generate innovative solution concepts through creative ideation methods.
3. Develop and refine prototypes using appropriate tools, materials, and human-centered design principles, showcasing proof of concept through iterative development.
4. Evaluate and implement design solutions through usability testing, business model development, and effective communication of design outcomes using structured presentation techniques.

Unit 1 **[2 Hrs]**

Introduction
Experiential Learning Styles, Self-assessment
Principles & Frameworks in Design Thinking
Design Process and Various Frameworks**,** Project Identification (SDGs)
Case Study: IDEO Shopping Cart

Unit 2 **[4 Hrs]**

Research & Empathize
Secondary Research & Primary Research**,** Understanding Users-Levels of Designs
Tools: Data gathering fromavailableresources;5W1H matrix, User mapping, Observations & Questionnaires, Contextual Inquiry,
Questionnaires, Empathy Interviews etc.
Case Study example

Unit 3 **[4 Hrs]**

Analyze and Define
Analysis of the data gathered-empathy and users**,** Structured inquiry (select, sort, cross-relate, prioritize, identify, visualize
Tools: Mappings, OIOR Table etc.
Case Study example

Unit 4 **[4 Hrs]**

Ideation
Brainstorming, Idea Sketching**,** Prioritizing Ideas & Creating concept maps**,** Redefine problem

statement **Tools** Divergent & Lateral Thinking, Challenging assumptions & breaking patterns, SCAMPER, HMW, POV/concept maps **Case Study example**	
Unit 5	**[4 Hrs]**
Build, Do and Prototype Nature & importance**,** Soft Prototypes-visual representation, Medium Prototype-User interaction with the design/concept, choosing the right technology & medium **Tools**: Rough sketches, drafts/mockups, MVP/POC/IA/XD **Case Study example**	
Unit 6	**[4 Hrs]**
Prototype Continued Hard Prototype-Introduction**,** Conceptual level-Human Factors/Ergonomics, Hi-fidelity design, System mapping, 3D printing/modeling **Case Study example**	
Unit 7	**[2 Hrs]**
Test and Implement Usability Studies-Iteration and final design, Feedback, re-design, re-create **Tools**: Observation, conversation, Thinkaloudprotocol, Usability Testing **Case Study example**	
Unit 8	**[2 Hrs]**
Final Presentation and Business Model Development Innovative Business Model**,** SWOT & SOAR analysis**,** Pitch presentation	
Reference Books:	
[1]	Norman, D. (2013). The Design of Everyday Things. Basic Books, NY.
[2]	Norman, D. (2004). Emotional Design. Basic Books, NY.
[3]	Brown, T. (2019). Change by Design. HarperCollins Publishers, NY.
[4]	Raskin, Jef. (2000). The Humane Interface: New Directions for Designing Interactive Systems. Addison-Wesley.
[5]	Kumar, V. (2012). 101 Design Methods. John Wiley & Sons.
[6]	Ulrich K. T., Eppinger S. D. (2008). Product design and development. New Delhi: McGraw-Hill Higher Education.
[7]	Buxton, W. (2007). Sketching user experiences: Getting the design right and the right design. Elsevier/Morgan Kaufmann.
[8]	Sanders, M. S., & McCormick, E. J. (1993). Human factors in engineering and design (7th ed.). McGraw-Hill Book Company.
[9]	Bridger R. S. (2008). Introduction to ergonomics. New York: CRC Press.
[10]	Lal, D. M. (2021). Design Thinking- Beyond the Sticky Notes. Sage Publications India Pvt. Ltd.

Sanskrit for Beginners: Language and Culture						
Course Code	**AS(HS)-24001**		**Examination Scheme**			
Teaching Scheme	2-0-0-1		**Theory**	TA: 20	MSE: 30	ESE: 50
Credits	02		**Laboratory**			--
Course Outcomes: Students will be able to:						
1. Remember and describe essential Sanskrit grammar principles (such as śabdākhyāna, sandhi, kāraka, samāsa), literary genres, philosophical schools, and scientific terminology. 2. Interpret and explain selected Sanskrit texts and shlokas, demonstrating understanding of their						

linguistic, philosophical, or cultural significance.
3. Apply Sanskrit expressions in oral communication and presentations, and interpret classical verses in contextualized, real-life scenarios.
4. Evaluate social values, ethical dilemmas, and management insights drawn from classical Sanskrit literature using analytical frameworks.
5. Create interdisciplinary projects or prototypes inspired by Sanskrit knowledge systems to propose innovative solutions to modern issues such as AI, governance, or social development.

Unit 1	**[6 Hrs]**
Sanskrit Language and Grammar Introduction to Sanskrit alphabets, sandhi, samāsa, tenses, and karaka. Functional vocabulary for modern contexts.	
Unit 2	**[6 Hrs]**
Scientific Literature in Sanskrit Excerpts from texts like *Vaisheshika Sutra*, *Aryabhatiya*, *Sushruta Samhita*, etc. Scientific terminologies and descriptions in Sanskrit.	
Unit 3	**[6 Hrs]**
Socially Relevant Topics Understanding ideas from *Arthashastra*, *Patanjali Yoga Sutra*, etc. Their application in contemporary policy and governance.	
Unit 4	**[6 Hrs]**
Value Education through Sanskrit Texts Selected verses from *Bhagavad Gita*, *Bhartrihari's Śatakatraya*, and *Panchatantra*. Ethical and moral reasoning, decision-making, and dharma.	
Unit 5	**[6 Hrs]**
Entrepreneurship, Startups & Internships Sanskrit literature references to business, trade, management (e.g., *Arthashastra*, *Mahabharata*). Project-based learning: Create a Sanskrit-based pitch or prototype idea.	

Reference Books:

[1]	Ashtadhyayi
[2]	Vyakaranvidhi NCERT Textbook
[3]	Mayamatam of Mayasur
[4]	Lilavati of Bhaskaracharya
[5]	Science in Sanskrit
[6]	Yajnyawalkya Smriti
[7]	PatanjalYogsutra
[8]	SarvadarshanSangraha
[9]	Neetishatak
[10]	Panchatantra
[11]	Arthashastra

Mandarin for Beginners: Language and Culture

Course Code	**AS(HS)-24006**		**Examination Scheme**			
Teaching Scheme	2-0-0-1		**Theory**	TA: 20	MSE: 30	ESE: 50
Credits	02		**Laboratory**			--

Course Outcomes: Students will be able to:

1. Recognize and pronounce basic Mandarin sounds, tones, and pinyin with reasonable accuracy.
2. Apply fundamental Chinese grammatical structures and sentence patterns to construct coherent simple sentences.
3. Read, write, and use commonly used vocabulary and simple everyday phrases in both spoken and written contexts.

