BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)

COLLEGE OF ENGINEERING, PUNE

B. Tech. (Civil Engineering): Semester –I (2023 COURSE)- 2311202

Sr. No	Category	Subject Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	IA	TW	PR	OR	Total	Th	Pr/ Or	Tut	Total
1.	BM	BM1113101	Engineering Mathematics- I	3	-	1	60	40	-	-	-	100	3	-	1	4
2.	BC	BC1113102	Engineering Chemistry	3	2	-	60	40	50	-	-	150	3	1	-	4
3.	MJ	MJ1102103	Fundamentals of Civil Engineering	4	2	-	60	40	25	-	-	125	4	1	-	5
4.	EG	EG1111104	Engineering Graphics	3	2	-	60	40	25	-	-	125	3	1	-	4
5.	MJ	MJ1102105	Building Construction and Materials	4	2	-	60	40	50	-	-	150	4	1	-	5
6.	AE	AE1113106	Communication skills	-	2	-	-	-	50	-	-	50	-	1	-	1
7.	SE	SE1102107	Skill Based Course-I – Computer Aided Drawing	-	4	-	-	-	25	-	25	50	-	2	-	2
			Total	**17**	**14**	**1**	**300**	**200**	**225**	**-**	**25**	**750**	**17**	**7**	**1**	**25**

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)

COLLEGE OF ENGINEERING, PUNE

B. Tech. (Civil Engineering): Semester –II (2023 COURSE)- 2311202

Sr. No	Category	Subject Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	IA	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	BM	BM1113201	Engineering Mathematics- II	3	-	1	60	40	-	-	-	100	3	-	1	4
2.	BP	BP1113202	Engineering Physics	3	2	-	60	40	50	-	-	150	3	1	-	4
3.	ES	ES1102203	Engineering Mechanics	4	2	-	60	40	25	-	-	125	4	1	-	5
4.	MJ	MJ1102204	Building Planning and Design	3	4	-	60	40	50	-	-	150	3	2	-	5
5.	MJ	MJ1102205	Surveying and Levelling	3	2	-	60	40	25	-	-	125	3	1	-	4
6.	UH	UH1113206	Universal Human Values	-	2	-	-	-	50	-	-	50	-	1	-	1
7.	SE	SE1102207	Skill Based Course -II Hands on Training on Total station	-	4	-	-	-	25	-	25	50	-	2	-	2
			Total	**16**	**16**	**1**	**300**	**200**	**225**	**-**	**25**	**750**	**16**	**8**	**1**	**25**

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)

COLLEGE OF ENGINEERING, PUNE

B. Tech. (Civil Engineering): Semester –III (2023 COURSE)- 2311202

Sr. No	Category	Subject Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	IA	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	BS	BS1113301	Engineering Mathematics III	3	-	1	60	40	-	-	-	100	3	-	1	4
2.	MJ	MJ1102302	Concrete Technology	3	2	-	60	40	25	-	25	150	3	1	-	4
3.	MJ	MJ1102303	Construction Equipment and Techniques	3	2	-	60	40	25	-	25	150	3	1	-	4
4.	MJ	MJ1102304	Mechanics of Solids	3	2	-	60	40	25	-	25	150	3	1		4
5.	AE	AE1102305	Economics and Finance in Civil Engineering	3	-	-	60	40	-	-	-	100	3	-	-	3
6.	SE	SE1102306	Skill Based Course–III Computer Programming (Python)	-	2	-	-	-	25	-	25	50	-	1	-	1
			Total	**15**	**8**	**1**	**300**	**200**	**100**		**100**	**700**	**15**	**4**	**1**	**20**
7.	*AE	AE1102307	MOOC-I	-	-	-	-	-	-	-	-	-	-	-	-	**2**
8.	**VA	VA1102308	Value Added Course –I a. Sustainable development b. Water Conservation	2		-	-	100	-	-	-	100	-	2	-	**2**

*MOOC-I : This is not mandatory, but students will be motivated to get certification for MOOC courses. Students completing these courses will be given additional credits

** Value Added Course –I (SD/WC)-This course will be mandatory Audit course

BHARATI VIDYAPEETH (DEEMED TO BE UNIVERSITY)

COLLEGE OF ENGINEERING, PUNE

B. Tech. (Civil Engineering): Semester –IV (2023 COURSE)- 2311202

Sr. No	Category	Subject Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	IA	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1.	MJ	MJ1102401	Structural Analysis-I	3	-	1	60	40	-	-	-	100	3	-	1	4
2.	MJ	MJ1102402	Geotechnical Engineering	3	2	-	60	40	25	-	25	150	3	1	-	4
3.	MJ	MJ1102403	Mechanics of Fluids	3	2	-	60	40	25	-	25	150	3	1	-	4
4.	MJ	MJ1102404	Geoinformatics	3	2	-	60	40	25	-	25	150	3	1	-	4
5.	MJ	MJ1102405	Project Management	3	-	-	60	40	-	-	-	100	3	-	-	3
6.	SE	SE1102406	Skill Based Course-IV(Project Management)	-	2	-	-	-	25	-	25	50	-	1	-	1
			Total	**15**	**8**	**1**	**300**	**200**	**100**	**-**	**100**	**700**	**15**	**4**	**1**	**20**
7.	*AC	AC1113407	Audit Course –I (Indian Knowledge System)	**2**	**-**	**-**	**-**	**100**	**-**	**-**	**-**	**-**	**2**	**-**	**-**	**2**
8.	** EC	EC1102408	Social Activity													**2**

* Audit Course –I(Indian Knowledge System) – This is mandatory Audit Course

** Social Activity – Mandatory activity

Open Electives: Total Credit: 20(Minor Degree)

Sr. No	Sem	Subject Code	Subject	Teaching Scheme			Examination Scheme-Marks						Credits			
				L	P	T	ESE	IA	TW	PR	OR	Total	Th	Pr/Or	Tut	Total
1	III	MI1102309	Minor-I	3	2	-	60	40	25	-	25	150	3	1	-	**4**
2	IV	MI1102409	Minor-II	3	2	-	60	40	25	-	25	150	3	1	-	**4**
3	V	MI11025xx	Minor-III	3	2	-	60	40	25	-	25	150	3	1	-	**4**
4	VI	MI11026xx	Minor-IV	3	2	-	60	40	25	-	25	150	3	1	-	**4**
5	VII		Minor – V - Project	-	4	-	-	-	50	-	50	100	-	4	-	**4**
			Total	**12**	**12**	**-**	**240**	**160**	**150**	**-**	**150**	**700**	**12**	**8**	**-**	**20**

Sr. No.	Minor No.	Sem	Minor - A	Minor - B	Minor - C	Minor - D	Credits
			Artificial Intelligence and Data Science	**Cyber Security**	**Integrated Building System**	**Green Infrastructure**	
01	Minor-I	III	Soft computing MI1103301	Information Security MI1103302	Interior design and landscaping MI 1102301	Green Construction Practices MI1102302	**4**
02	Minor-II	IV	Artificial Intelligence MI1103401	Network Security MI1103402	Building Automation MI1102401	Sustainable Transportation System MI1102402	**4**
03	Minor-III	V	Advanced Machine Learning MI1103501	Basics of Ethical Hacking MI1103502	Electrical and Plumbing MI1102501	Planning of smart cities MI1102502	**4**
04	Minor-IV	VI	Data Science MI1103601	Cyber Forensics and Laws MI1103602	Building Information modelling in Architecture and Construction MI1102601	Environmental Management System MI1102602	**4**
5	Minor - V	VII	**Project**	**Project**	**Project**	**Project**	**4**

This subject must be considered in the respective semester-III, IV, V, VI only.

Programme: B. Tech. (Civil) Sem – III

COURSE: ENGINEERING MATHEMATICS-III		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 03Hrs / Week Tutorial: 01Hrs / Week	End Semester Examination:60 Marks Internal Assessment: 40Marks	Theory: 03 Tutorial: 01
	Total marks : 100	Total: 04

Course Pre-requisites: The students should have knowledge of	
1	Differentiation, integration and differential equation of first order
2	vector algebra and probability
Course Objective: On completion of the course -	
1.	This course aims at enabling students, To get acquainted with mathematical modelling of physical systems and their solutions through higher order Linear Differential Equations.
2.	To develop the problem solving skill using Statistical analysis and Probability theory.
3.	To achieve a solid understanding of higher level mathematics and their applications in Civil Engineering.
Course Outcomes: On completion of the course, the students will be able to -	
1	Find Complimentary and Particular integral for higher order linear differential equations
2	Calculate the deflection for bending of a beam, whirling of shaft problems and Natural Frequencies & mode of vibration for mass spring system using the concepts of higher order linear differential equations.
3	Solve wave, transport, one and two-dimensional heat flow equations using the separation of variables method.
4	Examine the vector fields using concepts of vector differentiation.
5	Apply theorems of vector integration to solve Fluid Mechanics, Continuity equations, Streamlines, Equations of motion, Bernoulli's equations.
6	Analyse the data using descriptive and inferential statistics & probability.

Course Content:

Unit-I	**Linear Differential Equations with Constant Coefficient:** Solution of nth order LDE with Constant Coefficients, Method of Variation of Parameters, Cauchy's & Legendre's DE, Modeling of problems on bending of beams, whirling of shafts and mass Spring systems.	**(08 Hrs)**
Unit-II	**Applications of Partial Differential Equation:** Solution of Partial Differential Equations (PDE):Wave equation,1D and 2D-Heat equation by using Separation of variables, Applications of PDE to problems of Civil and allied engineering	**(08 Hrs)**
Unit-III	**Vector Differential Calculus:** Physical Interpretation of Vector Differentiation, Vector Differential Operator, Gradient, Divergence and Curl, Directional Derivative, Solenoidal, Irrotational	**(08 Hrs)**

	and Conservative Fields, Scalar Potential, Vector Identities	
Unit-IV	**VectorIntegralCalculus:** Line, Surface and Volume integrals, Work-done, Green's Lemma, Gauss's Divergence Theorem, Stroke's Theorem. Applications to problems in Fluid Mechanics, Continuity equations, Streamlines, Equations of motion, Bernoulli'sequations	**(08 Hrs)**
Unit-V	**Statistics:** Measures of Central Tendency, Standard Deviation, Coefficient of Variation, Moments, Skewness and Kurtosis, Correlation and Regression, Reliability of Regression Estimates. Test of Hypothesis: Chi-Square test, t-test, Analysis of variance (ANOVA)	**(08 Hrs)**
Unit-VI	**Probability Theory and Distributions:** Theorems and Properties of Probability, Probability Density Function, Probability Distributions: Binomial, Poisson, Normal and Hyper geometric;	**(08 Hrs)**

Internal Assessment: A) Unit Test	
Unit Test -1	Units: I, II, III
Unit Test -2	Units: IV, V, VI

B) Project Based Learning: Any ONE based on following topics but not limited to-	
Students are expected prepare report on any one topic, write its definition, applications and illustrate with few examples. Also, write pseudo code /proof for it, wherever applicable	
1	Method of variation of parameters
2	Cauchy's linear differential equation
3	Legendre's linear differential equation
4	Bending of beam
5	Mass spring system
6	Wave equation
7	One dimensional heat equation
8	Laplace equation
9	Directional derivative
10	Curl and divergence
11	Work done
12	Gauss divergence theorem
13	Stokes theorem
14	Central tendency
15	Measures of dispersion
16	Skewness and kurtosis
17	Theoretical probability distributions

Reference Books:	
1	B.V. Raman Engineering Mathematics by Tata McGraw-Hill.
2	M.D. Greenberg Advanced Engineering Mathematics,2E, by Pearson Education
3	Wylie C.R.& Barrett L.C. Advanced Engineering Mathematics, McGraw-Hill,Inc.
4	B.S. Grewal Higher Engineering Mathematics by Khanna Publication, Delhi.

