Bharati Vidyapeeth

(Deemed to be University)

Pune, India

College of Engineering, Pune

Program Curriculum

B.Tech (Civil Engineering)-2021

Sem – V & VI

(w.e.f. from 2023-24)

BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY)
COLLEGE OF ENGINEERING, PUNE

VISION OF UNIVERSITY:

Social Transformation through Dynamic Education

MISSION OF UNIVERSITY:

- To make available quality education in different areas of knowledge to the students as per their choice and inclination
- To offer education to the students in a conducive ambience created by enriched infrastructure! and academic facilities in its campuses.
- To bring education within the reach of rural, tribal and girl students by providing them substantive fee concessions and subsidized hostel and mess facilities
- To make available quality education to the students of rural, tribal and other deprived sections of the population

VISION OF THE INSTITUTE

To be World Class Institute for Social Transformation through Dynamic Education.

MISSION OF THE INSTITUTE

- To provide quality technical education with advanced equipment, qualified faculty members, infrastructure to meet needs of profession and society.
- To provide an environment conducive to innovation, creativity, research and entrepreneurial leadership.
- To practice and promote professional ethics, transparency and accountability for social community, economic and environmental conditions.

DEPARTMENT OF CIVIL ENGINEERING

VISION OF DEPARTMENT

To create Civil Engineers who will transform Civil Engineering Industry for sustainable development of society.

MISSION OF DEPARTMENT

- To create Civil Engineers enriched with quality technical education.
- To inculcate innovation, creativity and research approach among the graduants.
- To create entrepreneurs practicing professional ethics.

BHARATI VIDYAPEETH
(DEEMED TO BE UNIVERSITY)
COLLEGE OF ENGINEERING, PUNE

PROGRAMME: B.TECH (CIVIL ENGINEERING)

Programme Educational Objectives (PEOs):

PEO1: To prepare students for career in Civil Engineering Profession.

PEO2: To develop a responsible 'Entrepreneur.'

PEO3: To develop the student to cope up with the advancements in Civil Engineering.

Programme Outcomes (PO): An Engineering Graduates will be able to:

PO-1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO-2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

PO-3. Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO-4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO-5. Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO-6. The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO-7. Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO-8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO-9. Individual and team-work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO-10. Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO-11. Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12. Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Programme Specific Outcomes (PSOs): A Civil Engineering Graduates will be able to:

PSO1: Industry Exposure: adapt to work and address challenges in construction Industry

PSO2: Optimal and Sustainable Solution: workout optimal and sustainable solution to infrastructural needs of the society

Bharati Vidyapeeth (Deemed To Be University), Pune
Faculty of Engineering and Technology
Programme: B. Tech. (Civil) –CBCS 2021 Course

Program: B. Tech. Civil Sem: V

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1.		Analysis of Indeterminate Structures	4	-	-	60	40	-	-	-	100	4	-	-	4
2.		Infrastructure and Transportation Systems	4	2	-	60	40	25	25	-	150	4	1	-	5
3.		Arbitration and Laws Related to Construction Industry	3	-	-	60	40	-	-	-	100	3	-	-	3
4.		Advanced Surveying with Geomatics**	3	2	-	60	40	25	25	-	150	3	1	-	4
5.		Limit State Design of Steel Structures*	4	2	1	60	40	25	25	-	150	4	1	1	6
6.		Vocational Course-III: Structural Assessment and Retrofitting / Industrial Orientation for Civil Engineers-I	-	2	-	-	-	25	25	-	50	--	1	-	1
7.		Civil Engineering Software – II (Staad Pro)	-	4	-			25	--	25	50	--	2	-	2
	Total		**18**	**12**	**1**	**300**	**200**	**125**	**100**	**25**	**750**	**18**	**6**	**1**	**25**
	Environmental Studies***		2	-	-	50	-	-	\-	-	-	-	-	-	-
	Social Activity- II ****		-	-	-	-	-	-	-	-	-	-	-	-	2

*Theory paper of 4 hours duration
**Industry Taught Course – III
** *Mandatory audit course
**** Add on course

Bharati Vidyapeeth (Deemed To Be University), Pune
Faculty of Engineering and Technology
Programme: B. Tech. (Civil) –CBCS 2021 Course

Program: B. Tech. Civil Sem: VI

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1.		Water Supply Engineering	4	2	-	60	40	25	-	25	150	4	1	-	5
2.		Hydrology and Irrigation Engineering	4	-	-	60	40	-	-	-	100	4	-	-	4
3.		Design and Detailing of Reinforced Concrete Structures**	4	4	-	60	40	50	25	-	175	4	2	-	6
4.		Quantitative Techniques, Communication and Values	4	-	-	60	40	-	-	-	100	4	-	-	4
5.		Project Estimation and Valuation*	4	2	-	60	40	25	50	-	175	4	1	-	5
6.		Vocational Course-IV: Contracts and e-Tendering// Industrial Orientation for Civil Engineers-II	-	2	-	-	-	25	25	-	50	-	1	-	1
	Total		**20**	**10**	**-**	**300**	**200**	**125**	**100**	**25**	**750**	**20**	**5**	**-**	**25**
	MOOC-II***		--	--	--	-	-	--		--	--	-	-	-	2

* Theory paper of 4 hours duration
** Industry Taught Course – IV
*** Add on course

Programme: B. Tech. (Civil) Sem –V (2021)

COURSE: ANALYSIS OF INDETERMINATE STRUCTURES		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 04
		Total: 04

Course Pre-requisites: The students should have knowledge of	
1	Analysis of Determinate Structures
2	Mechanics of Solids
3	Statics and Dynamics
Course Objective:	
	The student should be able to calculate member forces and deflection of members of indeterminate beams and frames.
Course Outcomes: The student will be able to	
1	calculate plastic moment capacity of section.
2	analyse Indeterminate truss using strain energy method.
3	calculate fixed end moments.
4	analyse plane structure using slope deflection method.
5	analyse plane structure using moment distribution method.
6	analyse frame using approximate method.

Course Content:

Unit-I	**Plastic Analysis of Structure:** Elastic and Plastic moment capacity, Plastic hinge, Shape factor, Collapse mechanism, Applications to continuous beams, Fixed beams, Singlebay single storied rectangular frames.	**(08 Hours)**
Unit-II	**Analysis of Indeterminate Plane Trusses using Castigliano's theorem:** Analysis of indeterminate trusses by application of Castigliano's second theorem; Effect of Internal and External indeterminacy, Effect of Lack of fit, Temperature changes and Sinking of support. (Maximum 2 degree of indeterminacy)	**(08 Hours)**
Unit-III	**Fixed Beam and Clapeyron's Three Moment Theorem:** Fixed Beam: Calculation of fixed end moments due to different types of loads; Effect of sinking of support. Clapeyron's Three moment theorem: Analysis indeterminate beams using three moment theorem for different support conditions; Effect of sinking of support.	**(08 Hours)**
Unit-IV	**Slope Deflection Method:** Analysis of continuous beams using slope deflection method-sinking and rotation at support; Deflected shape of beam; Analysis of non- sway and sway rectangular portal frames (with indeterminacy up to 3 degrees);	**(08 Hours)**
Unit-V	**Moment Distribution Method:** Analysis of continuous beams using moment distribution method-sinking and rotation at support; Analysis of non-sway and sway rectangular portal frames (with indeterminacy up to 3 degrees).	**(08 Hours)**
Unit-VI	**Approximate Methods of the Analysis:** Approximate methods of analysis of multistoreyed, multibay, 2-D rigid jointed frames by i) Portal method ii) Cantilever method	**(08 Hours)**

	iii) Substitute Frame Method	
Internal Assessment:		
	Unit Test -1	UNIT – I, II, III
	Unit Test -2	UNIT – IV, V, VI
Project Based Learning:		
1	Prepare PowerPoint presentation on plastic hinge formation and numerical example on it.	
2	Prepare chart of location of plastic hinges for different beams and frames.	
3	Analyse indeterminate truss using software and compare result with manual solution.	
4	Prepare PowerPoint presentation on analysis of indeterminate trusses.	
5	Prepare PPT/chart on deflected shape of different structures.	
6	Analyse fixed beam using software and compare result with manual solution.	
7	Prepare PowerPoint presentation on fixed end moments for different loading cases.	
8	Prepare chart on fixed end moments for different loading cases.	
9	Analyse indeterminate beam using software and compare result with manual solution.	
10	Prepare PowerPoint presentation on slope deflection method.	
11	Analyse indeterminate plane frame using software and compare result with manual solution.	
12	Prepare PowerPoint presentation on moment distribution method.	
13	Analyse plane frame for lateral loads using software and compare result with approximate method.	
14	Prepare PowerPoint presentation on portal method of analysis.	
15	Prepare PowerPoint presentation on cantilever method of analysis.	
16	Prepare PowerPoint presentation on portal method of analysis.	
Textbooks:		
1	Bhavikatti S.S., “Structural Analysis- I and II”, Vikas Publication	
2	Menon Devdas “Structural Analysis”, Alpha Science International Publication	
3	Ramamrutham S. & Narayan R., “Theory of Structures”, Dhanpat Rai Publishing Company	
4	Prakash Rao D. S., “Structural Analysis”, Universities Press Publication	
Reference Books:		
1	Hibbeler R. C., “Structural Analysis”, Prentice Hall Publication	
2	Aslam Kassimali, “Structural Analysis”, Cengage Learning.	
3	Pandit G. S. & Gupta S. P., “Theory of Structures Vol-I”, Tata McGraw Hill Publication	
4	Timoshenko S. P. & Young, “Theory of Structures”, McGraw Hill Publication	

Programme: B. Tech. (Civil) Sem – V (2021)

COURSE: INFRASTRUCTURE AND TRANSPORTATION SYSTEMS		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week Practical: 02 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks Term work: 25 Marks Oral: 25 Marks	Theory: 04 Practical: 01
		Total: 05

Course Pre-requisites: The students should have knowledge of

1	Construction and Materials
2	Construction Equipments and Methods
3	Economics and Finance

Course Objective:

	The student should be able to plan and design the highway with consideration to traffic, geometry and pavement material using the standard codes.