4. Engage in basic conversations on topics such as self-introduction, family, food, travel, and shopping, by communicating meaningfully and responding to questions. *(Apply/Evaluate)* 5. Demonstrate cultural awareness by identifying Chinese traditions, festivals, etiquette, and contemporary aspects like economy and technology, and utilize digital tools to independently lookup pronunciation and meanings of unfamiliar characters.	
Unit 1	**[2 Hrs]**
Introduction to Mandarin Chinese: Overview, significance, script, regions	
Unit 2	**[4 Hrs]**
Pronunciation & Pinyin: Initials, finals, tones, tone rules, pronunciation drills	
Unit 3	**[5 Hrs]**
Basic Grammar & Sentence Structure: Word order, common verbs, measure words	
Unit 4	**[6 Hrs]**
Vocabulary Building: Greetings, numbers, family, food, shopping	
Unit 5	**[4 Hrs]**
Speaking & Listening Practice: Conversations, Role plays, Audio Comprehension	
Unit 6	**[3 Hrs]**
Reading & Writing Characters: Stroke order, radicals, character recognition	
Unit 7	**[3 Hrs]**
Chinese Culture & Real-life Usage: Festivals, etiquette, scenarios, traditions	
Unit 8	**[1 Hrs]**
Using Digital Tools: OCR dictionaries, handwriting input, translation apps	
Unit 9	**[2 Hrs]**
Review & Assessment: Practice exercises, oral test, feedback	
Reference Books:	
[1] Customized developed by Mrs.Yashodhara Gadgil, YinYang center for Chinese language, Pune	

French HS-24002						
Course Code	**AS(HS)-24004**		**Examination Scheme**			
Teaching Scheme	2-0-0-1		**Theory**	TA: 20	MSE: 30	ESE: 50
Credits	02		**Laboratory**			--
Course Outcomes: Students will be able to:						
1. Introduce themselves and others in French 2. Talk about their family 3. Understand the basics of French culture and civilization 4. Make basic affirmative, negative and interrogative sentences						
Unit 1						**[8 Hrs]**
❖ **Communication:** - Greetings - Introduction ❖ **Phonetics:**						

- Alphabets
- Rules of pronunciation

❖ **Vocabulary:**

Days of the week

- Months of the year
- Numbers

❖ **Grammar:**

- Basic sentence structure
- Definite and indefinite articles

Verbs (être – to be, and avoir – to have)

Unit 2	**[2 Hrs]**

❖ **Communication:**

- Introducing others
- Family relations, nationalities and professions

❖ **Vocabulary:**

- Family relations,

❖ **Grammar:**

- Possessive adjectives

Affirmative sentences

Unit 3	**[6 Hrs]**

❖ **Communication:**

- Talking about one's likes and dislikes
- Talking about one's hobbies

❖ **Vocabulary:** hobbies, likes and dislikes

❖ **Grammar:**

- Conjugation of "er" verbs in the Présent de l'Indicatif (regular verbs and sub-categories) + grammar exercises

Negative sentence (ne + verbe + pas)

Unit 4	**[4 Hrs]**

❖ **Communication :**

- Asking for and telling directions

❖ **Vocabulary:**

- Directions
- Means of transport

❖ **Grammar:**

- Conjugation of "ir" verbs in the Présent de l'Indicatif
- Verbs "aller" and "faire"

Articles contractés

- Prepositions

Unit 5	**[4 Hrs]**

❖ **Communication:**

- Talking about one's food habits

❖ **Vocabulary:**

- Foods (Vegetables, Fruits, Milk products, drinks)
- Ingredients
- Quantities

❖ **Grammar:**

- articles partitifs

"pas de / pas d'"

Unit 6	**[4 Hrs]**

❖ **Communication:**

- Talking about one's health

❖ **Vocabulary:** - Body parts - Some ailments - Expressions with "être" and "avoir" to talk about one's health ❖ **Grammar:** Interrogative sentences	
Unit 7	**[2 Hrs]**
❖ **Revision of concepts and addressing doubts**	

Spanish for Beginners: Language and Culture						
Course Code	**AS(HS)-24002**		**Examination Scheme**			
Teaching Scheme	2-0-0-1		**Theory**	TA: 20	MSE: 30	ESE: 50
Credits	02		**Laboratory**			--
Course Outcomes: Students will be able to: 1. Remember and describe essential facts about Spain and Latin America, including cultural traditions, geography, and socio-historical context. 2. Pronounce and use Spanish letters, basic greetings, and numerals up to 1000 accurately in spoken contexts. 3. Introduce and describe yourself and another person using simple sentences in present tense, employing third-person forms correctly. 4. Construct and respond to basic questions and statements to interact in classroom and everyday situations (e.g. asking time, placing an order, shopping interactions). 5. Interpret and engage in routine communicative scenarios - telling time, responding in service contexts, and showing cultural awareness of conversational norms						
Unit 1						**[4 Hrs]**
Greetings and introduction Alphabets, numbers, days and months, common expressions, greetings.						
Unit 2						**[4 Hrs]**
Basic Grammar Gender, plural forms, articles, question words, regular verbs, important verbs…. Ser, tener, llamarse.						
Unit 3						**[4 Hrs]**
Family and likes-dislikes Vocabulary of the family, possessive adjectives, Mi familia Describe person with some adjectives. Verbs: Gustar, encantar, interesar**.**						
Unit 4						**[4 Hrs]**
Comida Understanding Spanish cuisine, meal courses, names of the ingredients, conversation with the waiter in restaurant.						
Unit 5						**[4 Hrs]**
La compra Clothing, accessory, vocabulary, Demonstrative pronouns, how to ask about price, numbers till 1000						
Unit 6						**[4 Hrs]**
La rutinadiaria Mention time, daily routine, express frequency, reflexive verbs and other irregular verbs, sequence events or actions, describe daily routine						
Unit 7						**[2 Hrs]**
Oral and listening practice.						

Unit 8		**[2 Hrs]**
Revision		
Reference Books:		
[1]	Customized developed by Sharmili Joshi.	
[2]	Aula internacional 1 Jaime Corpas, Eva García, Agustín Garmendia, Neus Sans Baulenas (contributor), published by Goyal Publishers and Distributors Pvt. Ltd	
[3]	Gramática de uso del español.	

German for Beginners: Language and Culture						
Course Code	**AS(HS)-24003**		**Examination Scheme**			
Teaching Scheme	2-0-0-1		**Theory**	TA: 20	MSE: 30	ESE: 50
Credits	02		**Laboratory**			--
Course Outcomes: Students will be able to: 1. Remember and describe factual information about Germany and other German-speaking countries, including basic cultural elements and traditions. 2. Pronounce and use German letters, greetings, and numerals (up to 1000) with accurate pronunciation and basic computational fluency. 3. Introduce and describe oneself and another person using simple sentences and third-person forms in present-day contexts. *(Apply)* 4. Construct and respond to basic questions and statements to interact in classroom and daily scenarios (e.g., asking time, placing orders, shopping) 5. Navigate routine social situations by using appropriate language structures, comprehension of time-related expressions, and contextual cultural awareness.						
Unit 1						**[4 Hrs]**
Guten Tag! Greetings, self-introduction & partner introduction, nationalities, languages, alphabets, numbers.						
Unit 2						**[4 Hrs]**
Freunde, Kollegen und ich(Friends, colleagues and myself) Hobbies, Days of the week, months, season, professions, classroom objects & classroom communication.						
Unit 3						**[4 Hrs]**
Dining out Understanding German cuisine, meal course, names of the ingredients, conversation with the waiter and in the supermarket.						
Unit 4						**[4 Hrs]**
Uhrzeit (Timing) Mention time, describe daily routine, making appointments.						
Unit 5						**[4 Hrs]**
Grammatik (Grammar) Verb conjugations, WH-questions, personalpronouns, gender, articles, plural forms, negation						
Unit 6						**[4 Hrs]**
Vokabeln (Vocabulary) Family members, food items and supporting exercises, audios & videos.						
Unit 7						**[2 Hrs]**
Oral and listening practice.						
Unit 8						**[2 Hrs]**
Revision						
Reference Books:						
[1]	Customized developed by Neha Shah					