5	P.N. Wartikar & J.N. Wartikar Applied Mathematics Volume I and II Pune Vidyarthi Griha Prakashan, Pune

COURSE: CONCRETE TECHNOLOGY		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 03Hrs / Week Practical: 02Hrs / Week	End Semester Examination:60 Marks Internal Assessment: 40Marks Term work: 25Marks Oral : 25 Marks	Theory: 03 Practical: 01
	Total: 150 Marks	Total: 04

Course Pre-requisites: The students should have knowledge of		
1	Engineering Chemistry	
2	Fundamentals of Civil Engineering	
3	Building Construction and Materials	
Course Objective: On completion of the course -		
	The students will be able to design concrete mix and control the quality of concrete in construction.	
Course Outcomes: On completion of the course, the students will be able to -		
1	test ingredients of concrete	
2	control quality of concrete	
3	measure strength of hardened concrete	
4	estimate durability of concrete	
5	apply special concreting techniques	
6	design of concrete mix	
Course Content:		
Unit-I	**Ingredients of Concrete:** **Cement** - Chemical composition, hydration, heat of hydration, hydratedstructure, types of cement, testing of cement as per Indian standard. **Aggregates** - Utility in concrete, classification, effect of geometry & texture,strength, mechanical properties, moisture content, water absorption, bulkingof sand, deleterious substances, sieve analysis, various grading, and gradingrequirements, sampling & testing as per Indian Standards, Use of recycled Aggregates. **Water** - General Requirements & limiting values of impurities.	**(06 Hrs)**
Unit-II	**Manufacturing of Concrete:** Methods of batching, mixing, transporting, placing, compacting and curing of concrete. **Workability** – Definition and requirement, factors affecting workability,various tests as per IS and ASTM. Segregation and bleeding, stiffening, retempering. Chemical and Mineral Admixture for concrete.	**(06 Hrs)**
Unit-III	**Strength of Concrete:**	**(06 Hrs)**

	Tests for strength of concrete: Destructive, semi destructive, and non-destructivetests with their limitations, test methods as per IS Code. **Factors affecting strength –** type and period of curing, water cement ratio, gel space ratio, aggregatecement ratio, properties of ingredients, effect of age, maturity, aggregatecement-paste inter-face, various finishes of concrete.Introduction to aspects of elasticity, shrinkage, and creep.	
Unit-IV	**Durability of Concrete:** Cracking, permeability and carbonation, of concrete; Concrete in Aggressive Environment; Alkali-Aggregate Reaction, Sulphate Attack, Chloride Attack, Acid Attack,Effect of Sea Water, Special Coating for Water Proofing	**(06 Hrs)**
Unit-V	**Special Concrete and concreting techniques:** Need and types of Special Concrete, self-compacting concrete, High strength concrete,Ultra High Strength Concrete, High PerformanceConcrete, Fiber Reinforced Concrete, Light Weight Concrete,and Concrete for Precast. **Special concreting techniques:** Pumped concreting, mass concreting, underwater concreting, hot and cold weather concreting, Ready mixconcrete, Tremie method etc	**(06 Hrs)**
Unit-VI	**Design of Concrete Mix:** Principles of Mix Proportioning, Probabilistic Parameters, Factors Governing Selection of mix. IS Method of Concrete Mix Design, Variability of Test Results,Acceptance Criteria, IS Code Provisions for Mix Design, use of GGBS and Fly ash.	**(06 Hrs)**

Internal Assessment:A) Unit Test	
Unit Test -1	Units: I, II, III
Unit Test -2	Units: IV, V, VI

B) Project Based Learning: AnyONEbased on following topicsbut not limited to-	
1	Report writing by market survey of different types of cements, their properties and cost.
2	Report writing by market survey of different types of coarse aggregates, their properties and cost.
3	Report writing by market survey of different types of fine aggregates, their properties and cost.
4	Report writing by market survey of different types of concrete admixtures, their properties and cost.
5	Report writing by visit to RMC plant
6	Compare volume batching and weight batching for concrete mix.
7	Report writing by visit to construction site during concreting.
8	Report writing on form work preparation by visiting the site.
9	Preparation of Mix Design for Concrete Mix Design as per IS Code
10	Preparation of Mix Design for Concrete Mix Design as per ACI Code
11	Compare Concrete Mix Design by IS Code and ACI Code.
12	Calculate ingredients required for Concrete per cubic meter.

13	Calculate Cost of Concrete per cubic meter
14	Report writing on advancement in concrete by studying journal publications.
15	Report writing on NDT of concrete and its limitations.
Term work: The term work shall consist of following practical-	
A)	**Test on Aggregate (Minimum 4)**
1	Moisture content, Water Absorption
2	Specific Gravity of Aggregate
3	Fineness Modulus of Aggregate
4	Aggregate Impact Value Test
5	Aggregate Crushing Value Test
6	Aggregate Flakiness Index, Elongation Index
B)	**Test on Cement (Minimum 3)**
7	Fineness of Cement
8	Standard consistency and Setting time of Cement
9	Compressive strength of Cement
10	Soundness of Cement
C)	**Tests on Concrete (Minimum 3)**
11	Effect of admixture on workability of concrete
12	Compressive Strength of Concrete
13	Split-tensile Strength of Concrete
14	Flexural strength of concrete
15	Rebound Hammer Test
16	Ultrasonic Pulse Velocity Test
17	Permeability Test
Oral:	
	The oral examination will be based on above term work and course content.
Reference Books:	
1	A. M. Neville; 'Properties of Concrete', Pearson Education
2	M S Shetty; 'Concrete Technology', S. Chand Publication New Delhi
3	M L Gambhir; 'Concrete Technology', Tata McGraw Hill
4	P Kumar Mehta, 'Monteiro; Concrete Technology', Indian Concrete Institute
5	A R Santhakumar; 'Concrete Technology', Oxford University Press
Reference Codes:	
1	IS 269 - Ordinary Portland Cement- Specifications, Bureau of Indian Standards
2	IS4031 - Methods of physical tests for hydraulic cement Part 1 to 15, Bureau of Indian Standards
3	IS 383 - Coarse and Fine Aggregate for Concrete – Specification, Bureau of Indian Standards
4	IS 2386 - Methods of Test for Aggregates for Concrete Part 1 to 8, Bureau of Indian Standards
5	IS 10262 - Concrete Mix Proportioning - Guidelines, Bureau of Indian Standards
6	IS 1199 - Fresh Concrete — Methods of Sampling, Testing and Analysis Part 1 to 7, Bureau of Indian Standards
7	IS 516 - Hardened concrete methods of test Part 1 to 12, Bureau of Indian Standards

8	IS 456 - Plain and Reinforced Concrete- Code of Practice, Bureau of Indian Standards
9	IS 9103 - Specification for Concrete Admixture, Bureau of Indian Standards
Reference Links: List of Open Source Software/learning website:	
1	https://nptel.ac.in/courses/105102012
2	https://archive.nptel.ac.in/courses/105/104/105104030/
3	https://cs-iitd.vlabs.ac.in/

COURSE: CONSTRUCTION EQUIPMENT AND TECHNIQUES.		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 3 Hrs / Week Practical: 2 Hrs / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks Termwork: 25 Marks Oral: 25 Marks	Theory: 03 Practical: 01
	Total Marks 150 Marks	Total: 04

Course Pre-requisites: The students should have knowledge of	
1	Building Construction.
2	Building Planning & Design.
3	Engineering Economics.
4	Concrete Technology.
Course Objective: On completion of the course -	
	The students will be able to apply knowledge of construction equipment in planning and executing civil engineering projects.
Course Outcomes: On completion of the course, the students will be able to -	
1	understand construction equipment, its significance, selection factors, and advancements
2	evaluate the suitability of advanced construction techniques like launching methods and trenchless technology.
3	synthesize a plan for underwater construction, considering cofferdams, dredging, and foundation methods
4	apply techniques for excavation, grading, and site preparation using appropriate earthmoving equipment safely
5	justify the selection of hoisting and conveying equipment based on project needs and safety regulations
6	predictthe impact of dewatering techniques, paving equipment, and automation on future construction projects.

Course Content:		
Unit-I	**Introduction to Construction Equipment:** Definition and classification of construction equipment, Significance, and role of construction equipment in civil engineering projects, Economic considerations and factors influencing equipment selection, Overview of modern advancements in construction equipment technology.Maintenance Management. Cost Control of Equipment.	**(06 Hrs)**
Unit-II	**Advanced Construction Techniques:** Construction - Light, Medium & Heavy duty. Launching of Girders,Precast Techniques, Tunnel Driving techniques, Tunnel boring machines(Open & Shield), Shotcre`ting&Gunieting, Trenchless Technology, Micro Tunnelling. Pneumatic Drilling equipment.Drill & Blast method, M1 Technology constructions.	**(06 Hrs)**

Unit-III	**Under Water Construction:** Cofferdams Dams & Caissons – Definition, Classification & its use.Dredging Techniques. Construction under deep water (Tremie Method).Types of piles and their applications,Pile driving equipment and techniques,Foundation construction methods. Jetties.	**(06 Hrs)**
Unit-IV	**Earth Work Machineries:** Types and applications of earthmoving equipment (bulldozers, excavators, loaders, Tractor, Scraper, Ripper, Shovel, Backhoe, dumper and hauling equipment), Principles of operation and key components, Techniques for excavation, grading, and site preparation,Safety considerations in earthmoving operations.	**(06 Hrs)**
Unit-V	**Hoisting & Conveying Equipment:** Types of cranes and their applications, Conveyors: Belt, screw, and pneumatic, Factors influencing the design of hoisting and conveying systems, Selection criteria for hoisting and conveying equipment, Hoisting, and conveying safety regulations, Crushers and types.	**(06 Hrs)**
Unit-VI	**Dewatering, Paving Equipment & Concrete Pump:** Dewatering Techniques, Electro-Osmosis Methods, Well Point system, Paving Equipment: Types (Asphalt, Slip Form, Concrete), Uses. Pumps: Types, Uses, Green material. Automation and Robotics in Construction, Future outlook and innovation.	**(06 Hrs)**

Internal Assessment:	
Unit Test -1	Units: I, II, III
Unit Test -2	Units: IV, V, VI

	Project Based Learning: ANYONE based on following topics but not limited to it
1	Develop an optimized site layout considering construction equipment movement, material flow, and worker efficiency
2	Conduct a safety audit for a construction site, identify potential hazards related to equipment and methods, and propose safety improvement measures.
3	Develop a preventive maintenance plan for a set of construction equipment, including schedules, checklists, and documentation procedures.
4	Evaluate the economic impact of upgrading construction equipment in terms of efficiency, fuel consumption, and overall project costs.
5	Build a miniature pile driver model to demonstrate the process of driving piles into the ground, showcasing the principles of foundation construction
6	Investigate and propose environmentally friendly construction methods and equipment to reduce the environmental impact of construction projects.
7	Build a small-scale working model of a crane using simple materials like cardboard, popsicle sticks, and strings. Demonstrate the basic principles of crane operation.
8	Design and build a small-scale conveyor belt system using rollers, belts, and a motor. Showcase how materials can be moved efficiently on construction sites.
9	Design and build a small-scale, portable light tower powered by solar energy to demonstrate an eco-friendly lighting solution for construction sites.