Course Outcomes: The student will be able to

1	describe the scope of road transportation & significance of highway engineering.
2	evaluate in detail the planning of transport system.
3	design the roads by considering its geometry.
4	analyze various materials used in highway construction & design the pavements.
5	describe the process of highway construction, highway drainage and its maintenance.
6	apply urban transport technology & its financing

Course Content:

Unit-I	**Introduction to Highway Engineering:** Role of transportation, scope of road transportation, Classification of roads, highway development in India, necessity of highway planning and development plans e.g. Bombay plan, Lucknow plan. Highway alignment: Basic requirements of an ideal alignment and factors controlling it.	**(08 Hours)**
Unit-II	**Transport System Planning:** Traffic characteristics-road user characteristics, vehicular characteristics, Traffic studies, level of service, traffic analysis, speed delay studies, parking studies, OD matrix, Types of Surveys, Travel demand forecasting-trip generation, trip distribution, modal spilt analysis, trip assignment	**(08 Hours)**
Unit-III	**Geometric Design:** Design controls and criteria for geometric design, Cross sectional elements, Sight distance requirements, Stopping distance, Overtaking sight distance, Overtaking zones with IRC recommendations, Attainment of super elevation, Vertical alignment, Gradient and its type with IRC recommendations.	**(08 Hours)**
Unit-IV	**Highway materials & Pavement Design:** Importance and properties of sub-grade, pavement component materials, Tests on aggregates. Bitumen: Types-cut back, tar, emulsion and tests on bitumen. Pavement design: Objects and requirements, Types of pavements structures, Functions of pavement components, Factors affecting pavement design, Design of flexible pavement by C.B.R. Method, IRC 37-guidelines, Design of rigid pavements, IRC 58- Design guidelines, Introduction to mechanistic designs.	**(08 Hours)**

Unit-V	**Highway Construction, Drainage & Maintenance:** Highway Construction: Construction of various types of roads, Joints in cement concrete pavements. Highway Drainage: Significance of drainage, Requirements of drainage, Surface Drainage, Sub-surface Drainage. Highway Maintenance: Causes of failure of road pavements, Maintenance of rigid and flexible pavements.	**(08 Hours)**
Unit-VI	**Urban Transport Technology & Financing:** Mass Rapid Transit System, Intelligent Transport System, Introduction to-BRT, Monorail, sky bus, metro projects and concept of Integrated Inter Model transit system, Significance of Transit oriented development, Concept of green highway. Financing: Financing of road projects, BOT, BOOT, PPP models.	**(08 Hours)**

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

Project Based Learning:	
1	Prepare a poster on highway development plans
2	Prepare a poster on Classification of Roads
3	Write short note on various surveys in Transport Planning
4	What are the Travel demand forecasting techniques
5	Prepare a power point presentation on Traffic Problems in metro cities
6	Solve a numerical on calculation of sight distance on highway
7	Prepare a power point presentation on various geometric design parameters
8	Prepare a chart for mechanistic design of pavements
9	Prepare a power point presentation on the materials used in road construction
10	Pavement design of highways (rigid and flexible) according to IRC guidelines
11	Write a case study on Highway maintenance
12	Write the importance of mass rapid transit system in Urban areas
13	Write case study of land use and transport planning.
14	Write a case study on BOT, BOOT type of Project.
15	Case study on metro/ monorail project

Practical:	
1.	Tests on Aggregate **(Compulsory)**
	a. Aggregate Impact Value Test
	b. Specific Gravity and Water Absorption Test by basket method
	c. Shape Test (Flakiness Index and Elongation Index)
	Test on Aggregate **(Any one)**
	d. Los Angeles Abrasion Test
	e. Aggregate Crushing Strength Test
2.	f. Stripping Value Test
	Tests on Bitumen **(Compulsory)**
	a. Ductility Test
	b. Specific Gravity Test
	Tests on Bitumen **(Any One)**
	c. Penetration Test
3.	d. Softening Point Test

	e. Bitumen Emulsion Test
	Traffic and Transportation Planning
	a. Traffic Count Survey
4.	Site visit **(Any One)**
	a. Hot Mix Plant
	b. Ongoing Road Construction
Oral:	
	The oral examination will be based on above term work and course content.
Textbooks:	
1	Khanna S. K. & Justo C. E. G., "Highway Engineering", Nem Chand & Bros Publishers, Rorkee, Uttarakhand
2	L. R. Kadiyali, "Traffic Engineering and Transport Planning" Khanna Publishers.
3	F. L. Mannering, Scott S. Washburn, Wiley India "Principles of Highway Engineering and Traffic Analysis (4th edition)"
Reference Books:	
1	David Croney, & Paul Croney, "The Design and Performance of Road Pavements" McGraw-Hill Book Company.
2	Michel A. Taylor, William Young, & Peter W Bonsall, "Understanding Traffic System" Taylor and Francis Group.
3	B. G. Hutchinson, "Principles of Urban Transport Systems Planning" Publisher, Scripta Book Company, 1974.
4	Laurence I. Hewes & Clarkson H. Oglesby, "Highway Engineering" John Wiley & Sons.
5	Dr. V. K. Raina, "Raina's Field Manual for Highway and Bridge Engineers" Handbook.
6	Nicholas J. Garber & Lester A. Hoel, "Traffic & Highway Engineering" Edition 4, Publisher, Cengage Learning, 2008.
7	S. P. Bindra, "A Course in Highway Engineering", Dhanpat Rai and Sons, Delhi.
8	G. V. Rao, "Transportation Engineering", Tata McGraw Hill Publication.
Codes:	
1	Indian Road Congress (IRC) 58 – 2018 for Rigid Pavement Design.
2	Indian Road Congress (IRC) 37 – 2018 for Flexible Pavement Design.
3	Specifications for Road and Bridge works (MORTH)-IRC, New Delhi.

Programme: B. Tech Civil Sem –V (CBCS-2021)

Course: ARBITRATION AND LAWS RELATED TO CONSTRUCTION INDUSTRY		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 03 Hours/Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Credits: 03
		Total: 03

Course Pre-requisites: The students should have knowledge of	
1	Economics & Finance
2	Building Construction.
3	Building Planning and Design
4	Planning & Management of Construction Projects
Course Objectives:	
	To study different types of contracts in construction, arbitration and legal aspects and its provision.
Course Outcomes: The student will be able to	
1	describe importance of Arbitration in Civil Engineering Industry.
2	classify methods of dispute resolution in construction industry.
3	explain Conciliation and its provisions in dispute resolution.
4	describe Importance and Provisions of Indian Contracts Act.
5	explain different labour Laws.
6	explain various Environmental laws in India.

Course Content:

UNIT - I	**Arbitration:** Importance of Arbitration in Construction Industry, Arbitration Process, Causes and resolution of disputes, settlement for claims and extra items, arbitration. Comparison Laws-Agreements, Alternative Dispute Resolution.	**(06 Hours)**
UNIT - II	**Dispute Resolution in Construction:** Dispute Resolution methods- mediation, conciliation, arbitration and Dispute Resolution Boards Arbitration and Conciliation Act 1996, Extent of application of 1996 Act. Arbitrators-Conditions of Arbitrations-Powers and duties of Arbitrators	**(06 Hours)**
UNIT - III	**Conciliation:** Conciliation and its provisions in the Act, Conduct of conciliation and arbitral proceedings, grounds for challenge. Arbitral award and its enforcement. Procedure of appeal against the awards	**(06 Hours)**
UNIT - IV	**Contract Law:** Indian Contract Act, 1872-Importance and Provisions, Definition of the contract as per the ACT. Valid, Voidable, Void contracts, Objectives of the act, Requirements of Indian Contract Act.	**(06 Hours)**
UNIT - V	**Labour Law:** Industrial Disputes Act, 1947 Importance and Provisions, Requirements of Indian Contract Act, Workmen's Compensation Act 1923, Minimum Wages Act 1948, Payment of Wages Act 1936 with the Amendment Act 2017, The Code on Social Security, 2020, New Labor Code for India, The Mines Act, 1952, Inter-State Migrant Workmen Act, 1979.	**(06 Hours)**
UNIT - VI	**Environmental Laws:**	**(06 Hours)**

	The Environment (Protection) Act, 1986 – Aims and Objectives, Powers and Functions of the Central Government, Air (Prevention and Control of Pollution) Act, 1981- Air Pollution – Meaning, Causes and Effects, The Water (Prevention and Control of Pollution) Act, 1974, Water Pollution- Meaning, Central & State Pollution Control Board-Constitution, Powers and Functions.	