[2]	Netzwerk Neu A1 (Klettsprachen)

Environmental Studies						
Course Code	AS-24001		**Examination Scheme**			
Teaching Scheme	1-0-0-1		**Theory**	CIE:100		
Credits			**Laboratory**			--
Course Outcomes: Students will be able to:						
CO1: Aware about different sustainable techniques for conservation and management of natural resources and importance of studying sustainable development goals **CO2:** Aware about sources of different kinds of pollution and its types, sensitize themselves to adverse health impacts of pollution and knowing the techniques of pollution prevention and management **CO3:** Aware about factors impacting biodiversity loss and ecosystem degradation in India and the world & major conservation strategies taken in India, importance of biodiversity and their role in conserving biodiversity **CO4:** Aware about Climate change with reference to impacts, adaptation & mitigation strategies **CO5:** Learn about Environmental management system, Environmental legislation, policies, international treaties etc and our country's stand on and responses to the major international agreements. Major international institutions and programmes and the role played by them in the protection and preservation of the environment.						
Unit 1 Humans and the Environment						**[01 Hrs]**
Unit 2 Natural Resources and Sustainable Development, Environmental Issues: Local, Regional and Global						**[02 Hrs]**
Unit 3 Conservation of Biodiversity and Ecosystems						**[02 Hrs]**
Unit 4 , Environmental Pollution and Health						**[02 Hrs]**
Unit 5 Climate Change: Impacts, Adaptation and Mitigation,						**[02 Hrs]**
Unit 6 Environmental Management						**[02 Hrs]**
Unit 7 Environmental Treaties and Legislation						**[02 Hrs]**
Unit 8 Case Studies and Field Work						**[01 Hrs]**
Text Books:						
Hughes, J. Donald (2009) An Environmental History of the World-Humankind's Changing Role in the Community of Life, 2nd Edition. Routledge.						
Gilbert M. Masters and W. P. (2008). An Introduction to Environmental Engineering and Science, Ela Publisher (Pearson)						
Rajagopalan, R. (2011). Environmental Studies: From Crisis to Cure. India: Oxford University Press.						
Krishnamurthy, K.V. (2003) Textbook of Biodiversity, Science Publishers, Plymouth, UK						

Jackson, A. R., & Jackson, J. M. (2000). Environmental Science: The Natural Environment and Human Impact. Pearson Education.
Pittock, Barrie (2009) Climate Change: The Science, Impacts and Solutions. 2nd Edition. Routledge

Community Engagement Activity (CEA) / Field Project						
Course Code	**AS-24004**		**Examination Scheme**			
Teaching Scheme	**0-0-4-0**		**Theory**	**TA:**	**MSE:**	**ESE:**
Credits	**1**		**Laboratory**	**CIE: 100**	**ESE:**	

Course Outcomes: Students will be able to:

1. Identify community-level civil engineering problems through field observations.
2. Apply civil engineering principles to analyze local infrastructure issues.
3. Demonstrate effective communication with community stakeholders.
4. Propose simple and feasible engineering solutions for identified problems.
5. Present findings using basic technical reports and visual tools.
6. Recognize ethical and social responsibilities in community-based engineering work..

LIST OF ASSIGNMENTS

Assignment 1: Community Survey & Problem Identification. (Understand local issues through direct interaction.)

- Select a locality (urban slum / rural village / campus surroundings).
- Conduct a structured survey (minimum 25–30 households).

A. Identify issues related to:

- Water supply
- Drainage
- Roads
- Solid waste management

B. Prepare:

- Survey questionnaire
- Data summary (charts/tables)
- List of key problems (ranked)

Assignment 2: Infrastructure Mapping (Develop field observation and mapping skills)

A. Prepare a layout map of the selected area showing:

- Roads
- Drainage system
- Water supply lines (approximate)
- Waste disposal points

B. Use:

- Manual sketch / Google Maps / basic GIS tools

- Assignment 3: Problem Analysis & Data Collection (Apply engineering basics to analyze issues.)

A. Select one major problem (e.g., water logging, poor roads).

B. Collect relevant data such as:

- Road condition survey
- Drainage slope observation

- Water quality (basic tests if possible)

C. Identify causes of the problem.

Assignment 4: Solution Development -Engineering Proposal (Design practical and feasible solutions.)

A. Propose 2–3 alternative solutions.

B. Include:

- Sketches / drawings
- Basic calculations (if applicable)
- Approximate cost estimation

C. Select the best solution with justification.

Assignment 5: Community Interaction & Awareness Activity (Improve communication and social engagement.)

A. Conduct one activity such as:

- Awareness campaign (waste management / water conservation)
- Demonstration (rainwater harvesting model)

B. Collect community feedback.

Assignment 6: Final Report & Presentation (Documentation and professional communication.)

A. Prepare a comprehensive report including:

- Survey findings
- Mapping
- Problem analysis
- Proposed solutions
- Community feedback

B. Presentation/viva.

Textbooks:

[1]	Civil Engineering for the Community, Dennis Randolph, 1st Edition-1993, American Society of Civil Engineers (ASCE), ISBN-0872628450.
[2]	Basics of Civil Engineering, 1st Edition (2014), New Age International Publishers, ISBN-978-8122435597.
[3]	Civil Engineering: Conventional and Objective Type, R. S. Khurmi, J. K. Gupta, 2018 Edition, S. Chand & Company Ltd, ISBN-978-8121926058
Reference Books:	
[1]	Fundamentals of Civil Engineering: An Introduction to the ASCE Body of Knowledge, Richard H. McCuen, Edna Z. Ezzell, Melanie K. Wong, 1st Edition-2011, Taylor & Francis, ISBN- 978-1439851487.
[2]	Humanitarian Civil Engineering: Practical Solutions, Georgia Kremmyda, 1st Edition-2021, Emerald Publishing, ISBN-978-0727764683 .
[3]	Engineering in Plain Sight: An Illustrated Field Guide, Grady Hillhouse, 1st Edition-2022, No Starch Press, ISBN- 978-1718502321.