10	Build a small electric or manual concrete mixer model to showcase the mixing process and principles of concrete construction
11	Create a model demonstrating effective water drainage systems on construction sites using slopes, channels, and simple pump mechanisms
12	Build a miniature tower crane model using materials like wooden sticks, strings, and small motors to demonstrate the operation of a tower crane.
13	Research a specific case study of a major construction project utilizing an advanced technique like micro-tunnelling or prefabrication.
14	Research and compare different methods for underwater inspection of structures like bridges or pipelines.
15	Analyze the potential for using recycled materials or sustainable alternatives in construction projects.
Termwork:The term work shall consist of**Any Six** of following practical- (Site visit is mandatory)	
1	Collection of pamphlets and information regarding various construction techniques equipment (Information pertaining to the following aspects should be collected) i. Types, Different makes of the equipment. ii. Useful Life and area of use iii. Equipment performance data iv. Cost and Rent Consideration
2	Conduct a cost analysis of renting vs. purchasing specific equipment for a hypothetical construction project, considering factors like project duration, frequency of use, and maintenance costs.
3	Research the different types of piles used in underwater construction and their specific applications. Create a poster or presentation showcasing the different types of piles with illustrations and explanations.
4	Design and build a model of a cofferdam or caisson using readily available materials. Explain the different types of cofferdams/caissons, their functionalities, and their advantages and disadvantages.
5	Choose a specific type of earthmoving equipmentResearch its working principles, key components, and different applications Cost Consideration and Rent Consideration. Develop a presentation or a short video demonstrating the operation of the chosen equipment.
6	Research and compare the different types of cranes used in construction based on their design, lifting capacity, and operating characteristics, Cost Considerations. Create a chart or infographic summarizing the information with visuals.
7	Research and compare different dewatering techniques used in construction, such as electro-osmosis and well point systems. Analyze their effectiveness, cost considerations, and environmental impact. Present your findings in a report
8	Research and compare different types of concrete pumps used in construction. Explain the working principles and Cost Consideration of each type and their suitability for different construction projects. Create a presentation or video to illustrate your findings.
9	Site Visit report to be prepared after visiting the site covering topics mentioned in syllabi.
Reference Books:	
1	Robert L. Peurifoy, Clifford J. Schexnayder, and Aviad Shapira: Construction Planning,

	Equipment, and Methods" (Ninth Edition, 2023)
2	Jimmie Hinze."Construction Equipment and Methods: Planning, Innovation, Safety". (Eighth Edition)
3	Paul Jay Coleman "Construction Equipment and Methods: Planning, Innovation, Safety" (Eighth Edition, 2023)
4	John Schaufelberger "Construction Equipment Management".(Seventh Edition, 2022)
5	Dr. Manoranjan Samal 'Advanced Construction Techniques and Equipment'.(First Edition, 2022)
6	Mohammed A. Ozbay and Atilla Bardıner Handbook of Tunnel Construction (Second Edition, 2019)
7	William C. Maclean Construction Dewatering and Groundwater Control (Third Edition, 2011)
8	James Gallagher Paving Equipment: Materials and Practices (Second Edition, 2008)
Online References:	
1	https://onlinecourses.nptel.ac.in/
2	https://onlinecourses.nptel.ac.in/noc24_ce07/preview
3	https://online.umich.edu/courses/construction-equipment-and-methods/
4	https://constructionclasses.com/108-construction-equipment-and-methods/

COURSE: MECHANICS OF SOLIDS

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 03 Hours / Week Practical: 02 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks Term Work: 25 Marks Oral: 25 Marks	Theory: 03 Practical: 01
Total: 36 Hours	Total: 150 Marks	Total: 04

Course Pre-requisites: The students should have knowledge of

1	Engineering Mechanics
2	Engineering Mathematics I and II

Course Objective:

	The student should be able to calculate stresses developed in the material.

Course Outcomes: The student will be able to

1	determine axial stresses in the member.
2	draw shear force and bending moment diagram for determinate beams.
3	calculate bending stresses of beam.
4	calculate shear stresses due to shear force and torsion.
5	compute principal stresses using analytical and graphical method.
6	calculate critical load on column.

Course Content:

Unit-I	**Simple Stresses and Strains** Concept of stress and strain: Linear, lateral, shear and volumetric stresses and strains, Hooke's law, Stress-strain curve; Elastic constants and their relationship; Generalized Hooke's law. Stresses due to Axial load and Temperature: Axial force diagram; Stresses, strains and deformation of determinate and indeterminate bars of prismatic, homogenous and composite cross section.	**(06 Hours)**
Unit-II	**Shear Force and Bending Moment Diagram** Concept of Shear Force and Bending Moment; Relation between Shear Force, Bending Moment and intensity of loading; Shear Force Diagram and Bending Moment Diagram of determinate beams due to concentrated load, uniformly distributed load, uniformly varying load and moments. Bending moment and loading diagram from given shear force diagram.	**(06 Hours)**
Unit-III	**Bending Stresses** Bending Stresses: Theory and assumptions of pure bending; Moment of resistance; Flexural formula; Flexural rigidity; Modulus of rupture; Flexural stress distribution diagram for various sections; Moment of resistance of cross section.	**(06 Hours)**
Unit-IV	**Direct and Torsional Shear Stress** Direct Shear Stresses: Concept of direct and transverse shear; Shear stress formula; Concept of complementary shear stress; Shear stress distribution diagram for symmetrical and unsymmetrical section. Torsion of Circular Shafts: Theory, assumptions and derivation of torsional formula; Shear stress distribution across cross section; Twisting	**(06 Hours)**

	moment diagram; Shear stresses and strains in solid and hollow cross sections subjected to twisting moment; Power transmitted by shafts.	
Unit-V	**Principal Stresses and Principal Planes** Normal and shear stresses on any oblique plane. Concept of principal stresses and principal planes, Maximum shear stress; Analytical and graphical method (Mohr's circle method).	**(06 Hours)**
Unit-VI	**Axially and Eccentrically Loaded Columns** Axially loaded columns: concept of critical load and buckling, Euler's formula for buckling load with hinged ends, concept of equivalent length for various end conditions, Rankine's formula, safe load on column and limitations of Euler's formula. Direct and bending stresses for eccentrically loaded short column, Resultant stress diagrams due to axial loads, uni-axial, and bi-axial bending. Concept of core of section for solid and hollow rectangular and circular sections.	**(06 Hours)**

Internal Assessment:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

Project Based Learning: ANYONE based on following topics but not limited to it.	
1	Prepare the chart for various types of stresses and strain with suitable example.
2	Development of an excel sheet for calculation of Elastic constants, Thermal stresses with suitable example.
3	Market survey for structural materials (at least ten materials)
4	Prepare the chart for Shear force and bending moment diagram for simply supported beam and overhanging beam (At least Five problems with different types of loading)
5	Development of an excel sheet for calculation of bending stresses for different sections. (At least three problem)
6	Prepare the chart for derivation of flexural formula and bending stress distribution diagram for different section.
7	Prepare the chart for deflection and slope of simply supported beam (at least five problems with different types of loading)
8	Prepare the chart for deflection and slope of cantilever beam (at least five problems with different types of loading)
9	Prepare the chart for derivation of direct and torsional shear stress formula and shear stress distribution diagram for different section.
10	Development of an excel sheet for calculation of direct and bending stress in section. (At least three problem)
11	Prepare the chart for core section (square, rectangular, circular, hollow rectangular and hollow circular).
12	Development of an excel sheet for load carrying capacity of column by using Euler's theory. (At least three problem)
13	Collect the photographs along with justification of (a) failure of short and long column (b) Failure of beam in bending and shear.
14	Draw the Mohr's circle (at least five problems)

15	Prepare the chart for Calculation of principal stress at a point, normal and shear stress by using graphical method.
Practical: The term-work shall consist of following practical.	
A)	**Tests on Metal (Minimum 4)**
1	Tension test on mild steel
2	Direct shear (Single & Double) test on metals
3	Tension test on tor steel
4	Torsion test on metals
5	Impact tests (Izod & Charpy) on metals e.g. Mild steel, Aluminium, Brass, Copper e.g. Mild Steel, Aluminium, Brass, Copper
6	Hardness test (Rockwell) on metals
B)	**Tests on Brick (Minimum 2)**
7	Compressive strength of brick
8	Water absorption test on brick
9	Efflorescence test on brick
10	Field tests on bricks
C)	**Tests on Timber and Tile (Minimum 2)**
11	Bending test on timber
12	Flexural test on flooring tile
13	Abrasion test on flooring tile
Oral:	
	The oral examination will be based on above term work and course content.
Reference Books:	
1	Beer F. P. and Johnston E. R., "Mechanics of Materials", McGraw Hill Publication.
2	Singer F. L. & Pytel A., "Strength of Materials", Harper and Row Publication.
3	Gere J. M. & Timoshenko S. P., "Mechanics of Materials", CBS Publishers & Distributors.
4	Bansal R. K., "Strength of Materials", Laxmi Publications.
5	Ramamrutham S. "Strength of Materials" Dhanapat Rai Publications.
6	Bhavikatti S.S "Strength of Materials", New Age Publications.
7	Popov, E. P., Engineering Mechanics of Solids, Pearson (Second edition).
8	Hibbeler, R.C., "Mechanics of Materials", Sixth Edition, Pearson.
Online References:	
1	https://nptel.ac.in/courses/105105108

COURSE: ECONOMICS AND FINANCE IN CIVIL ENGINEERING		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 03 Hrs / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 03
		Total: 03

Course Pre-requisites: The students should have knowledge of	
1	Basic Mathematics
Course Objective: On completion of the course -	
	Economics and Finance will help students to understand the principles of economics and its applications to financial systems and organisations.
Course Outcomes: On completion of the course, the students will be able to -	
1	paraphrase the concept of Engineering Economics.
2	relate the Cost & time value of money
3	express the Project parameters of estimates
4	Calculate the depreciation cost
5	Composing balance sheet
6	generate finance for organization.

Course Content:

Unit-I	**Introduction to Project Economics** Definition, Principles, Importance in Construction Industry, Types of Market Structure in Construction Industry, Market & Competitive Environment, Perfect Competition, Monopoly, Difference between Cost, Value, Price, Law of Demising Marginal Utility, Demand, Demand Schedule, Law of Demand, Demand Curve, Elasticity of Demand, Supply, Supply Schedule, Supply Curve, Elasticity of Supply, Construction economics – Introduction of BOOT, BOT, BOO Methods	**(06 Hrs)**
Unit-II	**Cost & Cash Flow** Actual Cost & Opportunity Cost, Fixed & Variable Cost, Short Run & Long Run Cost, Price Fixation Pricing Method, Time Value of Money, Cash flow Diagram, Net Present Value, Present, Future & annual worth method of Comparing alternatives, Break Even analysis, Cost Benefit Ratio,	**(06 Hrs)**
Unit-III	**Economics of Project Parameters** Equipment Economics, Operating Costs, Buy, Rent and Lease Options, Replacement Analysis, Cost Estimates, Type of Estimates, Parametric Estimate, Management Accounting, Financial accounting principles, basic concepts, financial statements, accounting ratios	**(06 Hrs)**
Unit-IV	**Investment Evaluation and Financing Projects** Taxation, Direct & Indirect Taxation, Introduction of GST, Depreciation, switching between different depreciation methods, Inflation, Sources of Project finance, equity, debit, securities, borrowings, debentures, Working capital Management, Inventory Management, Mortgage Financing,	**(06 Hrs)**
Unit-V	**Financial Management** Introduction of Banking Sector, Types of Banks, Types of Accounts , Types of Loans, Construction accountancy, charts of accounts, financial statement, profit and loss account, Balance sheet study of construction Company ,	**(06 Hrs)**

	insurance audits and financial risk aspects	
Unit-VI	**Project Budgeting** Projects & Content of Project, Types of Budgets, fixed and Working capital, Forms of foreign capital, Money and capital market in India. New economic policy. Role of financial institutions in economic development	**(06 Hrs)**

Internal Assessment:	
Unit Test -1	Units: I, II, III
Unit Test -2	Units: IV, V, VI

Project Based Learning: ANYONE based on following topics but not limited to it	
1	Preparation of cash flow diagrams and finding out time value of money
2	Comparison chart of different projects by different methods
3	Determination depreciation value of equipment
4	Preparation of balance sheet for project
5	The impact of fiscal deficit on economic performance in developing countries. A case study of India.
6	The effect of taxation on the Indian economic growth.
7	Investments & Project Budgets
8	The impact of capital market on the economic growth in India.
9	The impact of foreign direct investment on the Indian economy.
10	Foreign direct investment and employment generation in India.
11	Infrastructure scenario in India Budgeting for project
12	Financial planning for large scale projects based on BOT / BOOT Basis.
13	Report on Infrastructure and economic development.
14	Report on Working capital management.
15	New Economic Policy of India.