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

Project Based Learning:	
1	Prepare a report on case study of Arbitrations in Construction Industry.
2	Prepare a report on case study for settlement for claims.
3	Prepare a report on Alternate Dispute Resolution.
4	Case Study on Dispute Resolutions in Constructions.
5	Brief report on Arbitration and Conciliation Act 1996.
6	Brief report on Conciliation and its provisions in the Act.
7	Brief report on Arbitral award and its enforcements.
8	Case study report on Indian Contract Act.
9	Brief report with case study on Importance and provisions of Indian Contracts Act.
10	Case Study report on Industrial Disputes Act 1947.
11	Brief report on the Mines Act 1952.
12	Brief report on Code on Social Security.
13	Brief report on new Labour Codes for India.
14	Case study report on the environment protection act.
15	Case Study report on Water (Prevention and Control of Pollution) Act, 1974.

Textbooks:	
1	B. S. Patil, "Civil Engineering Contracts and Estimates", Universities Press- 2006 Edition, Reprinted in 2009.
2	The Indian Contract Act (9 of 1872), 1872- Bare Act- 2006 edition, Professional Book Publishers.
3	The Arbitration and Conciliation Act, (1996), 1996 (26 of 1996) - 2006 Edition, Professional Book Publishers.

Reference Books:	
1	Dr. R.K. Bangia, "Law of contract Part I and Part II", 2005 Edition, Allahabad Law Agency.
2	Standard General Conditions for Domestic Contracts- 2001 Edition- Published by Ministry of Statistics and Program Implementation, Government of India.
3	Dispute Resolution Board Foundation Manual-www.drbf.org.
4	Shyam Diwan and Armin Rosenkranz, "Environmental Law and Policy in India– Cases, Materials and Statutes" (2^{nd} edition, 2001), Oxford Publisher.
5	P. Leela Krishnan, "Environmental Law in India" (5^{th} edition, 2019), Lexis Nexis Publisher.

Programme: B. Tech. (Civil) Sem – V (2021)

COURSE: ADVANCED SURVEYING WITH GEOMATICS (ITC III)		
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: 04

Course Pre-requisites: The students should have knowledge of

1	Basic Surveying.
2	Engineering Mathematics
3	Applied Physics

Course Objective:

	To make students aware about Advanced surveying techniques such as Total station Survey, Space based positioning techniques and Remote sensing and GIS.

Course Outcomes: The student will be able to

1	describe Triangulation Survey and carryout triangulation adjustments
2	demonstrate Total station for various surveys.
3	describe principles of remote sensing techniques and its applications
4	describe principles of GIS and its applications.
5	describe principles of SBPS and its applications
6	describe process of Photogrammetry and its applications.

Course Content:

Unit-I	**Geodetic Control Survey:** Introduction to geodetic control survey, System- Triangulation and Trilateration, Triangulation stations and figures, concept of base line. Types of errors, Probable error and its determination, Laws of weights, Method of least squares, Normal equation, Adjustment of triangulation figure.	**(06 Hours)**
Unit-II	**Modern Survey Instrument:** Concept and necessity of an electronic total station instrument. Types of total station as per EDM, range and angle resolution system. Principle features of an ETS, temporary adjustments, On board programmes such as REM, RDM, Free stationing, resectioning etc. traverse survey with ETS. Data retrieval and field generated graphics Concept of data downloading and post processing software, Errors in ETS survey.	**(06 Hours)**
Unit-III	**Remote Sensing**: Concepts Definition, History Development, Stages in RS-EMR, EMR Spectrum, Theories of EMR, Types of RS and Laws of Radiation, Introduction to solar spectrum. Interaction of EMR: Interaction with Earth's Atmosphere, Atmospheric Window Fundamentals of Radiometry: concept of solid angle, radiometric measurements, observation geometry in RS. Spectral Signature: Interaction with Soil, Water and Vegetation Platforms, Sensors, Orbits: Types of Platforms, Types of Sensors, Cameras and Satellite Orbits Data Products: Satellite Data Generation, Type of data Formats and Aerial Photography Products.	**(06 Hours)**

Unit-IV	**GIS**: Definitions, Evolution, Components and Objectives, Overview of GIS Software Packages. Spatial Data: Types of Geographic Data, Levels of Measurements. Concepts of Space and Time, Layers Coverage. Spatial Data Models, Representation of Geographic Features in Vector, Raster Data Models. Spatial Data Input: Digitization, Error Identification. Errors: Types, Sources, Correction. Editing and Topology Building.	**(06 Hours)**
Unit-V	**Introduction and concept SBPS:** Segments of SBPS- space, control and user. GNSS type SBPS in action-GPS, GLONASS, Compass. RNSS type SBPS in action-Quasi zenith, IRNSS. GPS signals, GPS receivers-navigation and surveying. SBPS positioning systems-absolute and differential, Access denial techniques and ephimeris. SBPS coordinates and heights, Surveying with SBPS, Errors in positioning with SBPS. Applications of SBPS.	**(06 Hours)**
Unit-VI	**Photogrammetry:** Elements of photogrammetry, Types of photogrammetry. Aerial photographs their types and scale, Concept of relief displacement, Stereoscopy, parallax and mirror stereoscope, parallax equation and difference in elevation from differential parallax, Ground control, Procedure of aerial survey and flight planning, LIDAR and its applications.	**(06 Hours)**

Internal Assessment:

Unit Test -I	UNIT – I, II, III
Unit Test -II	UNIT – IV, V, VI

Project Based Learning:

1	Carry out triangulation survey using three stations and perform triangulation adjustments.
2	Carry out survey of the area using electronic total station and prepare a plane table map and contour map.
3	Using a handheld GPS perform a driver survey and locate coordinates of traverse stations.
4	Carry out urban planning with the use of photogrammetry.
5	Carry out urban growth monitoring using photogrammetry.
6	Carry out transport planning using photogrammetry.
7	Carry out water resources assessment using remote sensing and GIS.
8	Carry out land use and power analysis using remote sensing and GIS.
9	Carry out assessment of crop yield using remote sensing and GIS.
10	Carry out reservoir sedimentation studies using remote sensing and GIS.
11	Report on various remote sensing data products available from various sources like BHUVAN NRSA Hyderabad etc.
12	Carry out setting off layout for foundation using electronic total station.
13	Carry out electronic total station survey for contour mapping.
14	Carry out electronic total station survey for profile levelling.
15	Carry out electronic total station survey for laying out pipeline.

Practical:

1	Study and use of total station for traverse survey. (3 Practicals).
2	Applications of Total Station for REM, RDM. (1 Practical).
3	Study and Use of Mirror stereoscope with parallax bar. (1 Practical).
4	Overview of Arc GIS Attribute Data Input: Creation of Schema, Tables, Data Definition, Data

	Input, Data Updating, Queries on Tables, Simple-Complex Query with Two or More Tables Using SQL. Queries Using Union (4 Practicals).
5	Spatial Data Input: Vector Data Formats with File Extensions. Scanning, On-Screen Digitization, Editing, Topology Creation, Line and Area Measurements, Data Attribution (4 Practicals).
6	Georeferencing Data: Coordinate Systems, Datum Conversions, Map Projections, Types, Storing- Viewing Projection Information. (3 Practicals).
7	Working with Layers in Arc map: Building Templates, Classification, Displaying Qualitative and quantitative Values, Labelling Features and Map Creation. (3 Practical).
8	Surface Analysis: DEM, DSM and DTM, Presenting Data: Map Design, Map Composition (4 Practical).
Oral:	
	The oral examination will be based on above term work and course content.
Textbooks:	
1	Duggal S. K., "Surveying Vol-1, Vol-2", Tata McGraw Hill pub. Co., New Delhi
2	Punmia B. C., "Higher Surveying", Laxmi Publications, New Delhi
3	Chandra A.M.," Higher Surveying", New Age International Publishers
4	Bannister A. and Raymond Baker, "Surveying", Pearson Education
5	Anji M. Reddy, "Textbook of Remote Sensing and GIS ", BSP BS Publications
Reference Books:	
1	Uren J., & W. F. Price, "Surveying for Engineers", Macmillan Publication.
2	Wolf P. R., "Elements of Photogrammetry", McGraw Hill Publication.
3	Agarwal C. S., & Garg P. K., "Remote Sensing in Natural Resources", Wheeler Publishing
4	Lo C.P., & Albert Yeung, "Concepts and techniques of GIS ", Prentice Hall of India Publication.
5	Bao, J., & Tsui, Y., "Fundamentals of Global Positioning System Receivers", John Wiley Sons, Inc., Hoboken Publication.

Programme: B. Tech. (Civil) Sem –V (2021)

COURSE: LIMIT STATE DESIGN OF STEEL STRUCTURES		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week Practical: 02 Hour / Week Tutorial: 01 Hour / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks Term work: 25 Marks Oral: 25 Marks	Theory: 04 Practical: 01 Tutorial: 01
		Total: 06

Course Pre-requisites: The students should have knowledge of	
1	Analysis of Determinate and Indeterminate Structures.
2	Mechanics of Solids.
Course Objective:	
	The student should be able to design different structural steel members using relevant code of practise with consideration to safety, serviceability and economy.
Course Outcomes: The student will be able to	
1	estimate design load.
2	design connection for axial load.
3	design members for axial tension.
4	design members for axial compression.
5	design built up column.
6	design beam.