Principles of Economics						
Course Code	HS-24004		**Examination Scheme**			
Teaching Scheme	2-0-0-1		**Theory**	TA:	MSE:	ESE:
Credits	2		**Laboratory**			--
Course Outcomes: Students will be able to:						
1. learn basic tools and techniques of Economic Analysis. 2. analyze and interpret economic events of common interest. 3. learn basic concepts relating to the measurement of National Income, and Cost of Living 4. learn about various types and measures of Unemployment; Money in the Economy and the Monetary System						
Unit 1 Ten Principles of Economics (chapter 1)						**[02 Hrs]**

Unit 2 Thinking like an Economist (chapter 2)	**[02 Hrs]**
Unit 3 The Market Forces of Supply and Demand (chapter 4)	**[02 Hrs]**
Unit 4 Elasticity and Its application (chapter 5)	**[04 Hrs]**
Unit 5 Consumers, Producers and the efficiency of the markets (chapter 7)	**[02 Hrs]**
Unit 6 The costs of production (chapter 13)	**[02 Hrs]**
Unit 7 Market structure (chapter 14-17)	**[02 Hrs]**
Unit 8 Measuring a Nation's Income(chapter23)	**[02 Hrs]**
Unit 9 Measuring the cost of living (chapter24)	**[02 Hrs]**
Unit 10 The Monetary system(chapter29)	**[04 Hrs]**
Unit 11 The public economics: externalities, public goods and design of the tax system (chapters 10-12)	**[02 Hrs]**
Unit 12 Open economy: the basic concepts (chapter 31)	**[02 Hrs]**
Text Books:	
[1]	N Gregory Mankiw (2012); "Principles of Economics", 6th Edition, South Western Cengage Learning, ISBN-13:978-0-538-45305-9 (hereafter, Mankiw, 2012, 6e).
Reference Books:	
[1]	Satish Deodhar: Everyday Economics

Matrices, Differential Calculus and Probability (MDCP)						
Course Code	HS-24004		**Examination Scheme**			
Teaching Scheme	3-0-0-1		**Theory**	TA: 10	MSE: 30	ESE: 60
Credits	3		**Laboratory**			--

Course Outcomes: Students will be able to:

1. Define matrices, linear equations, and determinants, recall basics of probability theory, probability distribution, gradient, divergence and curl, Laplace Transform, ODE and PDE.
2. Identify types of ordinary differential equations and partial differential equations, state the formulae for Fourier coefficients, basic concepts of probability, probability distributions, Laplace Transform.
3. Solve ODEs and PDEs, find Fourier series expansions, analyze, and calculate eigen values, eigen vectors, evaluate probability of compound events, find probabilities using standard distributions, solve ODE using Laplace Transform.
4. Prove theorems, solve theoretical problems.
5. Apply concepts of ODE and PDE, Matrix algebra, Calculus and Probability to various problems including real life problems.

Matrix Algebra	**[6 Hrs]**
Properties of Matrices and Determinants, Solutions of Systems of linear equations using Gauss Elimination method, Eigen Values and Eigen Vectors. S: Properties of Matrices and Determinants	
Vector Differential Calculus	**[6 Hrs]**
Functions of several variables (Domain and Range), Partial Derivatives, The Chain Rule, Vector differentiation, gradient, divergence, and curl. S: Review of Vector Algebra	
Ordinary Differential Equations	**[12 Hrs]**
First order Ordinary Differential Equations - Variable Separable, Homogeneous, Linear; Higher order linear equations with constant coefficients, non-homogeneous higher order linear differential equations with constant coefficients: method of variation of parameters; Applications to Initial value problems: Simple Electrical Circuits. Definition of Laplace Transform, Laplace Transform of standard functions, basic properties to solve ODE: linearity and LT of derivatives. S: First order Ordinary Differential Equations - Variable Separable, Homogeneous ODEs	
Partial Differential Equations	**[8 Hrs]**
Fourier Series; Partial differential equations. Initial and Boundary value problems by separation of variables method, boundary value problems: Vibration of string: one dimensional wave equation. S: Types of PDEs	
Probability	**[7 Hrs]**
Mean, median, mode, standard deviation, combinatorial probability, compound, and conditional probability. Probability distributions, Binomial distribution, Poisson distribution, Normal distribution. S: Compound and conditional probability	

Text Books:	
[1]	Advanced Engineering Mathematics (10th edition) by Erwin Kreyszig, Wiley Eastern Ltd.
[2]	Thomas's Calculus (12th edition) by Maurice D. Weir, Joel Hass, Frank R. Giordano, Pearson Education.
Reference Books:	
[1]	Calculus for Scientists and Engineers by K.D Joshi, CRC Press.
[2]	A course in Calculus and Real Analysis (1st edition) by Sudhir Ghorpade and Balmohan Limaye, Springer-Verlag, New York.
[3]	Applied Mathematics Vol.1 (Reprint July 2014) by P.N. Wartikar and J.N. Wartikar, Pune Vidhyarthi Griha Prakashan Pune.
Note:	
[1]	To measure CO1, questions may be of the type- define, identify, state, match, list, name etc.
[2]	To measure CO2, questions may be of the type- explain, describe, illustrate, evaluate, give examples, compute etc.
[3]	To measure CO3, questions will be based on applications of core concepts.
[4]	To measure CO4, questions may be of the type- true/false with justification, theoretical fill in the blanks, theoretical problems, prove implications or corollaries of theorems, etc.
[5]	To measure CO5, some questions may be based on self-study topics and comprehension of unseen passages.

Semester IV

Geotechnical Foundation Engineering						
Course Code	CE-24005		**Examination Scheme**			
Teaching Scheme	3-0-2-1		**Theory**	TA: 20	MSE: 30	ESE: 50
Credits	3		**Laboratory**	CIE: 50	ESE: 50	--
Course Outcomes: Students will be able to:						
1. Demonstrate the characteristics and classification of soil types, and the principles of the three-phase soil system 2. Apply testing methods to determine soil characteristics. 3. Analyze soil stresses and bearing capacity. 4. Evaluate slope stability and earth pressure theories. 5. Create integrated foundation design solutions for complex geotechnical challenges.						
Properties of Soil						**[7 Hrs]**
Introduction to Soil Mechanics, major soil deposits of India such as marine deposits, black cotton soils, lateritic soils, alluvial deposits and desert soils. Three phase soil system, weight volume						

relationships, index properties of soil - methods of determination and its significance, I.S. classification of soil. Soil structure: single grained and honey combed, flocculated and dispersed.

Permeability and Seepage **[7 Hrs]**

Darcy's law, Factors affecting permeability, Determination of permeability by constant head and falling head method as per IS - 2720, field test as per IS – 5529 (part I) - pumping in test and pumping out test. Permeability of layered soils, Seepage forces, General flow equation. Flow net and its application.

Compaction **[7 Hrs]**

Soil compaction phenomenon, Factors affecting compaction. Dry density and moisture content relationship. Zero air voids line, Effect of compaction on soil structure. Standard Proctor test and Modified Proctor test as per IS – 2720. Field compaction equipment and methods for cohesive and non-cohesive soils

Shear Strength of Soil **[7 Hrs]**

Mohr's circle, Mohr-coulomb failure criteria, Effective stress concept. Peak and residual shear strength. Factors affecting shear strength. Laboratory measurement of shear strength by direct, unconfined and triaxial tests under different drainage conditions. Vane shear test.