Reference Books:

1	Blank, L. T. and Tarquin, A. J., "Engineering Economy", Fourth Edition, WCB/McGraw-Hill, 1998.
2	Bose, D. C., "Fundamentals of Financial management", 2nd ed., PHI, New Delhi, 2010.
3	Alfred William Stonier ,D.C Hague , "Textbook of Economic Theory", Longman Higher Education Publication,, 5th edition , 1980
4	Boyer, C. B. and Merzbach, U. C., "A History of Mathematics", 2nd ed., John Wiley & Sons, New York, 1989.
5	Gould, F. E., "Managing the Construction Process", 2nd ed., Prentice Hall, Upper Saddle River, New Jersey, 2002.
6	Gransberg, D. G., Popescu, C. M. and Ryan, R. C., "Construction Equipment Management for Engineers, Estimators, and Owners, CRC/Taylor & Francis, Boca Raton, 2006.
7	Harris, F., McCaffer, R. and Edum- Fotwe, F., "Modern Construction Management", 6th ed., Blackwell Publishing, 2006.
8	Jha, K. N., "Construction Project Management, Theory and Practice", Pearson, New Delhi, 2011.

9	Newnan, D. G., Eschenbach, T. G. and Lavelle, J. P., "Engineering Economic Analysis", Oxford University Press, 2010
10	Ostwald, P. F., "Construction Cost Analysis and Estimating", Prentice Hall, Upper Saddle River New Jersey, 2001
11	Peterson, S. J., "Construction Accounting and Financial Management", Pearson Education Upper Saddle River, New Jersey, 2005.
12	Prasanna Chandra Fundamentals Of Financial Management, 7th Edition, MC graw Hill Publication, 20 July 2020
13	Prasanna Chandra ," Financial Management: Theory & Practice" 11th Edition, MC graw Hill Publication 12 December 2022

Programme: B.Tech. (Civil) –Sem III		
COURSE: Skill Based Course–III Computer Programming (Python)		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Practical :- 02 Hours/ Week	Term Work : 25 Marks	01
	Total Credits	**01**

Course Pre-requisites: The students should have knowledge of		
1.	C language	
2.	C++ language	

Course Objective:	
1	To acquire the skills and knowledge necessary for programming in Python at beginner Level.

Course Outcomes: The student will be able to	
1	develop the application specific codes using python.
2	understand Strings, Lists, Tuples and Dictionaries in Python
3	analyze programs using modular approach, file I/O, Python standard library
4	apply control structures
5	understand Lists, Dictionaries in python
6	apply Digital Systems using Python

Term Work : The term work shall consist of following practical-(Any 8)	
1	Introduction to Python
2	Start a Python interpreter and use it as a Calculator.
3	Write a program to calculate compound interest when principal, rate and numbers of periods are given.
4	Given coordinates (x1, y1), (x2, y2) find the distance between two points
5	Read name, address, email and phone number of a person through keyboard and print the details
6	Print the below triangle using for loop. 6 5 5 4 4 4 3 3 3 3 2 2 2 2 2
7	Write a program to check whether the given input is digit or lowercase character or uppercase character or a special character (use 'if-else-if' ladder
8	Python Program to Print the Fibonacci sequence using while loop
9	Python program to print all prime numbers in a given interval (use break)
10	How do you make a module? Give an example of construction of a module using different geometrical shapes and operations on them as its functions
11	Write a function called draw rectangle that takes a Canvas and a Rectangle as arguments and draws a representation of the Rectangle on the Canvas.
12	Add an attribute named color to your Rectangle objects and modify draw rectangle so that it uses the color attribute as the fill color.

TEXT BOOKS:

1	Brian R. Overland and John Bennett "Supercharged Python: Take your code to the next level" , Addison-Wesley Professional , 1st Edition July 2019
2	Mark Lutz, O'reilly "Learning Python", Publisher(s): O'Reilly Media, Inc. 5th Edition July 2013
REFERENCE BOOKS:	
1	Vamsi Kurama "Python Programming: A Modern Approach", Publisher :Pearson Education India,1st Edition 2017
2	Michael Dawson "Programming with Python, A User's Book", Publisher Cengage Learning, 3rd Edition Jan 2010
3	Sheetal Taneja, Naveen Kumar "Python Programming A Modular Approach with Graphics, Database, Mobile, and Web Applications", Publisher :Pearson Education India, 1st September 2017
ONLINE REFERENCES:	
1	https://onlinecourses.swayam2.ac.in/cec22_cs20/preview
2	https://www.computerscience.org/resources/python/
3	https://ocw.mit.edu/courses/6-0001-introduction-to-computer-science-and-programming-in-python-fall-2016/
4	https://www.geeksforgeeks.org/python-programming-language/

Programme: B. Tech. (Civil) Sem –(NEP 2020 Course)		
COURSE:VALUE ADDED COURSE – WATER CONSERVATION		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: -02 Hours/ Week	End Semester Examination: Marks : Nil	02
	Internal Assessment Marks :100	
Total Credits		**02**

Course Pre-requisites: The students should have knowledge of	
1	**Environmental Science**
Course Objective:	
1	The water conservation subject aims to equip students with the knowledge, skills, and motivation necessary to contribute effectively to sustainable water management practices
Course Outcomes: The student will be able to	
1	**Identify Problem and Analyse it**
2	**Apply of Conservation Techniques:**
3	Analyse data collected
4	Understand and adhere to relevant policies, regulations, and standards governing water conservation
5	Recognize the interconnectedness between water conservation and climate change
6	Apply critical thinking skills to evaluate the effectiveness of water conservation measures

Course Content:		
Unit-I	**Understanding Water Conservation:**Definition of water conservation, Importance of water conservation, Overview of global water scarcity issues Explanation of the water cycle Factors affecting water availability, Discussion on renewable and non-renewable water resources. Exploration of human activities affecting water availability, Case studies on the depletion of groundwater, pollution of water bodies, and deforestation Understanding the consequences of water mismanagement	**(6Hrs)**
Unit-II	**Techniques and Strategies for Water Conservation:**Tips for reducing water usage in households Importance of fixing leaks and using water-saving appliances Practical methods for conserving water in daily activities, Introduction to efficient irrigation techniques, Sustainable farming practices to conserve water Crop selection and water management strategies, Overview of water-saving technologies in industries, Best practices for reducing water usage in commercial settings, Case studies on successful water conservation initiatives in the industrial sector	**(6Hrs)**
Unit-III	**Policies and Regulations for Water Conservation** Overview of national and international policies related to water conservation, Role of governmental agencies in water resource management Analysis of existing water conservation laws and regulations Importance of community involvement in water conservation Examples of	**(6Hrs)**

	community-driven water conservation projects Strategies for engaging communities in water conservation efforts	
Unit-IV	**Future Perspectives and Challenges** Exploration of innovative technologies for water recycling and desalinationPotential of artificial intelligence and Internet of Things(IoT) in water managementChallenges and opportunities in adopting new water conservation technologies Understanding the impact of climate change on water resource Strategies for adapting to changing precipitation patternsImportance of integrating climate change considerations into water conservation efforts, Role of education in promoting water conservation, Importance of raising awareness about water scarcity issues Recommendations for incorporating water conservation education into formal and informal learning environments	**(6Hrs)**

Project Based Learning (PBL)	
1	Prepare a presentation outlining the importance of water conservation in addressing global water scarcity and ensuring sustainable development.
2	Develop an educational video explaining the water cycle, detailing each stage and its significance in the movement and distribution of water on Earth.
3	Prepare a comparative analysis highlighting the differences between renewable and non-renewable water resources, with examples and implications for water management.
4	Investigate real-world case studies of groundwater depletion in different regions, analyzing causes, consequences, and potential solutions for sustainable groundwater management.
5	Create an educational poster highlighting the significance of fixing leaks promptly and investing in water-saving appliances to conserve water and reduce utility bills.
6	Prepare a comprehensive guidebook outlining best practices for reducing water usage in commercial settings, including restaurants, hotels, and office buildings, through measures like water audits, retrofitting, and employee training.
7	Research and analyze case studies of successful water conservation initiatives implemented by industries, highlighting key strategies, challenges faced, and outcomes achieved.
8	Research and compile a comprehensive report summarizing national and international policies related to water conservation, including regulations on water usage, pollution control, and watershed management
9	Write an essay discussing the importance of community involvement in water conservation efforts, including raising awareness, implementing local initiatives, and advocating for policy changes.
10	Develop a guidebook outlining strategies for engaging communities in water conservation efforts, including education campaigns, community workshops, grassroots organizing, and leveraging social media platforms.
11	Write a research paper exploring the potential applications of artificial intelligence (AI) and Internet of Things (IoT) technologies in water management, including real-time monitoring, predictive analytics, and smart water distribution systems.

12	Conduct interviews or surveys with industry experts and policymakers to identify the challenges and opportunities in adopting new water conservation technologies, analyzing factors such as cost-effectiveness, scalability, and regulatory barriers.
13	Prepare a multimedia presentation discussing the impacts of climate change on water resources, including changes in precipitation patterns, increased frequency of extreme weather events, and implications for water availability and quality.
14	Organize a debate on the topic of balancing economic development and environmental protection in water management, with students arguing for and against various policy approaches and trade-offs.
15	Organize a role-playing scenario where students represent various stakeholders (e.g., government officials, environmentalists, industry representatives, community leaders) negotiating water conservation policies, highlighting differing perspectives and interests.
REFERENCE BOOKS:	
1	"Water: The Epic Struggle for Wealth, Power, and Civilization" by Arjun Makhijani, Vandana Shiva, and Sunita Narain
2	"Water: India's Lifeline" by Santosh Kumar Sharma
3	"Water: India's Most Precious Resource" by Rishi Kumar Sharma
4	"Water: Harvesting the Sun" by Anupam Mishra
5	"Water Conservation in Rural India" by Shrikant Daji Limaye
ONLINE REFERENCES:	
1	https://www.worldwatercouncil.org/en
2	https://water.org/
3	https://www.nationalgeographic.com/environment/article/water-conservation-tips
4	https://www.indiawaterportal.org/

Programme: B. Tech. (Civil) Sem –(NEP 2020 Course)		
COURSE:VALUE ADDED COURSE – SUSTAINABLE DEVELOPMENT		
TEACHING SCHEME:	EXAMINATION SCHEME:	CREDITS:
Theory: -02 Hours/ Week	Internal Assessment Marks :100	02
	Internal Assessment Marks :100	
	Total Credits	**02**

Course Pre-requisites: The students should have knowledge of	
1	Environmental Science
2	Economics

Course Objective:	
1	To integrate principles of sustainable development into engineering practices, demonstrating a holistic understanding of environmental, social, and economic factors and their application in addressing contemporary engineering challenges.

Course Outcomes: The student will be able to	
1	grasp the principles of sustainable development and its historical context.
2	apply sustainable development concepts to engineering projects, considering environmental, social, and economic factors.
3	collaborate across disciplines to tackle complex sustainability challenges and develop innovative solutions.
4	critically analyse policies, evaluate economic viability, and effectively communicate findings in various formats.