Course Content:

Unit-I	**Design Philosophy:** Types of structural elements and their behaviour, Introduction to IS 875, Types of Loads, Estimation of Loads, Wind Load on Roof Truss. Load combinations, Design Load. Steel as a structural material, Type of structural steel, Mechanical Properties, Rolled steel sections and engineering properties, Introduction to SP 6(1), Strength of Section, Design strength, Partial safety factors, Concept of Limit state design, Introduction to IS 800.	**(08 Hours)**
Unit-II	**Design of Connections for Axial Load:** Types of fasteners, advantages and disadvantages, Types of bolts, Design strength of bolts, Design of bolted connection and detailing, Strength of weld, Design of weld and detailing.	**(08 Hours)**
Unit-III	**Design of Axially Loaded Tension Members:** Behaviour of member in tension, Axial tension capacity of plates, single and double angles and channel section, Design of axially loaded Tension members.	**(08 Hours)**
Unit-IV	**Design of Axially Loaded Compression Members:** Behaviour of member in compression, Concept of Effective Lengths, Axial compression capacity of single and double angle section, Design of axially loaded compression members	**(08 Hours)**
Unit-V	**Design of Built up Column and Column Base:** Axial compression capacity of Built up Column, Design of built up column, Design of Lacing system, Design of battening system, Design of slab base, Design of gusseted base.	**(08 Hours)**
Unit-VI	**Design of Beams:** Behaviour of beams, Shear and moment capacity of Laterally supported and laterally unsupported beam. Design of beam, Design of built up section, Curtailment of plates, Design of bolted connections for shear and moment.	**(08 Hours)**

	Introduction to Plate Girder.	

Internal Assessment:

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

Project Based Learning:

1	Make model of different types of structural steel sections.
2	Make model of different types bolted connections in structural steel.
3	Make model of different types of welded connections in structural steel.
4	Prepare PPT on Limit state design philosophy.
5	Prepare PPT on estimation of design load due to DL, IL, WL and their combination.
6	Prepare PPT on properties of a section.
7	Prepare PPT on calculation of design strength of bolted connection.
8	Write programme on calculation of design strength of bolted connection.
9	Prepare PPT on design of welded connection.
10	Write programme on design of welded connection.
11	Prepare PPT on calculation of design axial tensile strength of a member.
12	Write programme on calculation of design axial tensile strength of a member.
13	Prepare PPT on calculation of design axial compressive strength of a member.
14	Write programme on calculation of design axial compressive strength of a member
15	Prepare PPT on calculation of design moment and shear capacity of a member.
16	Write programme on calculation of design moment and shear capacity of a member.
17	Model making and testing of structural elements.

Term work: The term work shall consist of

a) Sketching of structural elements, joints and connections, built up sections, column base, etc (any 8 sketches)

b) Design of any **ONE** projects with 2 number of half imperial sheets based on following topics:

1	**Design of Roof Truss:** Load estimation, Analysis of truss, Design force for member, Design of Members, Design of connection, Design of Purlin, Drawing.
2	**Design of Building:** Load estimation, Analysis of frame, Design of Secondary beams, main beams, Columns, Beam to Beam, Beam to Column connections, column bases, etc.

Oral:

	The oral examination will be based on above term work and course content.

Textbooks:

1	S. S. Bhavikatti, "Design of Steel Structures: By Limit State Method", I. K. International Publication.
2	Dr. Ramchandra, "Limit State Design of Steel Structures", Scientific Publication.
3	Dr. M. R. Shiyekar, "Limit State Design in Structural Steel", Prentice-Hall of India Publication.

Reference Books:

1	N. Subhramanian, "Design of Steel Structures", Oxford University Press Publication.
2	S. K. Duggal, "Limit State Design of Steel Structures", Tata McGraw-Hill Publication.

Codes:

1	IS:800-2007, General Construction in Steel - Code of Practice"
2	IS:875-(Part 1 to 5), "Code of Practice for Design Loads for Buildings and Structures"

3	IS:808-2021, “Dimensions for Hot Rolled Steel Beam, Column, Channel and Angle Sections”
4	SP-6(6)- 1972, “Handbook for Structural Engineers”

Programme: B. Tech. (Civil) Sem – V (2021)

COURSE: STRUCTURAL ASSESSMENT AND RETROFITTING* (VC III)		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Practical: 02 Hours / Week	Term work: 25 Marks Oral: 25 Marks	Practical: 01
		Total: 01

Course Pre-requisites: The students should have knowledge of

1	different types and modes of failure of structures.
2	difference between repair, retrofitting and rehabilitation.

Course Objective:

	To develop the knowledge about structural assessment and various retrofitting techniques in Civil engineering field.

Course Outcomes: The student will be able to

1	diagnose the distress in the structure.
2	decide suitable assessment technique.
3	suggest appropriate retrofitting and rehabilitation technique.

Course Content:

Unit-I	**Structural Assessment:** Need of structural assessment and monitoring, Principles of structural assessment, Current scenario of infrastructure through case studies. Introduction to global infrastructure crisis.	**(08 hours)**
Unit-II	**Structural Assessment Techniques:** Structural health monitoring, Visual observations, Non-destructive and destructive testing, static and Dynamic Field Testing, Selection of suitable technique of structural assessment, Case study of structural assessment report.	**(08 hours)**
Unit-III	**Retrofitting & Rehabilitation of Structures:** Methods of retrofitting & rehabilitation, Materials for retrofitting & rehabilitation (conventional and smart materials), selection of suitable retrofitting & rehabilitation method.	**(08 hours)**

Term Work: (Any Eight) Practical on

1	methods on visual observation.
2	testing methods and sampling techniques.
3	working principle of Rebound Hammer.
4	calibration of Rebound Hammer.
5	compressive strength of structural element by Rebound Hammer.
6	limitations of Rebound Hammer.
7	working principle of Ultrasonic Pulse Velocity meter.
8	calibration of Ultrasonic Pulse Velocity meter.
9	surface preparation of structural elements for Ultrasonic Pulse Velocity meter.
10	compressive strength of structural element by Ultrasonic Pulse Velocity.
11	data collection, processing and interpretation of the results of Ultrasonic Pulse Velocity.
12	different retrofitting techniques and materials available and its selection.
13	Preparation of structural assessment report.

Oral:

	The oral examination will be based on above term work and course content.

Textbooks:	
1	Gandhi and Thompson, “Smart Materials and Structures”, Chapman and Hall publications.
2	Fu-Kuo Chang, “Structural Health Monitoring: Current Status and Perspectives”, SAE International publications, 2019.
Reference Books:	
1	Daniel Balageas, Claus-Peter Fritzen, & Alfredo Guemes, “Structural Health Monitoring”, John Wiley & Sons, 2006.
2	Douglas E., “Adams Health Monitoring of Structural Materials and Components”, Methods with Applications”, John Wiley and Sons, 2007.
3	J. P. Ou, H. Li & Z. D. Duan, “Structural Health Monitoring and Intelligent Infrastructure, Volume 1”, Taylor and Francis Group, London, UK, 2006.
4	Victor Giurglutiu, “Structural Health Monitoring with Wafer Active Sensors”, Academic Press Inc, 2007.
Codes:	
1	IS 516 (Part 5/Sec 1) : 2018 Hardened Concrete —Methods of Test Part 5 Non-destructive Testing of Concrete Section 1 Ultrasonic Pulse Velocity Testing (First Revision)
2	IS 516 (Part 5/Sec 4) : 2020 Hardened Concrete —Methods of Test Part 5 Non-Destructive Testing of Concrete Section 4 Rebound Hammer Test (First Revision)

Programme: B. Tech. (Civil) Sem –V (2021)

COURSE: CIVIL ENGINEERING SOFTWARE – II (STAAD PRO)		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Practical: 04 Hours / Week	Term work: 25 Marks Practical: 25 Marks	Practical: 02
		Total: 02

Course Pre-requisites: The students should have knowledge of

1	Mechanics of Solids.
2	Analysis of Determinate and Indeterminate Structures.
3	Structural Design.

Course Objective:

	The student should be able to design structure using FEM software.

Course Outcomes: The student will be able to

1	model the structure using FEM software.
2	apply loads, analyse the structure and interpret the analysis output.
3	design the structure using FEM software.

Course Content:

Unit-I	**FEM Model:** Generation of Geometry, Assign Section properties, Support Conditions and Specifications.	**(16 Hours)**
Unit-II	**Analysis Output:** Application of Loads and Load Combinations for Analysis, Analysis of Structure, Read and Interpret analysis output.	**(16 Hours)**
Unit-III	**Structural Design:** Design parameters, Design of members and Interpret design output, Preparation of Design Report.	**(16 Hours)**

Term work: Term work consists of following practical using FEM Software.