[7 Hrs]

a) Stress Distribution in Soils:
Boussinesq theory- point load, pressure distribution due to line load, strip load, pressure bulb, Westergaard's theory, contact pressure, approximate stress distribution method.
b) Bearing Capacity of Foundation:
Types of foundations, Terzaghi's and Meyerhoff bearing capacity analysis, effect of various BC factor on bearing capacity, Shear failure and Settlement criteria, Pile foundation. Use of field test (SPT and Plate Load) data for bearing capacity determination.

[7 Hrs]

a) Lateral Earth Pressure:
Earth pressure on vertical wall, effect of wall movement on earth pressure, earth pressure at rest, Rankine's theory, lateral earth pressure due to submerged backfill, backfill with uniform surcharge, backfill with sloping surface, Coulomb's theory.
b) Stability of Slopes:
Slope classification, slope failure, modes of failure. Infinite slope in cohesive and cohesion less soil, slope stability analysis using Swedish Slip Circle Method

Text Books:

[1]	opal Ranjan and A S Rao, "Basic and Applied Soil Mechanics", G. K. Publications pvt. Ltd
[2]	V. N. S. Murthy, "Soil Mechanics and Foundation Engineering", B.S.Publications (3rd Edition)
[3]	B. C. Punmia, "Soil Mechanics and Foundation Engineering", Laxmi Publishing Co., New Delhi.
[4]	Dr. B. J. Kasmalkar,"Geotechnical Engineering", Pune Vidyarthi Griha Prakashan, 1986

Reference Books:

[1]	Joseph E Bowles, "Engineering Properties of Soils and Their Measurements", McGraw Hill
[2]	Publications (2001)
[3]	Lambe and Whitman, "Soil Mechanics", S. Chand publications(SI Version),(1969).
[4]	Donald P Coduto, Man-chu Ronald Yeung and William A. Kitch "Geotechnical Engineering Principle and practice", McMillan Press (PHI) (2010)
[5]	P Purushothma Raj, "Geotechnical Engineering", McGraw Hill Publication 4th Edition (2008)

Note:

[1]	More emphasis would be given on basic fundamentals in the course work.
[2]	Tutorial 1-Based on basic index properties of soil.
[3]	Tutorial 2- Permeability of soil
[4]	Tutorial 3-Permeability of layered soil and seepage forces

[5]	Tutorial 4- Compaction
[6]	Tutorial 5- Shear strength of soil
[7]	Tutorial 6- Stress distribution of soil
[8]	Tutorial 7- Bearing capacity determination of shallow foundation.
[9]	Tutorial 8- Problems based on earth pressure determination for various condition. Tutorial 9- Slope stability.

Concrete Technology						
Course Code	CE-24006		**Examination Scheme**			
Teaching Scheme	3-0-2-1		**Theory**	TA: 20	MSE: 30	ESE: 50
Credits	3		**Laboratory**	CIE: 50	ESE: 50	--

Course Outcomes: Students will be able to:

1. Apply checks for quality of ingredients.
2. Determine quantities of ingredients for different concrete grades.
3. Design mix proportions of different ingredients.
4. Determine the properties of fresh concrete.
5. Evaluate the properties of hardened concrete.

Ingredients of Concrete **[6 Hrs]**

Cement: -Manufacture of Portland cement, Chemical composition, Hydration of cement, Classification and types of cement, Tests on cement.
Aggregate: -Classification, Mechanical and Physical properties, Deleterious Materials, Soundness, Alkali aggregate reaction, Grading of Aggregates, Tests on aggregate, Artificial and Recycled aggregate.
Water: -Mixing Water, Curing water, Tests on water.

Fresh Concrete **[6 Hrs]**

Workability: Factors affecting workability, measurement of workability, cohesion and segregation, bleeding, Mixing, Transporting, Placing, and Compaction of concrete Curing, Methods of curing, Influence of temperature, Maturity rule, Steam curing.

Hardened concrete **[7 Hrs]**

Strength of concrete – General, Factors affecting strength, Micro cracking and stress strain relation, other strength properties, Relation between tensile and compression strengths, impact strength, Resistance to abrasion.
Elasticity, Creep, and Shrinkage
Non-Destructive Testing Rebound hammer, Ultra Sonic Pulse Velocity, Impact echo test**.**

Concrete Mix Design **[7 Hrs]**

Factors to be considered, Statistical quality control, Methods of Mix Design IS(10262), and DOE, High strength concrete, Acceptance criteria for concrete as per IS specifications.

Admixtures in concrete **[7 Hrs]**

Functions, Classification, Types, Mineral and Chemical.

a) Chemical Admixtures: Plasticizers, Super plasticizers, Retarders, Air entraining agents, IS Specifications (9103), Compatibility of Admixtures, Marsh Cone test.
b) Mineral Admixtures: Fly ash, Silica Fume, GGBS, Rice husk ash.

Special Concretes and Durability of concrete **[7 Hrs]**

a) Special Concretes: Light weight concrete, Polymer concrete, Fibre reinforced concrete, High performance concrete, Pumped concrete, Ready mixed concrete, Roller compacted concrete, Ferrocement.
b) Durability of concrete: Significance, Permeability and Durability, Chemical Attack, Sulphate attack, Attack by Seawater, Acid attack, Chloride attack, Carbonation of concrete and its determination

Text Books:

[1]	M. L. Gambhir, “Concrete Technology”, Tata McGraw Hill Publications

Structural Mechanics

[2]	M. S. Shetty, “Concrete Technology”, S. Chand Publications
Reference Books:	
[1]	A. M. Neville, J. J. Brooks, “Concrete Technology” Pearson Education India
[2]	A. M. Neville, “Properties of Concrete”, Pearson Education India.
[3]	R.S. Varshney, “Concrete Technology”, Oxford and IBH.
[4]	P. Kumar Mehta, “Microstructure and properties of concrete”, Prentice Hall.SP-26

Concrete Technology Laboratory
The laboratory consists of any 8 experiments from PART A whereas PART B is compulsory.
PART A: List of Experiments 1. Test on Cement: Fineness, Standard Consistency, and Setting time, 2. Test on Cement : Soundness and Compressive strength 3. Test on Aggregate: Sp. Gravity, porosity, bulk density and void ratio of CA and FA 4. Test on Aggregate : Sieve analysis of FA and CA, Flakiness Index of CA 5. Test on Aggregate: Aggregate Impact value and Aggregate crushing value. 6. Test on fresh concrete: Workability tests (slump, compaction factor, veebee, flow table) 7. Test on fresh concrete: Effect of Admixtures on workability and setting time of concrete (Super plasticizers and retarders) 8. Concrete mix design: Using IS code / DOE method. 9. Test on hardened concrete: Compressive strength, split Tensile strength and Modulus of Rupture, Young’s modulus of concrete.
PART B: Site Visit 1. NDT Project (using rebound and ultrasonic pulse velocity tests) on any site under construction with a short report.