Course Content:

Unit-I	**Introduction to Sustainable Development:** Understanding Sustainable Development: Definitions, principles, and goals Historical Perspectives: Evolution of sustainability concepts and international frameworks (e.g., Agenda 21, Sustainable Development Goals) Triple Bottom Line Approach: Balancing environmental, social, and economic factors Systems Thinking: Interconnectedness and complexity in sustainable development	**(6Hrs)**
Unit-II	**Environmental Sustainability in Engineering:** Environmental Impact Assessment: Methods for evaluating environmental impacts of Engineering Projects Sustainable Resource Management: Strategies for efficient use of natural resources (energy, water, materials) Pollution Prevention and Control: Techniques for minimizing pollution and waste generation Life Cycle Assessment (LCA): Evaluating the environmental footprint of products and processes	**(6Hrs)**

Unit-III	**Social Aspects of Sustainable Engineering:** Social Equity and Justice: Addressing disparities and promoting inclusivity in engineering projects. Community Engagement: Stakeholder participation and collaboration in sustainable development initiatives Ethical Considerations: Ethical frameworks for decision-making in engineering practice Cultural Sensitivity: Understanding and respecting diverse cultural perspectives in sustainable development.	**(6Hrs)**
Unit-IV	**Economic Dimensions of Sustainable Engineering:** Cost-Benefit Analysis: Evaluating economic viability and long-term benefits of sustainable engineering solutions Green Technologies and Innovation: Role of technological innovation in driving sustainable development Corporate Social Responsibility (CSR): Business strategies for integrating sustainability into organizational practices Policy and Regulation: Government initiatives and regulations promoting sustainable development in engineering	**(6Hrs)**

Following Tools to be used for evaluation of Internal Assessment

A) Project based learning
B) Quiz
C) Case study
D) Presentation (seminar)
E) Industrial visit and report submission
F) Open book test
G) Industry relevant problem
H) MCQ
I) System design
J) Modelling
K) Unit test

Project Based Learning (PBL): Following topics can be used for PBL

1	Research and analyse case studies of sustainable development projects from different regions or industries. Identify the principles and goals of sustainability demonstrated in these projects.
2	Create a timeline showcasing the historical evolution of sustainability concepts and international frameworks. Highlight key events, agreements, and milestones that have shaped the sustainability discourse.
3	Select a real-world engineering project and conduct a triple bottom line analysis, assessing its environmental, social, and economic impacts. Propose strategies for improving sustainability performance based on the analysis.
4	Develop a systems dynamics simulation model to illustrate the interconnectedness and complexity of sustainability issues. Use the model to explore the potential consequences of different policy interventions or technological innovations.
5	Conduct an EIA for a proposed local engineering project, such as a construction

	development or infrastructure upgrade. Identify potential environmental impacts and recommend mitigation measures.
6	Create a sustainable resource management plan for a specific industry or sector (e.g., agriculture, manufacturing). Consider strategies for optimizing resource use, reducing waste, and promoting circular economy principles.
7	Challenge teams to develop innovative solutions for pollution prevention and control in a particular context (e.g., air pollution in urban areas, water pollution in industrial zones). Prototypes or feasibility studies can be part of this project.
8	Conduct a life cycle assessment of a chosen product, evaluating its environmental impacts from raw material extraction to end-of-life disposal or recycling. Propose design improvements or alternative materials to reduce environmental footprint.
9	Design and implement a community engagement initiative for a local engineering project. Involve stakeholders in the decision-making process, gather feedback, and address community concerns regarding social equity and justice.
10	Present students with ethical dilemmas commonly encountered in engineering practice (e.g., conflicts between profit and environmental protection, considerations of social justice in project planning). Facilitate discussions and decision-making exercises based on these case studies.
11	Organize a workshop or seminar series focusing on cultural sensitivity in engineering projects. Invite guest speakers from diverse backgrounds to share their perspectives and experiences related to cultural considerations in sustainable development.
12	Evaluate the economic viability of different renewable energy projects (e.g., solar, wind, hydro) using cost-benefit analysis techniques. Consider factors such as initial investment, operational costs, and long-term benefits (e.g., carbon savings, energy security).
13	Research and showcase innovative green technologies and sustainable engineering solutions. Organize a showcase event where students present their findings and demonstrate prototype technologies or applications.
14	Conduct a CSR audit of a selected company or organization to assess its sustainability practices and performance. Develop recommendations for enhancing CSR initiatives and integrating sustainability into organizational strategies.
15	Analyse existing government policies and regulations related to sustainable development and engineering practices. Identify gaps or areas for improvement and propose policy recommendations to support more effective implementation of sustainable practices.
REFERENCE BOOKS:	
1	"Introduction to Sustainable Engineering" by Paul Stanfield
2	"Sustainable Development for Engineers" by David E. James
3	"Sustainable Engineering: Principles and Practice" by J. Glenn Murdock
4	"Environmental Management for Sustainable Development" by Chris Barrow
ONLINE REFERENCES:	
1	United Nations Sustainable Development Goals (SDGs): https://sdgs.un.org/
2	World Commission on Environment and Development (Brundtland Commission) Report: https://sustainabledevelopment.un.org/milestones/wced
3	https://sustainabledevelopment.un.org/content/documents/Agenda21.pdf
4	Sustainable Development Goals (SDGs): https://sdgs.un.org/goals

5	https://www.epa.gov
6	Best Available Techniques (BAT) Reference Document:https://eippcb.jrc.ec.europa.eu/reference/BREF/SMP_BREF_0806.pdf
7	Life Cycle Assessment: Principles and Practice (Book): https://www.springer.com/gp/book/9789400773316
8	Ethical Decision-Making Frameworks:https://ethics.ieee.org/
9	Green Technology Resources:https://www.greenbiz.com/
10	Corporate Social Responsibility Resources:https://www.csreurope.org/
11	Environmental Policy Tracker:https://climatepolicytracker.org/
12	Sustainable Development Policies and Measures Database:https://planning4sustainabledevelopment.org/

Programme: B. Tech. (Civil) Sem –(NEP 2020 Course)		
COURSE: Value Added Course – Water Conservation		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: -02 Hours/ Week	End Semester Examination: Marks : Nil	02
	Internal Assessment Marks :100	
	Total Credits	**02**

Course Pre-requisites: The students should have knowledge of	
1	**Environmental Science**
Course Objective:	
1	The water conservation subject aims to equip students with the knowledge, skills, and motivation necessary to contribute effectively to sustainable water management practices
Course Outcomes: The student will be able to	
1	**Identify Problem and Analyse it**
2	**Apply of Conservation Techniques:**
3	Analyse data collected
4	Understand and adhere to relevant policies, regulations, and standards governing water conservation
5	Recognize the interconnectedness between water conservation and climate change
6	Apply critical thinking skills to evaluate the effectiveness of water conservation measures

Course Content:		
Unit-I	**Understanding Water Conservation:** Definition of water conservation, Importance of water conservation, Overview of global water scarcity issues Explanation of the water cycle Factors affecting water availability, Discussion on renewable and non-renewable water resources. Exploration of human activities affecting water availability, Case studies on the depletion of groundwater, pollution of water bodies, and deforestation Understanding the consequences of water mismanagement	**(6Hrs)**
Unit-II	**Techniques and Strategies for Water Conservation:** Tips for reducing water usage in households Importance of fixing leaks and using water-saving appliances Practical methods for conserving water in daily activities, Introduction to efficient irrigation techniques, Sustainable farming practices to conserve water Crop selection and water management strategies, Overview of water-saving technologies in industries, Best practices for reducing water usage in commercial settings, Case studies on successful water conservation initiatives in the industrial sector	**(6Hrs)**
Unit-III	**Policies and Regulations for Water Conservation** Overview of national and international policies related to water conservation, Role of governmental agencies in water resource management Analysis of existing water conservation laws and regulations Importance of community involvement in water conservation Examples of community-driven water conservation projects Strategies for engaging communities in water conservation efforts	**(6Hrs)**

Unit-IV	**Future Perspectives and Challenges** Exploration of innovative technologies for water recycling and desalination Potential of artificial intelligence and Internet of Things (IoT) in water management Challenges and opportunities in adopting new water conservation technologies Understanding the impact of climate change on water resource Strategies for adapting to changing precipitation patterns Importance of integrating climate change considerations into water conservation efforts, Role of education in promoting water conservation, Importance of raising awareness about water scarcity issues Recommendations for incorporating water conservation education into formal and informal learning environments	**(6Hrs)**

Project Based Learning (PBL)	
1	Prepare a presentation outlining the importance of water conservation in addressing global water scarcity and ensuring sustainable development.
2	Develop an educational video explaining the water cycle, detailing each stage and its significance in the movement and distribution of water on Earth.
3	Prepare a comparative analysis highlighting the differences between renewable and non-renewable water resources, with examples and implications for water management.
4	Investigate real-world case studies of groundwater depletion in different regions, analyzing causes, consequences, and potential solutions for sustainable groundwater management.
5	Create an educational poster highlighting the significance of fixing leaks promptly and investing in water-saving appliances to conserve water and reduce utility bills.
6	Prepare a comprehensive guidebook outlining best practices for reducing water usage in commercial settings, including restaurants, hotels, and office buildings, through measures like water audits, retrofitting, and employee training.
7	Research and analyze case studies of successful water conservation initiatives implemented by industries, highlighting key strategies, challenges faced, and outcomes achieved.
8	Research and compile a comprehensive report summarizing national and international policies related to water conservation, including regulations on water usage, pollution control, and watershed management
9	Write an essay discussing the importance of community involvement in water conservation efforts, including raising awareness, implementing local initiatives, and advocating for policy changes.
10	Develop a guidebook outlining strategies for engaging communities in water conservation efforts, including education campaigns, community workshops, grassroots organizing, and leveraging social media platforms.
11	Write a research paper exploring the potential applications of artificial

	intelligence (AI) and Internet of Things (IoT) technologies in water management, including real-time monitoring, predictive analytics, and smart water distribution systems.
12	Conduct interviews or surveys with industry experts and policymakers to identify the challenges and opportunities in adopting new water conservation technologies, analyzing factors such as cost-effectiveness, scalability, and regulatory barriers.
13	Prepare a multimedia presentation discussing the impacts of climate change on water resources, including changes in precipitation patterns, increased frequency of extreme weather events, and implications for water availability and quality.
14	Organize a debate on the topic of balancing economic development and environmental protection in water management, with students arguing for and against various policy approaches and trade-offs.
15	Organize a role-playing scenario where students represent various stakeholders (e.g., government officials, environmentalists, industry representatives, community leaders) negotiating water conservation policies, highlighting differing perspectives and interests.
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1	"Water: The Epic Struggle for Wealth, Power, and Civilization" by Arjun Makhijani, Vandana Shiva, and Sunita Narain
2	"Water: India's Lifeline" by Santosh Kumar Sharma
3	"Water: India's Most Precious Resource" by Rishi Kumar Sharma
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5	"Water Conservation in Rural India" by Shrikant Daji Limaye
ONLINE REFERENCES:	
1	**https://www.worldwatercouncil.org/en**
2	**https://water.org/**
3	**https://www.nationalgeographic.com/environment/article/water-conservation-tips**
4	**https://www.indiawaterportal.org/**

Programme: B.Tech. (Civil) Sem – IV

COURSE: STRUCTURAL ANALYSIS-I		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 03 Hours / Week Tutorial: 01 Hour / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 03 Tutorial: 01
Total: 48 Hours	Total: 100 Marks	Total: 04

Course Pre-requisites: The students should have knowledge of

1	Engineering Mechanics
2	Mechanics of Solids

Course Objective:

	The student should be able to calculate member forces and deflection of determinate beams, trusses and arches.

Course Outcomes: The student will be able to

1	determine degree of indeterminacy of structures.
2	calculate deflection of joints of determinate truss and beams.
3	determine influence line diagram for forces in beams
4	construct influence line diagram for rolling loads on beams.
5	calculate forces in members of truss using influence line diagram.
6	determine forces in three hinged arch.