1	FEM Model of beams.
2	FEM Model of plane and space frame.
3	FEM Model of plane truss and space truss.
4	Analysis of FEM Model of beams.
5	Analysis of FEM Model of plane and space frame.
6	Analysis of FEM Model of plane truss and space truss.
7	Design of beams.
8	Design of plane and space frame.
9	Design of plane truss and space truss.

Practical Exam:

	The practical examination will be based on above term work and course content.

Reference Books:

1	"STAAD.Pro V8i Technical Reference Manual", Bentley Communities.
2	Sham Tickoo, "Learning Bentley Staad.Pro V8i for Structural Analysis", BPB Publications.
3	Sham Tickoo/TIET, "Exploring Bentley's Staad.Pro Connect Edition", BPB Publications.
4	T. S. Sarma, "Staad Pro V8i for Beginners: With Indian Examples", Notion Press.
5	T. S. Sarma, "Design of Industrial Steel Buildings Using Staad Pro: With Indian Examples", Notion Press.

Programme: B.Tech. (Civil) Sem –V (2021)

SOCIAL ACTIVITY II (Add on course)		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
		Total: 02

Introduction:
The prime objective of Bharati Vidyapeeth (Deemed to be University) College of Engineering, Pune is holistic development of students. The learner achieves the status as whole, when he/she has not only achieved success in academics, but also has succeeded in bringing the nation up by connecting with socially left-out elements and bringing ray of hopes into their lives. In this respect, the new curriculum encourages the learner on the social activities. In this case, student's are provided with social activities by the colleges, but not limited to them.

Course Objectives:

1	To make people create balance, so they do not only focus on academic aspects, but there can also be other aspects to have in life.
2	To build better relationship with others.
3	To create great balance with the academic aspects.
4	To learn and understand society.
5	To develop the nature of help and enhance the ethical norms for behaviours.

Course Outcomes: The social activities make good impact on learners. **The learner will be able to**

1	**identify the Needs of Society:** It enables a learner to consider the perspective of other people and understand their needs by interacting with people from diverse backgrounds.
2	**recognize Different Perspectives and Engage Other Cultures:** Social events develop social skills and empathy- the outward- oriented dimensions of emotional intelligence (EQ). The interactions or conversations elicited by events helps students build relationships, understand different perspectives and engage other cultures. Social events provide as opportunity to expand one's social circle.
3	**maintain Positive Outlook Towards Life:** With high adaptability to diverse situation and good level of understanding of other's also less vulnerable to stressful situations and have fewer chances of getting involved in undisciplined behaviour. These students also have a more positive outlook on life.
4	**maintain Good Emotional Health:** With high adaptability of diverse situations and a good level of understanding of other's opinions, socially aware learners are less likely to indulge in negative behaviour. They are also less vulnerable to stressful situations and have fewer chances of getting involved in undisciplined behaviour. These students also have a more positive outlook on life.
5	**maintain Good Emotional Health:** Social activities keep the learner sharp and mentally engaged, and this is important to prevent the onset of serious diseases like dementia or Alzheimer. Connecting with others helps keep you in a positive mood, which in turn wards off depression by improving physical health and maintaining good emotional health as well.
6	**Sample list of Social Activities (not limited to them):** a. Organizing Educational Camps. b. Tree Plantation Drive. c. Offer Helping Hand for Martyrs Family by Fundraisers. d. National Service Scheme. e. Felicitation of people who have contributed to the society but now forgotten by society. f. Street Play on Social Awareness.

Bharati Vidyapeeth (Deemed To Be University), Pune
Faculty of Engineering and Technology
Programme: B. Tech. (Civil) –CBCS 2021 Course

Program: B. Tech. Civil Sem: VI

Sr. No.	Course Code	Name of Course	Teaching Scheme (Hrs./Week)			Examination Scheme (Marks)						Credits			
			L	P	T	ESE	IA	TW	OR	PR	Total	L	P	T	Total
1.		Water Supply Engineering	4	2	-	60	40	25	-	25	150	4	1	-	5
2.		Hydrology and Irrigation Engineering	4	-	-	60	40	-	-	-	100	4	-	-	4
3.		Design and Detailing of Reinforced Concrete Structures**	4	4	-	60	40	50	25	-	175	4	2	-	6
4.		Quantitative Techniques, Communication and Values	4	-	-	60	40	-	-	-	100	4	-	-	4
5.		Project Estimation and Valuation*	4	2	-	60	40	25	50	-	175	4	1	-	5
6.		Vocational Course-IV: Contracts and e-Tendering// Industrial Orientation for Civil Engineers-II	-	2	-	-	-	25	25	-	50	-	1	-	1
	Total		**20**	**10**	**-**	**300**	**200**	**125**	**100**	**25**	**750**	**20**	**5**	**-**	**25**
	MOOC-II***		-	-	-	-	-	-		-	-	-	-	-	2

* Theory paper of 4 hours duration
** Industry Taught Course – IV
*** Add on course

Programme: B. Tech. (Civil) Sem – VI (2021)

COURSE: WATER SUPPLY ENGINEERING		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week Practical: 02 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks Term work: 25 Marks Practical: 25 Marks	Theory: 04 Practical: 01
		Total: 05

Course Pre-requisites: The students should have knowledge of	
1	Engineering Chemistry.
2	Engineering Mathematics.
Course Objective:	
	To make student aware of Conventional, Advance water treatment and water supply, also about water conservation and water audit along with water modelling software use in field.
Course Outcomes: The student will be able to	
1	explain the water quality criteria and drinking water quality standards.
2	analyse and design the process Aeration and Sedimentation.
3	analyse and design the process filtration, Disinfection.
4	demonstrate the various advanced treatment system and knowledge about the recent advances in water treatment process.
5	design and evaluate water distribution system plumbing of buildings.
6	demonstrate process of water audit and various conservation methods related to Domestic Sector, Industrial Sector, Irrigation Sector.

Course Content:

Unit-I	**Sources and Quality of Water:** Public water supply system, Planning, Objectives, Design period, Population forecasting; Water demand, Sources of water and their characteristics, Analytical techniques, Surface and Groundwater, Impounding Reservoir, Development and selection of source, Source Water quality Characterization, Significance, Drinking Water quality standards. Water supply intake structures, Functions; Pipes and conduits for water, Pipe materials, Selection of pipe material, Hydraulics of flow in pipes, Transmission main design, Laying, jointing and testing of pipes, appurtenances, Types and capacity of pumps: Selection of pumps and pipe materials.	**(08 Hours)**
Unit-II	**Conventional Water Treatment: Aeration and Sedimentation:** Objectives of unit operations and processes, Principles, functions, and design of water treatment plant units. Aeration: Types of aerators, gravity aerator and fixed spray aerator. Sedimentation: Plain Sedimentation, Principles and types of plain Sedimentation, details of Sedimentation tank, types of tanks, inlet and outlet arrangements; Design criteria like surface overflow rate, detention time, weir loading, depth of tank. Chemical assisted Sedimentation– Necessity, Unit operation, coagulation, Different coagulants, flocculation, factors affecting flocculation, Design of Clariflocculator, Tube settlers: Introduction, Design of Tube settler.	**(08 Hours)**

Unit-III	**Conventional Water Treatment:** **Filtration, Disinfection:** Filtration: Necessity, mechanisms, Theory of filtration, types of filters, pressure filters, dual and multimedia filters, Different media, details of filter, Rapid sand filter and slow sand filter, design criteria, working and washing of rapid sand filter, design of rapid sand filter. Disinfection: Necessity, Different methods, Chlorination, Reactions involved, Free and combined residual chlorine, Break point chlorination.	**(08 Hours)**
Unit-IV	**Advanced Water Treatment:** Water softening, Desalination- R.O. Plant, demineralization, Adsorption Ion exchange, Membrane Systems, RO Reject Management, Iron and Manganese removal, De-fluoridation, Construction and Operation & Maintenance aspects, Recent advances, MBR process, Introduction to various water treatment modelling software.	**(08 Hours)**
Unit-V	**Water Distribution And Supply:** Requirements of water distribution, Components, Service reservoirs Functions, Network design, Economics, Analysis of distribution networks, Computer applications, Appurtenances, Leak detection. Principles of design of water supply in buildings: House service connection, Fixtures and fittings, systems of plumbing and types of plumbing, Introduction to SCADA and PLC for WTP and Water Distribution System including ESRs.	**(08 Hours)**
Unit-VI	**Water Audit and Water Conservation:** Water Audit, Benefits and Approach for Water Audit, Steps of Water Audit, Water Supply and Usage Study, Process Study, System Audit, Discharge Analysis, Water Audit Report, introduction to water audit for Domestic Sector, Industrial Sector, Irrigation Sector. Action Plan for Water Conservation, surface and ground water, Rain water harvesting, Action Points for Water Conservation, Domestic Sector, Industrial Sector, Irrigation Sector, Regulatory Mechanism for Water Conservation, Mass Awareness with respect to conservation Domestic Sector, Industrial Sector, Irrigation Sector.	**(08 Hours)**

Internal Assessment:

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

Project Based Learning:

1	Collect information and write report on sources of drinking water of your city.
2	Collect information related to water quality standards.
3	Calculate water demand for your house.
4	Collect samples / broachers of appurtenances.
5	Collect pipe samples / brochures of various materials use for residential water supply Design tube settler.
6	Report on various types of Aeration with photos.
7	Draw Plan and section of conventional water treatment plan.
8	Design slow sand filter.
9	Importance of various types of disinfection (conventional to advance).
10	Collect information on advance water treatment plant and write report on its importance with

	respect to today's pollution.
11	List software used for water distribution system and explain any one.
12	Study plumbing system of your house and write report with neat sketch and photos Write a report on your ideas about Mass Awareness with respect to conservation. a. Domestic Sector. b. Industrial Sector. c. Irrigation Sector.
13	Draft report on water audit of our institute.
14	Carry out awareness program in society related to water conservation and its importance and draft report on it.
15	Visit industry and collect information on usage of water, water conservation and water audit.
Practical: (Any Eight) (Practical 1 to 7 are compulsory and any one from 8 to 10)	
1	Determination of pH and alkalinity of water samples.
2	Determination of Total Hardness and its components of water samples.
3	Determination of Chlorides of water samples.
4	Determination of Turbidity and optimum dose of alum for raw water samples.
5	Determination of optimum dose of chlorine and residual chlorine for water samples.
6	Site visit – Water Treatment Plant.
7	Computer applications - Water Treatment.
8	Computer applications– Analysis of distribution networks.
9	Draw Layout of water supply in residential buildings.
10	Water audit of water supply of our institute.
Practical Exam:	
	The practical examination will be based on above term work and course content.
Textbooks:	
1	A. C. Panchdhari , "Water supply and Sanitary Installation", Nisha Enterprises Delhi 2008.
2	P. K. Goel, "Water Pollution, Causes, Effects, and Control", New Age International Publisher 2006.
3	J. V. S Murty, "Watershed management", New Age International Publisher 2008.
4	Arcadio P. Sincere, & Gregoria A Sincero, "Environmental Engineering – A Design Approach", S. B. Patel, Charator Publishing House 2010.
5	Anil Kumar De, & Arnab Kumar De, "Environmental Engineering", New age international Publisher 2009.
6	Rajni Kant, & Keshav Kant, "Water Pollution Management, Control and Treatment", New age International Publisher 2016.
Reference Books:	
1	S. C. Rangwala, "Water Supply and Sanitary Engineering", published by S. B. Patel, Charator publishing house 2004
2	G. S. Birdie, "Water Supply and Sanitary Engineering", published by J. C. Kapur 1993
3	Dr. A. S. Patel, & Dr. D. L. Shah, "Water management, Conservation, Harvesting and artificial recharge", published by new age international publisher 2006
4	Steven C. Chapra, "Surface Water Quality Modelling", Tata McGraw-Hill Companies, Inc., New Delhi, 1997.

Codes:	
1	IS 1172:1993 Code of basic requirements for water supply, drainage and sanitation.
2	IS 2065:1983 Code of practice for water supply in buildings.

Programme: B. Tech. (Civil) Sem – VI (2021)

COURSE: HYDROLOGY AND IRRIGATION ENGINEERING		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 04
		Total: 04

Course Pre-requisites: The students should have knowledge of

1	Fluid Mechanics and Open Channel Flow and Hydraulic Machinery.
2	Engineering Mathematics I and Engineering Mathematics II.

Course Objective:

	To make student aware of applications of Hydrology in Water Resources Projects and irrigation methods.

Course Outcomes: The student will be able to

1	explain measurement of precipitation and analysis of precipitation data.
2	identify and estimate losses from precipitation.
3	identify the runoff and estimate runoff.
4	describe ground water flow and estimate yield of aquifers.
5	evaluate water requirements of crops and storage capacity of reservoirs.
6	explain causes and effects of water logging and explain reclamation measures.

Course Content:

Unit-I	**Precipitation:** Hydrological cycle, Application of hydrology, Precipitation: Types of precipitation, measurement, Rain gauge network, Preparation of data: estimation of missing data, Presentation of rainfall data-mass rainfall curves, Hyetograph, Point rainfall, Moving average, Mean precipitation over an area: arithmetic mean method, Thiessen's polygon, Isohyetel method, Concepts of depth-area-duration analysis, Frequency analysis - frequency of point rainfall and plotting position, Intensity-duration curves, Maximum Intensity duration- frequency analysis.	**(08 Hours)**
Unit-II	**Abstractions from Precipitation:** Intercepction, Depression storage, Evaporation: Elementary concepts, factors affecting, Measurement of evaporation, Transpiration, Evapotranspiration: Process and measurement, Infiltration: Introduction, Infiltration capacity, Infiltrometer, Horton's method and infiltration indices Stream Gauging: Selection of site, various methods of discharge measurement (velocity-area method, dilution method, slope-area method).	**(08 Hours)**
Unit-III	**Runofff:** Factors affecting runoff, Rainfall-Runoff relationships, Empirical Techniques to determine runoff, Runoff hydrograph- Introduction, Factors affecting Flood Hydrograph, Components of Hydrograph, Base flow separation, Effective rainfall, Unit hydrograph theory, uses and limitations of Unit Hydrograph Floods: Synthetic Unit Hydrograph, Estimation of peak flow, Rational formula and other methods.	**(08 Hours)**
Unit-IV	**Ground Water Hydrology:** Occurrences and distribution of ground water, Specific yield of aquifers, Movement of ground water, Darcy's law, Permeability, Safe yield of basin,	**(08 Hours)**

	Hydraulics of wells under steady flow condition in confined and unconfined aquifers, Specific capacity of well, pumping and recuperation test, Well Irrigation: Tube wells, Open wells and their construction.	
Unit-V	**Crop Water Requirements and Irrigation:** Classes and availability of soil water, Available moisture depth, Frequency of irrigation, Relationship between duty a delta and base period, Factors affecting duty, Methods of improving duty, Irrigation efficiencies, Command areas, Kharif, Rabi and perennial crops, Crop rotation, Irrigation water requirement, Design discharge of canal and storage capacity of reservoir based on irrigation requirement, Types of irrigation,	**(08 Hours)**
Unit-VI	**Water Logging and Lift Irrigation:** Quality of irrigation water, various methods of irrigation, Suitability of various methods of irrigation, Water Logging, Definition, Effects, Causes and remedial measures of water logging, types of land drains, Layout and spacing of tile drains, Salt balance, saline and alkali soils, reclamation and management of salt affected soils. Lift Irrigation, necessity and components.	**(08 Hours)**

Internal Assessment:

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

Project Based Learning:

1	Delineation of watershed boundary by using Arc GIS.
2	Obtain a rainfall data for given catchment and determine average rainfall by various methods
3	Describe the working of Automatic Weather station.
4	Describe the working of Float type of rain gauge.
5	Recognize infiltration characteristics of different soils by tube infiltrometer.
6	Create Hydrographs of different durations from given flood hydrograph.
7	Identify the design discharge for a given area by various methods.
8	Elaborate the case study on Water logging and Reclamation.
9	Estimate design discharge of canal based on given cropping pattern and command area.
10	Elaborate the case study on drip and sprinkler irrigation.
11	Elaborate the case study of lift irrigation scheme.
12	Compare drip irrigation system Vs conventional irrigation system for a given field.
13	Delineation of watershed boundary by using QGIS.
14	Collection and analysis of rainfall data for a particular region for given time period.
15	Describe of different discharge measurement methods and compare the results.

Textbooks:

1	Subramanya K., “Engineering Hydrology”, Tata McGraw Hill Publishing Co. Ltd., New Delhi, 1990.
2	Asawa G. L., “Irrigation and water resources Engineering”, New Age International Publishers, New Delhi, 2005.
3	Garg S. K., “Irrigation Engineering and Hydraulic Structures”, Khanna Publishers, New Delhi, 1996.

Reference Books:	
1	Chow V. T., Maidment D. R., & Mays L. W., "Applied Hydrology", McGraw-Hill Book Company, New York, 1988.
2	Raghunath H. M., "Hydrology, Principles, Analysis and Design", New Age International (P) Ltd, New Delhi, 2000.
3	Michael A. M., "Irrigation Theory and Practice", Vikas Publishing House, New Delhi, 2004.

Programme: B. Tech. (Civil) Sem – VI (2021)

COURSE: DESIGN AND DETAILING OF REINFORCED CONCRETE STRUCTURES (ITC - IV)		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week Practical: 04 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks Term work: 50 Marks Oral : 25 Marks	Theory: 04 Practical: 02
		Total: 06

Course Pre-requisites: The students should have knowledge of	
1	conditions of equilibrium, shear force and bending moment diagram of beams for various support conditions and load combinations.
2	determination of bending stress and shear stress in beams.
3	concept of short, long columns, direct and bending stress.
4	concrete, concreting techniques and properties of concrete.
5	concepts of planning of staircase, planning and drawing of a building.
Course Objective:	
	The student should be able to complete the design and detailing of a G+2 storey R.C.C. building.
Course Outcomes: The student will be able to	
1	differentiate between various design philosophies and apply Limit State design philosophy.
2	calculate moment of resistance of beam section.
3	design and detail of different types of slabs and staircases.
4	design and detail of beams for flexure, shear, bond for various supporting conditions.
5	design and detail of short columns for axial load, uniaxial and biaxial bending.
6	design and detail of isolated column footings.