Course Code	CE-24007		Examination Scheme			
Teaching Scheme	3-0-2-1		Theory	TA: 20	MSE: 30	ESE: 50
Credits	3		Laboratory	-	-	--

Course Outcomes: Students will be able to:

1. Understand basic concepts of structural analysis, structural forms, and indeterminacy.
2. Apply energy methods such as Unit Load Method and Castigliano's theorems for deflection analysis.
3. Analyze determinate and indeterminate structures using energy and compatibility methods.
4. Analyze continuous beams using slope deflection and moment distribution methods.
5. Evaluate influence lines and analyze structures under moving loads.

Unit 1: Basic Concepts and Structural Idealization - Basic concepts of structural analysis, types and classification of structures based on structural forms (skeletal, surface and three-dimensional structures), concept of static and kinematic indeterminacy, degrees of freedom.	**[6 Hrs]**
Unit 2: Strain Energy and Energy Principles - Concept of strain energy due to axial force, shear force, bending moment and torsion, energy methods in structural analysis, Unit Load Method, Castigliano's theorems, Maxwell's reciprocal theorem and Betti's law.	**[6 Hrs]**
Unit 3: Deflection of Determinate Structures - Deflection of beams and rectangular portal frames using Unit Load Method and Castigliano's theorem, deflection of determinate trusses using Castigliano's theorem and virtual work principle.	**[6 Hrs]**
Unit 4: Analysis of Indeterminate Structures by Energy Methods - Analysis of indeterminate beams, trusses and rectangular portal frames using Castigliano's theorem and compatibility methods, effects of temperature change, lack of fit and support settlements (sinking of supports).	**[7 Hrs]**
Unit 5: Classical Methods for Indeterminate Structures - Analysis of continuous beams (up to three degrees of indeterminacy) including sinking of supports and rotational yielding using slope deflection method and moment distribution method.	**[7 Hrs]**
Unit 6: Influence Lines and Moving Loads - Basic concept of influence lines, application of Muller-Breslau principle, influence line diagrams for reactions, shear force and bending moment in beams, rolling loads including UDL and series of concentrated loads, conditions for maximum shear force and bending moment, absolute maximum bending moment, equivalent UDL, influence line diagrams for truss reactions and member forces in plane determinate trusses.	**[7 Hrs]**

Textbooks:

[1]	Hibbeler, R.C., 2017. *Structural Analysis*. 10th ed. Harlow: Pearson.
[2]	Kassimali, A., 2018. *Structural Analysis*. 5th ed. Boston: Cengage Learning.
[3]	Timoshenko, S.P. and Young, D.H., 1965. *Theory of Structures*. 2nd ed. New York: McGraw-Hill.
[4]	Reddy, C.S., 2017. *Basic Structural Analysis*. 3rd ed. New Delhi: Tata McGraw-Hill.
[5]	Bhavikatti, S.S., 2019. *Structural Analysis*. Vol. 1 & 2. New Delhi: Vikas Publishing House.
[6]	Bansal, R.K. and Goel, A.K., 2010. *Structural Analysis*. New Delhi: Laxmi Publications.

Note:

[1]	To measure CO1, questions may be of the type- define, identify, state, match, list, name etc.
[2]	To measure CO2, questions may be of the type- explain, describe, illustrate, evaluate, give examples, compute etc.
[3]	To measure CO3, questions may be of the type- explain, describe, illustrate, evaluate, give

	examples, compute etc.
[4]	To measure CO4, questions may be of the type- true/false with justification, theoretical fill in the blanks, define, state etc.
[5]	To measure CO5, some questions may be based on self-study topics and state, identify describe etc.

Sustainable Finance						
Course Code	OEC-24017		**Examination Scheme**			
Teaching Scheme	2-0-0-1		**Theory**	TA: 20	MSE: 30	ESE: 50
Credits	2		**Laboratory**	-	--	--

Course Outcomes: Students will be able to:

1. To understand the principles of sustainable finance and their relevance to civil engineering projects.
2. To analyze the economic, environmental, and social impacts of engineering projects.
3. To explore financing models for sustainable infrastructure development.
4. To develop decision-making skills using tools like cost-benefit analysis, life cycle costing, and green financing options.

Unit 1: Introduction to Sustainable Finance	**[4 Hrs]**
Definition and importance of sustainable finance, Global trends and policies in sustainable finance, Relevance of sustainability in civil engineering.	
Unit 2: Introduction to Finance for Civil Engineers	**[6 Hrs]**
Importance of Finance in Civil Engineering**,** Financial Terminologies: Revenue, Costs, Profit, Investments**,** Types of sustainable investments (e.g., impact investing, green bonds, socially responsible investing), Overview of Engineering Project Economics, Preparing a Bill of Quantities (BoQ),	
Unit 3: Principles of Sustainable Development in Civil Engineering	**[4 Hrs]**
The initiatives to support a sustainable future, Developing ideal strategies towards a sustainable future, Environmental, Social, and Governance (ESG) frameworks, Case study on ESG Impact on Performance. Life cycle assessment (LCA) of environmental impacts.	
Unit 4: Green Financing Mechanisms & Policy, Regulations, and Certifications	**[4 Hrs]**
Role of Governments & regulatory bodies, How Banks & investors promote Sustainable finance, International and national policies on sustainable finance, Certifications in green construction (LEED, BREEAM, etc.).	
Self-Study (SS):	**[4 Hrs]**
Case studies of policy-driven sustainable projects, Green-bonds and sustainability-linked loans, Sources of Finances- Government Private, Public-Private Partnership (PPP) models for sustainable projects	

Reference Books:

1. Infrastructure Finance in India by Pratap Kumar Ghosh
2. Sustainable Finance and CSR: Theory and Practice by M. Maruthanayagam and S. Premavathy
3. Sustainable Construction and Building Materials by M. S. Shetty
4. Sustainable Investing: Revolutions in Theory and Practice by Cary Krosinsky and Nick Robins
5. Sustainable Engineering Economics and Project Evaluation by David M. Whitman, Ronald E. Terry

Note:

1. To measure CO1, questions may be of the type- define, identify, state, match, list, name etc.
2. To measure CO2, questions may be of the type- explain, describe, illustrate, evaluate, give examples, compute etc.

3. To measure CO3, questions will be based on applications of core concepts.
4. To measure CO4, questions may be of the type- true/false with justification, theoretical fill in the blanks, theoretical problems, prove implications or corollaries of theorems, etc.
5. To measure CO5, some questions may be based on self-study topics and comprehension of unseen passages.

Design Thinking						
Course Code	HS-24005		**Examination Scheme**			
Teaching Scheme	1-0-2-1		**Theory**	TA: 20	MSE: 30	ESE: 50
Credits	2		**Laboratory**	CIE: 100	ESE: --	--

Course Outcomes: Students will be able to:

6. Identify local and global effects of pollution and suggest control measures.
7. Identify atmospheric stability conditions and relate them to transport of air pollutants and design of stack under given conditions.
8. Analyze data and problems of noise, odour pollution & solid waste management.
9. Prepare stages of environmental impact assessment.
10. Design the flow diagram for water and wastewater treatment process.