Course Content:

Unit-I	**Basic Concepts** Classification of structures, Types of structures, skeletal structures; members and member forces, joints, supports, loads and load effects; Concept of stability; Concepts of indeterminacy and degrees of freedom; Static and Kinematic degree of indeterminacy; Deflected shape of beams and frames.	**(08 Hours)**
Unit-II	**Strain Energy and Deflection of Truss** Strain Energy: Concept of strain energy; Modulus of Resilience; Strain energy due to axial force, shear force, bending moment and torsional moment. Deflection of joints of determinate truss using Castigliano's first theorem Deflection of beams by using Macaulay's method and Moment Area Method.	**(08 Hours)**
Unit-III	**Influence Line Diagrams for Beams** Basic Concept of Influence lines, Construction of Influence Line Diagrams (ILD) for Support reactions, Shear Force and Bending Moment at a given section for simply supported beams, overhanging beams and compound beams.	**(08 Hours)**
Unit-IV	**Application of Influence Line Diagrams for Rolling Loads on beams** Rolling loads: Use of influence line diagram for determination of SF and BM in beams due to UDL shorter than span, UDL longer than span, Series of concentrated loads. Conditions for maximum SF and maximum BM values	**(08 Hours)**
Unit-V	**Influence Line Diagrams and Application to Truss**	**(08 Hours)**

	Influence line diagram for axial forces in members of plane determinate trusses. Use of influence line diagram for determination of member forces of plane determinate trusses under dead load and live load.	
Unit-VI	**Analysis of Three Hinged Arch** Concept and types of arches, Three hinged arches - Analysis, Calculation of Normal Thrust, Radial Shear, and Bending Moment at a cross section.	**(08 Hours)**

Internal Assessment:	
Unit Test -1	UNIT – I, II, III
Unit Test -2	UNIT – IV, V, VI

Project Based Learning: Any ONE based on following topics but not limited to it.	
1	Make model of different types of supports.
2	Prepare model on different types of structures - space, plane, trusses, beams and frames.
3	Prepare animated PPT to show deflected shapes of different types of structures.
4	Prepare model on degree of static indeterminacy.
5	Prepare model on degree of kinematic indeterminacy.
6	Make skeletal model of truss.
7	Analyse truss using software.
8	Prepare model on deflection of truss.
9	Prepare model on ILD of truss.
10	Draw an ILD of truss using software.
11	Prepare model on ILD of beams.
12	Draw an ILD of beams using software.
13	Make model on Muller-Breslau's principle.
14	Make model of three hinged arch.
15	Prepare PPT on analysis of three hinged arch.

Reference Books:	
1	Hibbeler R. C., “Structural Analysis”, Prentice Hall Publication
2	Aslam Kassimali, “Structural Analysis”, Cengage Learning.
3	Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication
4	Bhavikatti S. S., “Structural Analysis- I and II”, Vikas Publication.
5	Pandit G. S. & Gupta S. P., “Theory of Structures”, Tata McGraw Hill Publication
6	Ramamrutham S. & Narayan R., “Theory of Structures”, Dhanpat Rai Publishing Company
7	Menon Devdas “Structural Analysis”, Alpha Science International Publication.
8	Khurmi R. S. “Theory of Structures”, S. Chand Publication

Online References:	
1	https://nptel.ac.in/courses/105101085

COURSE: Geotechnical Engineering		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 03Hrs / Week Practical: 02 Hrs / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks Term work: 25 Marks Oral: 25 Marks	Theory: 03 Practical: 01
	Total: 150 Marks	Total: 04

Course Pre-requisites: The students should have knowledge of	
1	Engineering Mathematics I & II
2	Engineering Mechanics
3	Strength of Materials
Course Objective: On completion of the course -	
	The students will be able to determine the Index and Engineering properties of soil and identify its suitability for use as a construction material.
Course Outcomes: On completion of the course, the students will be able to -	
1	summarize the properties and classify of soil.
2	determine the index properties of soil.
3	analyse the effect of flow of water through the soil.
4	calculate and analyze the stresses on soil.
5	analyse the shear parameter of soil by various method.
6	compute the lateral earth pressure on retaining wall and demonstrate an understanding of slope stability concepts.

Course Content:

Unit-I	**Introduction & classification of soil: -** Types of soils, their formation, Application area in Geotechnical Engineering, Three- and Two-Phase system of soil in terms weight and volume, Weight-Volume relationship: - Water Content, Mass density, Unit weight, Specific gravity, Porosity, Void ratio, Degree of Saturation, Air content. Types of Soil structure, Soil Classification System based on particle size and IS system	**(06 Hrs)**
Unit-II	**Index Properties of Soil:** Methods of determination of water content, Specific gravity, in-situ density test, Atterberg' limit, consistency indices, flow and toughness index, activity of clay, Particle size distribution, Mechanical sieve analysis, Particle size distribution curve.	**(06 Hrs)**
Unit-III	**Flow through soil:** **Permeability: -**Concept of Permeability, Factors affecting permeability, Darcy's law, Discharge and seepage velocity, Average permeability of Stratified soil, laboratory measurement of permeability: Constant and falling head method. **Seepage Analysis: -** Principles of total, neutral and effective stresses, effect of water, Seepage pressure, Quick-sand condition, 2-D Laplace equation.	**(06 Hrs)**
Unit-IV	**Compaction and Stress Distribution:**	**(06 Hrs)**

	Compaction: - Introduction, Factors of affecting compaction, Compaction curve, zero air void line, IS light and heavy compaction test. **Stress Distribution: -** Geo-statics stress, Pressure distribution along horizontal and vertical plane, concept of pressure bulb, Assumptions, Limitations and Comparison of Boussinesq's and Westergaard's theory of stresses in soil (No Derivation) for point load.	
Unit-V	**Shear Strength of Soil:** Introduction, Mohr's stress circle, Mohr-Coulomb failure theory. The effective stress principle- Total stress, effective stress and neutral stress / pore water pressure, factors affecting shear strength. Stress-strain behaviour of sands and clays, Sensitivity of clay, Thixotropy of clay. Measurement of Shear Strength- Direct Shear test, Triaxial Compression test, Unconfined Compression test, Vane Shear test. Their suitability for different types of soils advantages, and disadvantages. Different drainage conditions for shear tests.	**(06 Hrs)**
Unit-VI	**Earth Pressure Theory and Slope Stability: -** Earth Pressure: -Introduction to earth pressure theory, earth pressure at rest, active and passive condition, Rankine's earth pressure theory: - Assumption, active state in cohesive and cohesionless soil, effect of water table and surcharge. Slope Stability: - Introduction, types of slopes and their failure mechanism, factor of safety, Taylor Stability number.	**(06 Hrs)**

Internal Assessment: Unit Test	
Unit Test -1	Units: I, II, III
Unit Test -2	Units: IV, V, VI

Project Based Learning: Any One based on following topics but not limited to it	
1	Prepare chart of Two Phase and Three phase system showing with weight and volume relationship.
2	Prepare the chart of IS soil classification system.
3	Development of sheet excel or python programme for calculation coefficient of curvature and coefficient of uniformity.
4	Prepare the chart of different types of soil structure.
5	Development of sheet excel or python programme for calculation of consistency indices.
6	Draw the particle size distribution curve by using the excel (Minimum three problems)
7	Prepare the chart for comparison of constant and falling head method of permeability.
8	Development of sheet excel or python programme for calculation of effective stress in soil.
9	Prepare the chart for comparison of light and heavy compaction test.
10	Development of sheet excel or python programme for stress by using Boussinesq's equation.
11	Draw the compaction curve of soil by using the excel.
12	Collection of information and photographs of machines used for compaction of soil.
13	Draw the Mohr's circle of stress for various shear test.
14	Prepare chart for calculation of active earth and passive earth pressure on retaining wall.
15	Development of sheet excel or python programme for calculation active and passive earth

	pressure on retaining wall.
Term work: The term-work shall consist **of minimum Eight experiments** from list below, out of which first six are compulsory.	
1	Determination of water content of given soil sample by oven drying method.
2	Determination of specific gravity of given soil by pycnometer method.
3	Determination of consistency limits of soil – Liquid, plastic and shrinkage limit.
4	Determination of the shear parameters of given soil by Direct shear test.
5	Determine grain size distribution of given soil sample by mechanical sieve analysis.
6	Determine dry unit weight of soil in field by core cutter or sand replacement method.
7	Determination of coefficient permeability by constant head test or falling head test of given soil sample.
8	Determination of MDD and OMC by standard proctor test or Modified proctor test of given soil sample.
9	Determination of shear parameters of given soil by Unconfined Compression Strength of soil.
10	Determination of shear parameters of given soil by Triaxial Shear Test.
11	Determination of shear parameters of given soil by Vane Shear Test.
12	Rehann's and Culmann's graphical method for determination of earth pressure.
Oral/Practical:	
	The oral examination will be based on above term work and course content.
Reference Books:	
1	C. Venkatramaiah, "Geotechnical Engineering", Fifth Edition, New Age International Private Limited, 2017
2	Dr. B.C. Punmia, Er. Ashok K. Jain, Dr. Arun K. Jain, "Soil Mechanics & Foundations" Seventeen editions, Laxmi Publication, 2005
3	Dr. K.R. Arora, "Soil Mechanics & Foundation Engineering" Seventh Edition, Standard Publishers and Distributors, New Delhi, 2018
4	Gopal Ranjan , A. S. R. Rao,"Basic and Applied Soil Mechanics", Fourth Edition, New Age International Private Limited, 2022
5	Manoj Datta , S Gulhati, "Geotechnical Engineering" McGraw Hill Education, 2017
6	Prof. T G Sitharam & Prof T N Ramamurthy," Geotechnical Engineering' Fourth Edition, S. Chand Publication, 2005
Reference IS Code:	
1	IS 2720:- 1 to 12 Methods of Test for Soils
Reference link	
1	https://archive.nptel.ac.in/courses/105/101/105101201/
2	https://archive.nptel.ac.in/courses/105/105/105105168/
3	https://smfe-iiith.vlabs.ac.in/List%20of%20experiments.html

Programme: B. Tech (Civil) Sem – IV

COURSE: MECHANICS OF FLUIDS

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 03 Hours / Week Practical: 02 Hours / Week	Semester End Examination: 60 Marks Internal Assessment: 40 Marks Term Work: 25 Marks Oral : 25 Marks	Theory: 03 Practical: 01
	Total Marks: 150 Marks	Total: 04 Credits

Course Pre-requisites: The students should have knowledge of

1	Engineering Mathematics
2	Engineering Physics
3	Engineering Mechanics

Course Objective:

	To make the student understand the scope and application of Fluid Mechanics

Course Outcomes: The student will be able to

1	describe basic properties of fluids and measure its properties in static conditions
2	apply knowledge of fluid kinematics.
3	apply knowledge of fluid energy relationships
4	analyze physical phenomenon dimensionally
5	explain laminar flow and boundary layer theory.
6	explain turbulent flow & flow through pipes

Course Content:

Unit-I	**Properties of Fluids**: Physical properties of fluids, Newton's Law of Viscosity, Dynamic & Kinematic Viscosity, Classification of fluids. **Statics**: Pressure density height relationship & Measurement, Hydrostatic pressure on a plane, Centre of pressure, Buoyancy, Stability of floating bodies, Metacentre and Metacentric height.	**(06 Hrs)**
Unit-II	**Kinematics** Types of flow, path lines and streak lines, streamlines, Stream Tube, Continuity Equation in 1-D and 3-D, Velocity potential, Stream functions, Circulation and Vorticity, Concept and Application of Flow Net.	**(06 Hrs)**
Unit-III	**Energy Relationships** Derivation of Bernoulli's Equation from Newton's 2nd Law , Limitations, Modified form of Bernoulli's Equation, Total energy and Hydraulic Grade line, Impulse momentum equation..	**(06 Hrs)**
Unit-IV	**Dimensional Analysis and Model Studies** Dimensional homogeneity, important dimensionless parameters, Dimensional analysis using Buckingham's theorem, Model studies, Similitude, Model laws, Types of models.	**(06 Hrs)**
Unit-V	**Fundamental of Pipe Flow & Boundary layer theory** Reynolds experiment, Classification of Flows based on Reynolds Number, Moody's Diagram, Laminar flow in circular pipe, Hagen Poisullies	**(06 Hrs)**