Course Content:

Unit-I	**Materials and Design Approach:** Introduction of R.C.C: Materials: Types of reinforcements, Study of properties of concrete and properties of steel. Introduction to design philosophies of R.C. Structures: Working Stress Method, Ultimate Load method, Limit State Method. Various limit states, Semi-probabilistic approach, Partial safety factors for materials and loads, various structural elements and loads on the elements, Load combinations.	**(08 Hours)**
Unit-II	**R.C. Sections in Flexure:** Limit State Method: Assumptions, Strain variation diagram, Stress variation diagram; Concept of balanced, under reinforced, and over reinforced section; Design parameters of a singly reinforced rectangular section, modes of failure, Moment of resistance of singly reinforced, doubly reinforced, rectangular, singly reinforced flanged section.	**(08 Hours)**
Unit-III	**Slabs:** Design of Slabs: One Way Slabs: Simply supported, Cantilever, and Continuous slabs. Two Way Slabs: Simply supported, Continuous and restrained. Design of Staircase: Dog legged, Open well.	**(08 Hours)**

Unit-IV	**Beams:** Design of Beams for Flexure, Shear, Bond: Behaviour of R.C .beam in shear, Shear failure, Shear strength of beam Without shear reinforcement, Design of shear reinforcement. Bond -Introduction, types of bonds, Codal provision. Design of beams: Simply supported, cantilever, Continuous: Singly reinforced, doubly reinforced and flanged beam. Introduction to Redistribution of moments in beams: Assumption, Requirements of I.S.456-2000. Various load combinations in continuous beams.	**(08 Hours)**
Unit-V	**Columns:** Design of Columns: Axially loaded short columns, requirements of minimum eccentricity; Design of short columns for axial load, uniaxial, biaxial bending using interaction curves (SP 16).	**(08 Hours)**
Unit-VI	**Footings:** Design of Footings: Design of isolated rectangular column footing for axial load, uniaxial Bending. Introduction to combined footing: Concept and types.	**(08 Hours)**

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

Project based Learning:	
1	Prepare the chart for properties of concrete and steel materials.
2	Prepare the chart for design parameters for balanced section with stress and strain distribution diagrams.
3	Prepare the chart for design parameters for under-reinforced section with stress and strain distribution diagrams.
4	Draw design parameters for by using excel programming for various grades of concrete and steel.
5	Draw design parameters for under-reinforced section by using excel programming.
6	Develop of an excel sheet for calculation of design of one way slab.
7	Develop of an excel sheet for calculation of design of two way slab.
8	Develop of an excel sheet for calculation of design of cantilever slab.
9	Develop of an excel sheet for calculation of design of simply supported beam.
10	Develop of an excel sheet for calculation of design of continuous beam.
11	Develop of an excel sheet for calculation of design of cantilever beam.
12	Develop of an excel sheet for calculation of design of axially loaded column.
13	Develop of an excel sheet for calculation of design of uniaxially loaded column.
14	Develop of an excel sheet for calculation of design of biaxially loaded column.
15	Develop of an excel sheet for calculation of design of foundation.

Practical:	
1	Design of G + 2 (residential/commercial/public) storeys building having minimum floor area of 150 m^2 (for gravity loads only). The design should include all types of slabs, beams, columns, footings and staircase (first and intermediate flight).

	Note: Maximum four students in a group and each group should have different design data.
2	Four full imperial drawing sheets.
3	Detailing of reinforcement should be as per SP-34 & IS-13920.
4	Report of a site visit related to building under construction.
Oral:	
	The oral examination will be based on above term work and course content.
Textbooks:	
1	Dr. V. L. Shah & Dr. S. R. Karve, "Limit State Theory and Design", Pune Vidyarthi Griha.
2	Punmia, Jain & Jain, "Comprehensive Design of R. C. Structures", Standard Book House.
3	S. S. Bhavikatti, "Design of R.C.C. Structural Elements", New Age International Ltd.
4	P. Dayaratnam, "Limit State Analysis and Design", Wheeler Publishing Company, New Delhi.
5	P. C. Vergese, "Limit State Design", Prentice Hall India Publications, New Delhi.
6	Sinha R.C., "RCC Analysis and Design- Vol. I, II", Chand and Co, New Delhi Publications.
Reference Books:	
1	N. Subramanian, "Design of Reinforced Concrete Structures", Oxford University Press.
2	M. Fergusson, "R. C. Fundamentals", Tata McGraw Hill Publication.
3	S. Unnikrishnan Pillai, & Devidas Menon, "Reinforced Concrete Design", Tata McGraw Hill Publication.
4	Dr. H. J. Shah, "Reinforced Concrete -Vol.1 (Elementary Reinforced Concrete)", Charotar Publications.
Codes:	
1	IS 456-2000: Plain and Reinforced Concrete-Code of Practice.
2	IS 875-1987 (Part I to V): Code of Practice for Design Loads.
3	IS 13920-2016: Ductile Design and Detailing of Reinforced Concrete Structures subjected to Seismic Forces.
4	SP 16-1980: Design Aids for Reinforced Concrete.
5	SP 34-1987: Handbook on Concrete Reinforcement and Detailing.

Programme: B. Tech. (Common for All) Sem –VI (2021)

COURSE: QUANTITATIVE TECHNIQUES, COMMUNICATION AND VALUES		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
Theory: 04 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks	Theory: 04
		Total: 04

Course Pre-requisites: The students should have knowledge of	
1	basic maths and reasoning, and comprehensive ability.
2	basic knowledge of communication process, soft skills.
3	basic knowledge and idea about leaders and leadership qualities, ethics, etiquettes and values.
Course Objective:	
	The Quantitative Techniques, Communication and Values aims to augment students to face the campus recruitment test and train them on applying short techniques/ tricks to solve questions of Maths, reasoning and English in very less amount of time. The communication and values section focuses on the aspects of communication and soft skills such as grooming personality for leading team, presentation, business communication which would enable graduates to project themselves as a professionals in the corporate sector and/or otherwise.
Course Outcomes: The student will be able to	
1	solve the aptitude test in the recruitment and competitive exam by applying short techniques and solve the question in less amount of time.
2	apply the short mnemonics and techniques to solve the questions of logical reasoning in the placement and competitive exam in lesser time.
3	develop the verbal ability to communicate effectively using suitable vocabulary and proper sentence pattern.
4	explain the concept of soft skills and its implication at workplace.
5	build up the ability to study employment business correspondences and its proper implications.
6	recognize business ethics, etiquettes and values and apply them in the professional ventures.

Course Content:

Unit-I	**Quantitative Aptitude:** Umber system, Percentage, profit and loss, Simple Interest and Compound Interest, Ratio, Proportion and Average, Mixture and Allegation, Time, Speed & Distance, Time & Work , Permutation & Combination, Probability, Pipes and Cisterns.	**(08 Hours)**
Unit-II	**Non-Verbal Reasoning:** Coding, Decoding, Number series, Blood relation Directions, cubes & dices , Data Interpretation, Data Sufficiency, Set Theory & Syllogisms, Matching, Selection & Arrangement, Clocks & Calendars, Visual Reasoning, Input, Output & Flow Chart.	**(08 Hours)**
Unit-III	**Verbal Reasoning:** Sentence Patterns, Sentence correction and spotting errors, Vocabulary, antonyms and synonyms and analogy, Phrasal Verbs, idiomatic expressions, reading comprehension, closest, sentence rearrangement and theme detection.	**(08 Hours)**
Unit-IV	**Self Awareness and Soft Skills Development:** Concept of SWOT, Importance of SWOT, Individual & Organizational SWOT Analysis, Soft skills, meaning, need and importance, difference between soft skills and hard skills, life skills and personal skills, Leadership	**(08 Hours)**

	skills, Importance, Types, Attributes of good leader Motivational theories and leadership ,Emotional intelligence in personal and professional lives its importance need and application, Team Building and conflict resolution Skills, Problem solving skills, Time Management and Stress Management Skills Pareto Principle (80/20) Rule in time management, Time management matrix, creativity and result orientation, working under pressure, stress management.	
Unit-V	**Communication and Honing Employment Skills:** Communication process, Non-verbal codes in communication, importance of LSRW in communication, Barriers to communication, Principles of effective Technical writing, Email writing and Netiquettes, **Letter writing:** formal letters, job application letter, cover letter, structure of technical report writing, Building Resume and CV, Tips to build an effective Resume, Group discussion, Skills required for Group Discussion Interview skills, Ways of handling telephonic interviews, Importance of body language, grooming &etiquettes for getting right impression in PI&GD , Extempore, Introduction to PowerPoint presentation, Structure & flow of presentation.	**(08 Hours)**
Unit-VI	**Business Ethics, Etiquettes and Values:** The Importance of Ethics and Values in Business World, Respect for Individuality and diversity at workplace values of a good manager Key features of corporate etiquette, Corporate grooming & dressing, etiquettes in social & office Setting-Understand the importance of professional behaviour at the work place, Corporate Social Responsibility (CSR) and its importance and need.	**(08 Hours)**

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

Project Based Learning:	
1	Prepare mock Tests on Unit –I and solve it in given time (use of PSD lab manual).
2	Prepare mock Tests on Unit –I and solve it in given time (use of PSD lab manual).
3	Prepare online model test based on Unit-II and solve it in specific time (use of PSD lab manual).
4	Prepare online model test based on Unit-II and solve it in specific time (use of PSD lab manual).
5	Form a model for spoken and written communication skills which avoid grammar mistakes and common errors.
6	Develop various activity models for enriching and developing vocabulary.
7	Preparing strategies by using SWOT and TWOS analysis.
8	Analysing differences between Soft Skills, Hard skills, and Personal skills.
9	Develop Bruce Tuchman's Team Building Models with classmates/Teammates.
10	To study different personalities of Leaders from various sectors and find out their attributes and success stories.
11	Preparing a model for Time Management Skills and Stress Management and conduct activities for effective implementation of it.
12	Form a model to develop LSRW and communication Skills.
13	Conduct mock interview and practice GD activities to build competencies for actual selection process.