Design process: **[5 Hrs]**

Traditional design, Design thinking, Existing sample design projects, Study on designs around us, Compositions/structure of a design, Innovative design: Breaking of patterns, Reframe existing design problems, Principles of creativity Empathy: Customer Needs, Insight-leaving from the lives of others/standing on the shoes of others, Observation

Design team: **[5 Hrs]**

Team formation, Conceptualization: Visual thinking, Drawing/sketching, New concept thinking, Patents and Intellectual Property, Concept Generation Methodologies, Concept Selection, Concept Testing, Opportunity identification Prototyping: Principles of prototyping, Prototyping technologies, Prototype using simple things, Wooden model, Clay model, 3D printing; Experimenting/testing.

Sustainable product design: **[5 Hrs]**

Ergonomics, Semantics, Entrepreneurship/business ideas, Product Data Specification, Establishing target specifications, Setting the final specifications. Design projects for teams.

Laboratory assignments

3. Introduction to Design Thinking & Design Process
4. Study of Designs Around Us
5. Composition & Structure of Design
6. Innovative Design – Breaking Existing Patterns
7. Empathy Mapping & User Observation
8. Visual Thinking & Conceptual Sketching
9. Sustainable Product Design

Textbooks:

[1]	Tim Brown, Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation, HarperCollins Publishers Ltd.
[2]	Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013
[3]	Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve – Apply", Springer, 2011

Reference Books:

[1]	Brenda Laurel Design Research methods and perspectives MIT press 2003.
[2]	Terwiesch, C. & Ulrich, K.T., 2009. Innovation Tournaments: creating and identifying Exceptional Opportunities, Harvard Business Press.
[3]	Ulrich &Eppinger, Product Design and Development, 3rd Edition, McGraw Hill, 2004

[4]	Stuart Pugh, Total Design: Integrated Methods for Successful Product Engineering, Bjarki Hallgrimsson, Prototyping and model making for product design, 2012, Laurence King Publishing Ltd
[5]	Kevin Henry, Drawing for Product designers, 2012, Laurence King Publishing Ltd

MDM-01 Construction Materials and Building Design						
Course Code			**Examination Scheme**			
Teaching Scheme	3-0-0-1		**Theory**	TA: 20	MSE: 30	ESE: 50
Credits	3		**Laboratory**			--

Course Outcomes: Students will be able to:

1. Identify different building materials and their uses in construction sector.
2. Demonstrate properties of different construction material.
3. Apply various principles of building planning and building design.
4. Select proper material in a particular condition.

Building materials **[6 Hrs]**

a) Stones: Stones Requirements of good building stones, IS specification and tests on stones; stone masonry
b) Brick and block masonry: Characteristics of good building bricks, IS specifications and test; Classification of bricks

Materials for Doors and windows **[6 Hrs]**

Functional requirements, materials of doors and windows, glazing, method of fixing doors and windows, fixtures and fastenings.
Timber Types and properties, seasoning, testing; Glass – Types and properties

Flooring and Roof material **[7 Hrs]**

a) Flooring materials, tests and IS specifications: Ground and upper floors; Flooring functional requirements of flooring material, varieties of floor finishes and their suitability.
b) Roofing materials: GI, AC, fibre sheets, Mangalore tiles; Roof construction – types and their suitability.

Miscellaneous materials **[6 Hrs]**

Properties, types and uses of following materials, Lime, Ferrous metals, Polymers, Plastics types Mastic, Gypsum, Ferro Crete, Clay Tiles and glazed ware, Plaster of Paris.
Artificial stone; Aluminum and alloys– Properties.

Building planning **[8 Hrs]**

Principle of Building planning, Integrated approach in Built Environment, Building Rules and Byelaws, Necessity of laws, plot sizes, road width, open spaces, floor area ratio (F.A.R.), marginal distances, building line control line, height regulation, Builtup area, floor area, carpet area, Landscape elements and elements of interior decoration.

Building Design **[7 Hrs]**

Introduction, Types of load, thermal insulation of roofs and walls. Ventilation: Necessity of ventilation, stack effect, wind effect, Mechanical ventilation, objectives, selection of ventilation system, ventilation rate
Lighting**:** Principles, Day lighting, design of windows, sky component, E.R.C, Orientation, artificial illumination, supplementary illumination

Text Books:

[1]	Shah M.G., Kale C.M. and Patki S.Y., "Building drawing an Integrated approach to Built environment", Tata McGraw Hill (Fifth edition).
[2]	Mentt, "Building Design and Constructions", Tata McGraw Hill (Second edition)

Reference Books:

[1]	National Building Code of India 2016, Bureau of Indian Standard, New Delhi
[2]	Ghosh,"Materials of Construction" Tata McGraw Hill
[3]	M. S. Mamlouk and J. P. Zaniewski, Materials for Civil and Construction Engineers, 3rd Ed.,

	Prentice Hall, USA, 2010.
[4]	P. C. Varghese, Building Materials, PHI Learning Pvt. Ltd., India, 2005.
[5]	TTTI Chandigarh, “Civil Engineering Materials”, Tata McGraw Publication

Environmental Sustainability						
Course Code	3-0-0-1		**Examination Scheme**			
Teaching Scheme	2Hrs		**Theory**	TA: 20	MSE: 30	ESE: 50
Credits	03		**Laboratory**			--

Course Outcomes: Students will be able to:

1. Explain ecosystem concepts, biodiversity, and human environment interactions.
2. Apply pollution control and waste management methods.
3. Analyze renewable energy systems and sustainability challenges.
4. Evaluate climate change, carbon footprint, and sustainability frameworks.
5. Explain environmental policies and sustainable practices.

Environmental Systems and Human Interactions

Environment: Definition, components: biotic and abiotic, ecology and ecosystem: definition, scope, functional units, structure, components, functions of ecosystem; Productivity, Energy Flow, Nutrient Cycle, Decomposition, Human–Environment Interaction; Historical Perspective of Human–Environment Relationship, Global Environmental Change, Environmentalism and Philosophical Perspectives, Biodiversity; Importance of biodiversity, Threats to biodiversity and conservation, need for public awareness.

Environmental Pollution

Causes, Effects and Preventive measures of Water, Soil, Air and Noise Pollutions. Solid and E-Waste management.

Renewable Sources of Energy

Energy management and conservation, New Energy Sources: Need of new sources. Bioenergy: Biofuels (ethanol, biodiesel, biogas), Biomass (solid, liquid, gaseous forms), Algae biofuels, Biomass gasification, New energy sources: Geothermal energy, Ocean energy sources, Tidal energy conversion, Hydrogen energy.

Sustainability

Sustainability- concept, needs and challenges-economic, social and aspects of sustainability-from unsustainability to sustainability-millennium development goals, and protocols- Sustainable Development Goals-targets, indicators and intervention areas Climate change- Global, Regional and local environmental issues and possible solutions-case studies. Concept of Carbon Credit, its advantages and disadvantages, Carbon Footprint. Environmental management in industry-A case study.

Environmental Policy and Governance

Environmental policies in India like Air act, water act, Environment protection act, wild life protection act, Forest conservation act, Biodiversity act, Sustainable practices like Environmental management system: ISO 14000, definition and benefits, Green building and rating system in India, Cradle to cradle concept and Life cycle analysis.