	Equation, Introduction to Boundary Layer Theory, Concept of boundary layer, Development of Boundary layer over a flat plate, laminar sub layer, General characteristic of boundary layer, Boundary layer thickness, Velocity distributions within boundary layer		
Unit-VI	**Turbulent flow & Pipe Flow Problems** Characteristics of turbulent flow- Instantaneous velocity, Temporal mean velocity, Scale of turbulence and intensity of turbulence, Darcy- Weisbach equation, Flow through pipes: Energy losses in pipe flow, parallel and series pipes, Equivalent Pipe Concept, Siphons,		**(06 Hrs)**
Internal Assessment:			
	Unit Test -1	UNIT – I, II, III	
	Unit Test -2	UNIT – IV, V, VI	
	Project Based Learning:		
1	Determining physical properties of 3 different Fluids. (Specific Weight, Mass Density, specific volume, specific gravity etc.)		
2	Determining kinematic viscosity at different temperatures of 3 different fluids (Lubricating oils, Cooking oil etc.)		
3	Collection of Newtonian fluid, non-Newtonian Fluid, Ideal Plastics and Thixotropic Fluids one each and studying properties of fluids.		
4	Based on pressure density height relationship, prepare a sheet showing water pressure on wall of dam of different heights.		
5	Prepare a model of a ship showing different Metacentric heights		
6	Prepare a model ship showing stable, unstable equilibrium (C.G. and C.P.)		
7	Demonstrate and verify Bernoulli's theorem using other equipment's (Wind Tunnel, etc.)		
8	Collection of information and presentation of working of any hydraulic equipment (JCB, Earth moving machinery etc.)		
9	Calculation of Energy losses in pipe flow for different flow conditions.		
10	Calculation of Coefficient of discharge of Venturimeter by taking 10 different flow readings.		
11	Calculation of Coefficient of velocity of Venturimeter by taking 10 different flow readings.		
12	Calculation of Coefficient of discharge of Notch by taking 10 different flow readings.		
13	Preparing different shaped acrylic notches to measure discharge and calibrating it.		
14	Calculate Energy losses in domestic pipeline with given data.		
15	Preparing a acrylic model for a dam and testing it.		
Term Work: The term-work shall consist of Minimum **Eight** experiments from list below.			
1	Determination of Viscosity		
2	Study of Pressure Measuring Devices		
3	Study of Stability of Floating Bodies		
4	Verification of Bernoulli's Theorem.		
5	Calibration of C_d of Venturimeter		
6	Calibration of C_d of Orifice		
7	Calibration of C_d Notch		
8	Study of Laminar flow Using Heleshaw's Apparatus		
9	Study of Laminar flow Using Reynold's Apparatus		
10	Design of Venturimeter (As per IS Code)		
11	Design of Weir (As per IS Code)		

Oral: The Oral examination will be based on above term work and course content.	
Reference Books:	
1	Garde R. J. and Mirajgaonkar, "Engineering Fluid Mechanics" Scitech Publication, Ist Edition, 2010
2	C. P. Konthadraman, "Fluid Mechanics and Machinery" New Age Publications Ist Edition, 2012
3	S. Ramamurtham, "Hydraulics and Fluid Mechanics and Fluid Machines" Dhanpat Rai Publishing Company
4	R. K. Bansal "Fluid Mechanics and Hydraulic Machines" Laxmi Publications, 9th Edition, 2005
5	R.K. Rajput "Fluid Mechanics" S Chand Publications, 6th Edition, 2016
6	Garde R. J. and Mirajgaonkar "Fluid Mechanics Through Problems", New Age International New Delhi, Ist Edition 2000.
7	Modi P.N. and Seth S.M. "Fluid Mechanics" Standard Book House, 22nd Edition, 2019
Online References	
1	Cambridge University Press, "Fluid Mechanics A Short Course" https://www.cambridge.org/core/books/abs/fluid-mechanics/references/77E623917706B9F73C2DC12BFFF992AB
2	IIT Kanpur, "Introduction to Fluid Mechanics" hrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://home.iitk.ac.in/~nikhilk/Book.pdf
3	Open Text Book Library https://open.umn.edu/opentextbooks/textbooks/85
4	NPTEL Courses by Prof. Dutta on "Fluid Mechanics" https://onlinecourses.nptel.ac.in/noc20_ce59/preview
5	Physics Forum: https://www.physicsforums.com/threads/recommend-a-fluid-mechanics-book.104229/
Online Journals	
1	Journal of Applied Fluid Mechanics https://www.jafmonline.net/
2	Taylor and Francis Online "International Journal of Computational Fluid Dynamics" https://www.tandfonline.com/toc/gcfd20/current
3	Wiley online Library :International Journal for Numerical Methods in Fluids https://onlinelibrary.wiley.com/journal/10970363
4	Taylor and Francis "Engineering Applications of Computational Fluid Dynamics" https://oa.mg/journals/open-access-computational-fluid-dynamics-journals
5	Oxford Academic : Journal of Mechanics; "https://academic.oup.com/jom"
	IC Codes :
1	IS 1193-1959: Methods for measuring water flow in open channels using notches, weirs, and flumes
2	IS 13578: Code of Practice for subsurface exploration of Barrages and weirs
3	IS 14750 (2000): Code of Practice for Installation, including standard 90° V-Notch weirs
4	IS 9117-1979: V-notch weirs, which are normally manufactured according to this standard
5	IS 14386: This standard specifies the requirements for V-notch weirs for open channel flow measurement.
6	IS 8034: This standard covers the design and installation of sharp crested weirs for measurement of flow in open channels.
7	IS 3912: This standard pertains to Parshall flumes for measurement of flow in open channels.
8	IS 3913: This standard deals with broad crested weirs for measurement of flow in open channels.

COURSE: GEOINFORMATICS		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 03Hrs / Week Practical: 02Hrs / Week	End Semester Examination:60 Marks Internal Assessment: 40Marks Term work: 25Marks Oral : 25 Marks	Theory: 03 Practical: 01
	Total Marks : 150	Total: 04

Course Pre-requisites: The students should have knowledge of	
1	Basic land Surveying
2	Mathematics and Geometry
Course Objective: On completion of the course -	
	The students will be able to use techniques of RS , GIS, Drone and SBPS for various civil engineering applications.
Course Outcomes: On completion of the course, the students will be able to -	
1	Describe fundamentals and principles of RS techniques.
2	Demonstrate the knowledge of remote sensing and sensor characteristics
3	Explain the concept of GIS and acquire skills of data processing
4	Use GIS for various Civil engineering applications
5	Demonstrate use of drone survey for mapping and other applications
6	Describe fundamentals of SBPS and its use

Course Content:

Unit-I	**Fundamentals of Remote Sensing** Definition and scope, history and development of remote sensing technology, electromagnetic radiation and electromagnetic spectrum, EMR interaction with atmosphere and earth surface; atmospheric window, RS platforms, elements of remote sensing for visual interpretation, Types of sensors, orbital and sensor characteristics of major earth resource satellites, Indian remote sensing satellite programs.	**(06 Hrs)**
Unit-II	**Remote Sensing Satellites and Sensor Characteristics** Introduction to various open-source satellite data portals, global satellite programs, sensor classification, applications of sensor, concept of Swath & Nadir, resolutions, digital image. Introduction to spatial resolution, spectral resolution, radiometric resolution and temporal resolution, image interpretation , Digital image, concept of spectral signatures curve, digital image processing . Digital elevation model (DEM) and its derivatives, triangular irregular network model (TIN) and other models & their applications.	**(06 Hrs)**
Unit-III	**Geographic information system**, definition, spatial and non-spatial data, data inputs, data storage and retrieval, data transformation, Introduction to cloud computing (types & applications), data reporting, advantages of GIS, essential elements of GIS hardware, software GIS data types, thematic layers and layer combinations, difference between drafting software's and GIS, fundamentals of cartography and map	**(06 Hrs)**

	design, applications of RS and GIS in civil engineering, surveying and mapping.	
Unit-IV	**GIS Data and Applications** GIS data types and data representation, data acquisition, geo-referencing of data, projection systems, raster and vector data, raster to vector conversion, attribute data models and its types, remote sensing data in GIS, GIS database and database management system. Case studies: demarcation of dam catchment and command area, applications of land use and land cover pattern, application in urban planning, applications in irrigation planning and scheduling,	**(06 Hrs)**
Unit-V	**Introduction to Drone Survey:** Pre and Post Flight planning- Flight execution and photography, data collection- Image Format, GSD, Scale and Resolution. Surveying with drone: Consideration for hardware selections. Techniques of controlling errors, Consideration of GCP in vertical and horizontal accuracies. IMAGE PROCESSING : Aerial Triangulation, post processing softwares, DEM, DSM, Introduction to mapping and modeling concepts Application of drone for Surveying & Mapping-Construction	**(06 Hrs)**
Unit-VI	**Space Based positioning System** Introduction to GNSS and Types, IRNSS, GPS, GPS components . RNSS type SBPS in action GPS signals, GPS receivers-navigation and surveying. SBPS positioning systems-absolute and differential positioning ,ephimeris. SBPS coordinates and heights, Surveying with SBPS, Errors in positioning with SBPS. Applications of SBPS.	**(06 Hrs)**

Internal Assessment:A) Unit Test

Unit Test -1	Units: I, II, III
Unit Test -2	Units: IV, V, VI

B) Project Based Learning: Any ONE based on following topics but not limited to-

1	Prepare a report on urban planning with the use of Remote sensing.
2	Case study on urban growth monitoring using remote sensing .
3	Case study on transport planning using remote sensing.
4	Carry out water resources assessment using remote sensing and GIS.
5	Case study on land use and land cover analysis using remote sensing and GIS.
6	Case study on assessment of crop yield using remote sensing and GIS.
7	Report on various applications of Drone survey
8	Case study on use of RS and GIS in reservoir sedimentation
9	Report on Various remote sensing data products.
10	Case study on application of RS and GIS in flood zone mapping
11	Case study on use of Digital elevation models
12	Prepare a report on applications of GPS in transportation
13	Case study on use of GIS for forest monitoring
14	Applications of GPS with respect to Earthquake
15	Case study on applications of Rs and GIS in Hydrological studies.

Term work: The term work shall consist of following practical (any 8)	
1	Exploring Arc GIS Map tools.
2	Geodata base creation by Arc GIS
3	Digitalization by Arc GIS
4	Geo-referencing using Arc GIS.
5	Topology building by using Arc GIS
6	Generation of contour map using software.
7	Visual image interpretations from satellite images.
8	Image Classification - Unsupervised Classification Supervised Classification, Accuracy Evaluation
9	Mini project using Arc GIS.
10	Demonstration of Mapping using drones.
11	Use of DGPS for land survey.
Oral:	
	The oral examination will be based on above term work and course content.
Reference Books:	
1	Principals of Remote Sensing, Panda B C, Viva Books Private Limited
2	Remote Sensing & Geographical Information System, M. Anji Reddy, BS Publications, Hyderabad.
3	Remote Sensing & Digital Image Processing, John R. Jensen, Department of Geography University of South Carolina Columbia
4	Remote Sensing and Image Interpretation, Lillesand Thomas M. and Kiefer Ralph, John Villey
5	Textbook on Remote Sensing, C. S. Agarwal and P. K. Garg, Wheeler Publishing
On line References	
	https://bhuvan-app3.nrsc.gov.in/data/download/index.php
	https://asterweb.jpl.nasa.gov/gdem.asp
	https://qgis.org/en/site/

Programme: B. Tech. (Civil) Sem – IV (CBCS 2023)

COURSE: PROJECT MANAGEMENT		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 3 Hrs / Week	End Semester Examination: 60 Marks Internal Assessment: :40 Marks	Theory: 03
	Total : 100 Marks	Total: 03

Course Pre-requisites: The students should have knowledge of	
1	Building Construction
2	Building Design and Drawing
Course Objective: On completion of the course -	
	The students will be able to apply project management principles and techniques for effective planning, scheduling, control, and quality management in construction projects.
Course Outcomes: On completion of the course, the students will be able to -	
1	analyze the significance of project management, roles, and organizational structures in construction success.
2	apply project planning processes like WBS, Gantt/Milestone charts, and network diagrams for scheduling construction projects.
3	evaluate the suitability of CPM and PERT techniques for project control and monitoring, calculating critical paths and slacks.
4	apply resource allocation, levelling, and crashing techniques to optimize project execution and monitor costs.
5	analyze material management principles, planning, scheduling, and inventory control techniques for construction projects.
6	synthesize a plan for implementing Total Quality Management (TQM) in construction, including quality control, process improvement, and software tools.

Course Content:

Unit-I	**Introduction to Construction Project Management:** Overview of construction project management, Modern Scientific Management (Fayol. F.W, Taylor, Mayo), Role and responsibilities of a construction project manager, Importance of Organizational Structure, Types of Organization, Importance of effective project management in the construction industry.	**(06 Hrs)**
Unit-II	**Project Planning and Scheduling:** Project planning process and its components, Work Breakdown Structure, Introduction to Gantt/ Bar Charts & limitations, Milestone charts & limitations, Development of Network Problems, Components of Network- Event, Activity, Dummy, Types of Networks, Network Rules.	**(06 Hrs)**
Unit-III	**Project Control and Monitoring with Critical Path Method (CPM) and Program Evaluation & Review Techniques (PERT):** Definition and purpose of Critical Path Method (CPM), Forward pass and backward pass calculations, Identification of critical path, Types of floats, Definition and purpose of Program Evaluation & Review Techniques	**(06 Hrs)**

	(PERT), Three-time estimate technique, Slacks.	
Unit-IV	**Project Execution and Monitoring:** Resource Allocation, Resource Smoothening, Resource Levelling, Crashing Network, Updating of Network, Direct Cost, Indirect Cost, Cost Slope.	**(06 Hrs)**
Unit-V	**Material Planning and Forecasting:** Definition and significance of material management, Material requirement planning, Material scheduling, Inventory Control, Inventory Classification, Inventory management, Inventory Models, Economic order quantity, ABC analysis.	**(06 Hrs)**
Unit-VI	**Total Quality Management:** Importance of Total Quantity Management in Construction Process, Steps Involved in TQM in Construction, Concept of Quantity Control, Quality Assurance, Process improvement methodologies (Six Sigma), Introduction to Primavera.	**(06 Hrs)**

Internal Assessment:	
Unit Test -1	Units: I, II, III
Unit Test -2	Units: IV, V, VI

Project Based Learning: Any ONE based on following topics but not limited to it	
1	Create a detailed construction schedule for a small residential building project, including task sequencing and resource allocation.
2	Develop a project plan for the construction of a small residential house, including scheduling, budgeting, and resource allocation
3	Plan and manage the rehabilitation of a section of a road, considering traffic management, material procurement, and quality control
4	Manage the expansion of a water treatment plant, covering planning, scheduling, and coordination of construction activities
5	Develop a project plan for renovating a public park, addressing landscaping, infrastructure improvements, and community engagement
6	Plan the construction of additional classrooms for a school, considering project timelines, budget constraints, and safety measures.
7	Prepare a work breakdown structure for two different type of construction projects.
8	Prepare two detailed bar charts for any type of construction Project.
9	Prepare a detailed project analysis using Critical Path Method for two different Projects.
10	Prepare a detailed project analysis using Program Evaluation and Review Technique for two different types of research projects.
11	Prepare a detailed report on resource allocation in two different types of Construction Projects.
12	Prepare a report on Crashing of Network for Construction Projects with use of Direct cost, Indirect Cost and Cost slope.
13	Prepare a report on controlling of raw material and work in progress inventory for a construction project.
14	Prepare a detailed report on Importance on application of Total Quality Management for different types of Construction Projects.
15	Prepare a report on use of Six Sigma Concept and Primavera in Construction Projects.

Reference Books:	
1	Robert L. Peurifoy, Clifford J. Schexnayder, and Aviad Shapira "Construction Planning, Equipment, and Methods".(Ninth Edition, 2023)
2	Chris Hendrickson and Tung Au "Project Management for Construction". (Seventh Edition, 2020)
3	K. K. Chitkara "Construction Project Management". (Fourth Edition, 2019)
4	Kumar Neeraj Jha "Construction Project Management: Theory and Practice". (Second Edition, 2018)
5	S. Seetharaman, "Construction Engineering and Management" by Umesh Publications, New Delhi.
6	L.S. Srinath "PERT & CPM principles & applications" by affiliated East West press Pvt. Ltd., New Delhi.
7	Dr. B.C. Punmia, K.K. Khandelwal, "Project Planning & control with PERT & CPM" by Laxmi Publications (P) Ltd, New Delhi.
8	K.K. Chitkara "Construction Project Management Planning, Scheduling, and controlling" by TMH Publishing Company, New Delhi.
9	Alan C. Twort & J. Gordon Rees "Civil Engineering Project Management" by Elsevier.
10	Prasanna Chandra "Project Planning, Analysis selection, Implementation & Review" by Tata McGraw Hill, New Delhi.
Online References:	
1	https://swayam.gov.in/explorer
2	https://onlinecourses.swayam2.ac.in/nou24_ce04/preview
3	https://onlinecourses.nptel.ac.in/noc24_ce41/preview
4	https://www.udemy.com/courses/business/project-management/
5	https://www.coursera.org/courses?query=project%20management

Programme: B. Tech. (Civil) Sem – IV (CBCS 2023)

COURSE: SKILL BASED COURSE IV-PROJECT MANAGEMENT Microsoft Project (MSP)		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Practical: 2 Hrs / Week	Termwork: 25 Marks Oral: 25 Marks	Practical: 01
Total : 24 Hrs	Total: 50 Marks	Total: 01

Course Pre-requisites: The students should have knowledge of	
1	Building Construction
2	Building Design and Drawing
3	AutoCAD 2D & 3D
4	Project Management
Course Objective: On completion of the course -	
	The students will be able to utilize Microsoft Project software for effective task planning, resource management, scheduling, and progress tracking in various project management scenarios.
Course Outcomes: On completion of the course, the students will be able to -	
1	understand the key concepts of project management and apply basic functions in Microsoft Project (MSP).
2	apply Work Breakdown Structure (WBS) and scheduling techniques to analyze critical paths and create optimized project schedules in MSP.
3	evaluate resource availability and apply allocation and levelling techniques to manage resource costs and workloads in MSP.
4	utilize (advanced scheduling techniques, including constraints, baselines, and change management in MSP
5	monitor project progress, analyze variances, and communicate project status using reports and dashboards in MSP
6	apply advanced features like custom fields, automations, and integrations to extend MSP functionalities for complex project management scenarios.
Term work: The term work shall consist of **ANY EIGHT** of following practical's-	
1	Getting Started with MSP: Create a new project in MSP.
2	Task Planning and Scheduling: Define a work breakdown structure (WBS) for a sample project
3	Resource Management in MSP: Experiment with resource allocation and levelling techniques
4	Scheduling Techniques: Create and manage baseline and interim plans for the project.
5	Tracking and Reporting Progress: Practice updating task progress in MSP.
6	Advanced Features and Integration: Create custom fields and formulas to enhance project tracking.
7	Identify the critical path in your project plan, understanding its impact on the overall schedule in MSP.

8	Integrate MSP with Microsoft Excel and Teams for collaborative project management.
9	Import and export project data between MSP and other Microsoft tools.
10	Develop a project budget in MSP and track actual costs incurred, identifying cost variances, and implementing cost control measures as needed.
11	Write Assignment on Advancements in Primavera
Oral:	
	The oral examination will be based on above term work and course content
Reference Books:	
1	Carl Chatfield and Timothy Johnson "Microsoft Project 2016 Step by Step", Microsoft Press, 2016.
2	Carl Chatfield and Timothy Johnson "Microsoft Project 2016 Step by Step", Microsoft Press, 2022
3	John P. Nelson "Microsoft Project 2021 Step by Step" Microsoft Press 2021
4	Beverly Cleary **"Microsoft Project 2021 Visual QuickStart Guide".2021**
Online References:	
1	https://www.pmi.org/
2	https://www.udemy.com/
3	https://www.coursera.org/
4	https://learn.microsoft.com/en-us/project/
5	https://support.microsoft.com/en-us/project
6	https://create.microsoft.com/en-us

B. Tech. Sem. IV: Civil Engineering
SUBJECT: - INDIAN KNOWLEDGE SYSTEM

TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 02 Lectures /Week	Internal Assessment: 50 Marks	Credits: 02
		Total Credit: 02

Course Objectives:

1.	To sensitize the students about Indian culture and civilization including its Knowledge System and Tradition.
2.	To help student to understand the knowledge, art and creative practices, skills, and values in ancient Indian system
3.	To help to study the enriched scientific Indian heritage.
4.	To introduce the contribution from Ancient Indian system & tradition to modern science & Technology

Course Outcomes: After learning this course students will be able to understand

1	Concepts of Indian Knowledge System
2	India's contribution in Philosophy and Literature
3	India's involvement in Mathematics and Astronomy
4	India's role in Medicine and Yoga
5	India's influence in Sahitya
6	Concepts of Indian Shastra

UNIT – I	**Introduction to Indian Knowledge System**	**(04 Hours)**
	Definition, Concept and Scope of IKS, IKS based approaches on Knowledge Paradigm, IKS in ancient India and in modern India	
UNIT – II	**Philosophy and Literature**	**(04 Hours)**
	Contributions by Maharishi Vyas, Manu, Kanad, Pingala, Parasar, Banabhatta,Nagarjuna and Panini in Philosophy and Literature	
UNIT - III	**Mathematics and Astronomy**	**(04 Hours)**
	Contribution of Aryabhatta, Mahaviracharya, Bodhayan, Bhashkaracharya, Varahamihira and Brahmgupta in Mathematics and Astrononmy	
UNIT -IV	**Medicine and Yoga**	**(04 Hours)**
	Major contributions of Charak, Susruta, Maharishi Patanjali	

	and Dhanwantri in Medicine and Yoga	
UNIT -V	**Sahitya**	**(04 Hours)**
	Introduction to Vedas, Upvedas, Upavedas (Ayurveda, Dhanurveda, Gandharvaveda) Puran and Upnishad) and shad darshan (Vedanta, Nyaya.Vaisheshik, Sankhya, Mimamsa, Yoga, Adhyatma and Meditation)	
UNIT -VI	**Shastra**	**(04 Hours)**
	Introduction to Nyaya, vyakarana, Krishi, Shilp, Vastu, Natya and Sangeet	

Reference Books

1.Textbook on IKS by Prof. B Mahadevan, IIM Bengaluru

2. Kapur K and Singh A.K (Eds) 2005). Indian Knowledge Systems, Vol. 1. Indian Institute of Advanced Study, Shimla. Tatvabodh of sankaracharya, Central chinmay mission trust, Bombay, 1995.

3. The Cultural Heritage of India. Vol.I. Kolkata:Ramakrishna Mission Publication, 1972.

4. Nair, Shantha N. Echoes of Ancient Indian Wisdom. New Delhi: Hindology Books, 2008.

5. Dr. R. C. Majumdar, H. C. Raychaudhuri and Kalikinkar Datta: An Advanced History of India (Second Edition) published by Macmillan & Co., Limited, London, 1953.

6. Rao, N. 1970. The Four Values in Indian Philosophy and Culture. Mysore: University of Mysore.

7. Avari, B. 2016. India: The Ancient Past: A History of the Indian Subcontinent from c. *7000* BCE to CE 1200. London: Routledge.

8. Textbook on The Knowledge System of Bhārata by Bhag Chand Chauhan,

9. Histrory of Science in India Volume-1, Part-I, Part-II, Volume VIII, by Sibaji Raha, et al. National Academy of Sciences, India and The Ramkrishan Mission Institute of Culture, Kolkata (2014).

10. Pride of India- A Glimpse of India's Scientific Heritage edited by Pradeep Kohle et al. Samskrit Bharati (2006).

12. Vedic Physics by Keshav Dev Verma, Motilal Banarsidass Publishers (2012).

13. India's Glorious Scientific Tradition by Suresh Soni, Ocean Books Pvt. Ltd. (2010).

14.Kapoor, Kapil, Avadesh Kr. Singh (eds.) *Indian Knowledge Systems* (Two Vols), IIAS, Shimla, 2005