Self Study

Emerging Environmental Issues, Rain water harvesting, Concept of 5R(Refuse, Reduce, Reuse, Repurpose, Recycle)

Reference Books:

[1]	Anubha Kaushik and C. P. Kaushik‘s, Perspectives in Environmental Studies, 6th Edition, New Age International Publishers, 2018.
[2]	Benny Joseph, Environmental Science and Engineering, Tata McGraw-Hill, New Delhi, 2016.
[3]	Gilbert M.Masters, Introduction to Environmental Engineering and Science, 2nd edition,

	Pearson Education, 2004.
[4]	Allen, D. T. and Shonnard, D. R., Sustainability Engineering: Concepts, Design and Case Studies, Prentice Hall.
[5]	Bradley. A.S; Adebayo, A.O., Maria, P. Engineering applications in sustainable design and development, engage learning.
[6]	Environment Impact Assessment Guidelines, Notification of Government of India, 2006.
[7]	Mackenthun, K.M., Basic Concepts in Environmental Management, Lewis Publication, London, 1998

Entrepreneurship						
Course Code	HS-24001		**Examination Scheme**			
Teaching Scheme	2-0-0-1		**Theory**	CIE: 50	MSE: -	ESE: 50
Credits	02		**Laboratory**			--
Course Outcomes: Students will be able to:						
1. Demonstrate Understanding of Entrepreneurial Concepts L2 2. Generate and Assess Business Opportunities L3 3. Formulate Effective Marketing Strategies L4 4. Apply Financial Management Principles L4 5. Develop and Execute Business Plans L5						
The Essence of Entrepreneurship						**[6 Hrs]**
Meaning and types of entrepreneurship, Traits of successful entrepreneurs, Factors promoting entrepreneurship, Barriers to entrepreneurship, The entrepreneurial mindset and culture, Stages in the entrepreneurial process, Women entrepreneurship and economic development, Self-Help Groups (SHGs)						
Identifying and Validating Business Opportunities						**[6 Hrs]**
Recognizing opportunities and trend analysis, Generating ideas: Brainstorming, Focus Groups, Surveys, Customer advisory boards, Day-in-the-life research, Creating personas, Using AI to identify opportunities, Opportunity identification and evaluation, Product/service selection, Generation and screening of project ideas, Market analysis, Technical analysis, Cost-benefit analysis, Project formulation and feasibility assessment						
Business Models, Planning, and Financials						**[6 Hrs]**
Meaning and importance of a business plan, Business plan process and advantages, Introduction to the Business Model Canvas (BMC), Preparing a model project report, Financial modeling: Revenue and cost projections, Types of capital: Equity, debt, grants, Sources of finance: Venture capital, business angels, commercial banks, government grants						
Go-to-Market Strategy and Team Building						**[6 Hrs]**
Importance of a team in a startup, Different skill sets required in a team, How to build a team and align incentives, Developing a Go-to-Market (GTM) Strategy, Minimum Viable Product (MVP), Sales tactics and customer acquisition, Basics of digital marketing						
Legal Aspects and The Final Pitch						**[6 Hrs]**
Different types of business structures and their legal implications, Structuring businesses for growth, Protecting ideas and intellectual property rights (IPR), Patents and copyrights, The essential elements of a successful pitch, Preparing and delivering a final pitch in front of jurors						
Text Books:						
[1]	"The Discipline of Disruption- Entrepreneurship a strategic Science" by Manjula Subhash Nair					
[2]	"Entrepreneurship: Theory, Process, and Practice" by Donald F. Kuratko					
[3]	"New Venture Creation: Entrepreneurship for the 21st Century" by Jeffry A. Timmons, Stephen Spinelli					
Reference Books:						

[1]	"The Alignment Advantage – Sales, MarCom: One Growth Engine" by Manjula Subhash
[2]	"The Lean Startup" by Eric Ries
[3]	Ramachandran, Entrepreneurship Development, McGraw Hill
[4]	"Entrepreneurial Finance: Concepts and Cases" by J. Chris Leach and Ronald W. Melicher
[5]	"Zero to One: Notes on Startups, or How to Build the Future" by Peter Thiel and Blake Masters

Communication Skills						
Course Code	1-0-2-0		**Examination Scheme**			
Teaching Scheme			**Theory**	T1: 20	T2: 20	ESE: 60
Credits	02		**Laboratory**			--

Course Outcomes: Students will be able to:

1. Recall and use basic language skills listening, speaking, reading, and writing and attempt the tasks using grammar and vocabulary efficiently
2. Understand the concepts/ principles of communication skills and structured conversations effectively
3. Develop the knack to make their points of view clear to the audience and portray their learning well in front of a large audience on a variety of relevant situations
4. Analyze, apply, and present themselves competently in all formal spheres
5. Use language competencies for effective communication

Theory (1 credit)

Introduction to English for Engineers	**[2 Hrs]**
Varieties to English; English for Specific Purposes (ESP): Business English	
Foundation of Communicative and Linguistic Ability Development	**[4 Hrs]**
Types of Communication, Process of Communication, Barriers and ways to overcome them, Common Challenges: Phonological, Syntactic, Semantic and Pragmatic Errors	
Advanced Speaking Skills	**[4 Hrs]**
Nuances of Speaking Skills/ Public Speaking, Group Communication, Presentation Skills: The 4 P's of Presentation, Do's and Don'ts, Techniques for Effective Delivery	
Business Writing Development	**[4 Hrs]**
Techniques of Writing: Note-making, Drafting, Editing, Paraphrasing and Proof-reading, Business Letters, Emails and Brief Reports	

Practical (1 credit)

Foundation of Language Learning Skills	**[2 Hrs]**
Receptive Skills: Listening and Reading; Productive Skills: Speaking and Writing; Grammaticality and Appropriateness; Vocabulary Development	
Listening Skills	**[4 Hrs]**
Stages of Listening (pre, while and post), Strategies to Develop Active Listening Skills, Problem Sounds	
Speaking Skills	**[4 Hrs]**
Oral Communication, Sounds in English, Pronunciation, Stress, Intonation and Pauses, Formal and Informal Expressions, Situational Conversations, Group Discussion	
Reading and Writing Skills	**[4 Hrs]**
Reading Techniques: Scanning, Skimming and Active Reading; Common Problems in Reading; Stages of Writing (pre, while and post), 7 Cs of Effective Communication; Letter/ Email writing-drafting, editing, summarizing	

Reference Books:

[1]	Communication Skills for Engineers by S. Mishra & C. Muralikrishna (Pearson)
[2]	Communicative English for Engineers by N. Bhatnagar & M. Bhatnagar (Pearson)
[3]	Effective Communication and Soft Skills by N. Bhatnagar & M. Bhatnagar (Pearson)
[4]	English for Engineers by Sudarshana, N.P. and Savitha, C. (CUP)
[5]	Cambridge English for Engineering by M. Ibbotson (CUP)
[6]	Essential English Grammar (Elementary & Intermediate) Raymond Murphy (CUP)
[7]	Communication for Business: A Practical Approach by Shirley Tailor (Longman)
[8]	Business Correspondence and Report Writing, R. C. Sharma & Krishna Mohan (Tata