14	Preparing a model for evaluating Values and Ethics of Good Managers.
15	Preparing a model of dress codes and attire for different professional situations Corporate etiquettes and its implications.
16	Develop some good activities to understand the importance and need of Corporate social responsibility (CSR).
Reference Books:	
1	R. S. Agarwal, "Quantitative Aptitude", S. Chand Publication.
2	Shakuntala Devi, "The Book of Numbers".
3	R. S. Agarwal, "A Modern Approach To Logical Reasoning", S. Chand Publication.
4	Indu Sijwali, "A New Approach to Reasoning Verbal & Non-Verbal".
5	Meenakshi Raman, & Prakash Singh, "Business Communication", Oxford University Press Publication, Second Edition.
6	Sanjay Kumar, & Pushp Lata, "Communication Skills", Oxford University Press Publication, Second Edition.
7	Meenakshi Raman, & Sangeeta Sharma, "Technical Communication" Oxford University Press Publication.
8	Krishna Mohan, & Meera Banerji, "Developing Communication Skills" Macmillan India Pvt Ltd Publication.
9	Meenkashi Raman, "Soft Skills", Cengage Publication.
10	Dr. K. Alex, "Soft Skills", Oxford University Press Publication.
11	Dr. T. Kalyana Chakravarthi & Dr. T. Latha Chakravarthi, "Soft skills for Managers", Biztantra Publication.

Programme: B. Tech Civil Sem –VI (CBCS-2021)

Course: PROJECT ESTIMATION AND VALUATION		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS ALLOTTED:**
Theory: 04 Hours/Week Practical: 02 Hours / Week	End Semester Examination: 60 Marks Internal Assessment: 40 Marks Term work: 25 Marks Oral: 50 Marks	Theory: 04 Practical: 01
		Total: 05

Course Pre-requisites: The students should have knowledge of	
1	Building Planning and Design.
2	Advanced Surveying with Geomatics.
3	Planning & Management of Construction Projects.
4	Infrastructure and Transportation Systems.
5	Limit State Design of Steel Structures.
Course Objectives:	
	The aim of this course is to prepare the students to make estimate of building, road, and other civil engineering structures.
Course Outcomes: The student will be able to	
1	execute approximate estimate of structures.
2	execute quantities of different types of items of work.
3	explain specification with reference to different types of materials.
4	execute rate analysis for different types of structures.
5	execute abstract and build of different items of work for constructions.
6	calculate value of building and land.

Course Content:

UNIT - I	**Estimation:** Purpose of estimating and valuation, Types of estimates, types of estimates, data required for estimates, units of measurement & principles deciding the units, mode of measurement of building works, Abstracting, bill of quantities. Provisional & prime cost items, contingencies, establishment charges, centage charges, Schedule of rates (D. S. R.).	**(08 Hours)**
UNIT - II	**Methods of Taking out Quantities:** Long Wall-Short Wall Method and Centre Line method of taking out quantities for different items of building. Estimation of quantity of load bearing structures, Preparing Detailed Estimates of quantity single storied residential building, Preparing Detailed Estimates of quantity Different R.C.C. members, Preparing Detailed Estimates of water supply and sanitary works, Estimation of quantity of culverts and bridges, Methods of estimate of earthwork for roads, canals, Estimation of quantity of Trusses. IS Codes used for estimating. Calculating quantities using MS Excel.	**(08 Hours)**
UNIT - III	**Specifications:** Definition & purpose, Objectives and importance of specification, types, standard specifications, Specification of works, Drafting detailed specifications with reference to materials, quality, workmanship, method of execution, mode of measurement and payment, for major items such as earthwork, stone/brick masonry, plastering, ceramic tile flooring, R.C.C.	**(08 Hours)**

	work.	
UNIT - IV	**Rate Analysis:** Purpose, importance and requirements of rate analysis, Prerequisites, factors affecting rate analysis, overhead expenses, procedure for rate analysis, schedule of rates, Task work: Labor requirement for different works, material requirement for different works, Rate analysis of different Items of work.	**(08 Hours)**
UNIT - V	**Abstracting and Billing:** **Abstracting:** Purpose of abstract, Preparation of abstract, Measurement and billing, Checking of bills and final bills. **Billing:** Maintenance of muster role, Preparation of pay bill, Measurement of work for payment of contractors. Introduction to HIT-Office Software.	**(08 Hours)**
UNIT - VI	**Valuation:** Purpose, nature of value, price, cost and value, types of value, Factors affecting value of property. Concept of free hold and lease hold property, Depreciation & methods of working out depreciation, Sinking fund, Years Purchase, Out goings. Methods of Valuation of Building: Land & building basis, Rental basis, Reproduction & replacement cost basis.	**(08 Hours)**

Internal Assessment:

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

Project Based Learning: 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	Prepare approximate estimate of load bearing and framed structure.
2	Prepare approximate estimate for construction of septic tank.
3	Prepare detailed estimate for 3 storey framed structure.
4	Prepare a detailed estimate for construction of a road of 500m length.
5	Estimation of quantity of Trusses required for an industrial shed.
6	Prepare detailed specifications for different materials required for construction of residential structure.
7	Prepare rate analysis for different types of construction works.
8	Prepare abstract and bill for different types of construction activities.
9	Prepare valuation report of different types of structures.
10	Calculate Valuation of residential and commercial building based on rental method.
11	Prepare detailed estimate for pipe culvert.
12	Prepare detailed estimate for box culvert.
13	Prepare detailed estimate for industrial shed.
14	Prepare detailed estimate for bridge.
15	Carry out valuation for land and building.

Term Work: (Any Six)

1	Estimation of residential building using long wall & short wall method and centre line method.
2	Detailed estimate of a single storied RCC framed building using D.S.R. rates.
3	Estimation of quantity of culverts and bridges.

4	a) Detailed estimate of canal work. b) Assignment on road earthwork calculations.
5	Draft detailed specifications of any five items of work.
6	Assignment on Abstracting and Billing.
7	Prepare Detailed Rate analysis for any five items of work.
8	Carryout detailed valuation on different types of buildings.
9	**Project I:** Calculating quantities of different items using MS excel.
Oral:	
	The oral examination will be based on above term work and course content.
Textbooks:	
1	B. N. Dutta, "Estimating and Costing in Civil Engineering: Theory and Practice", S. Dutta & Company Publication, Lucknow.
2	B. S. Patil, "Civil Engineering Contracts & Estimates", Orient Longman Ltd. Publication Mumbai.
3	B. N. Dutta, "Estimating and Costing in Civil Engineering", USB Publishers Pvt. Ltd. New Delhi, ISBN:9788174767295.
4	S. C. Rangwala, "Estimating and Costing", Charotar Publishing House Pvt. Ltd., 2011.
Reference Books:	
1	Rangwala, "Estimating and Costing", Charotar Publishing House Pvt. Ltd.
2	M. Chakraborty, "Estimating, Costing Specifications & Valuation in Civil Engineering", M. Chakraborty Publication.
3	G. S. Birdie, "Estimating Costing", Dhanpat Rai Publishing New Delhi, 2016.
4	V. K. Raina, "Construction Management and Contracts", Shroff Publishers & Distributors New Delhi.
Codes:	
1	I.S.1200 (Part 01 to 25): Methods of Measurement of Building and Civil Engineering Works.

Programme: B. Tech Civil Sem –VI (CBCS-2021)

Course: CONTRACTS AND E-TENDERING (Vocational Course-IV)		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS**
Practical: 02 Hours / Week	Term work: 25 Marks Oral: 25 Marks	Practical: 01
		Total: 01

Course Pre-requisites: The students should have knowledge of

1	Building Planning and Design.
2	Planning & Management of Construction Projects.
3	Infrastructure and Transportation Systems.
4	Project Estimation and Valuation.

Course Objectives:

	The objective of this course is to prepare the students to understand and use provisions made in Indian Contracts Act, read tender notice ad file E-Tender.

Course Outcomes: The student will be able to

1	explain definition and essentials of a valid contract.
2	explain contract formation and conditions of contracts.
3	describe Indian Contract Act 1872 and provisions made in the act.
4	execute E-Tendering and Manual Tendering.
5	execute procedure for Civil contractor license for various departments.
6	explain tender notice and file E-Tender.

Course Content:

UNIT - I	**Contracts:** Definition, objective & essentials of valid contract, Types of contracts, FIDIC document, Standard forms of contracts, Contract formation, Conditions of contracts, Methods of inviting tenders, Pre-bid meetings, Pre-qualification system, scrutiny of tenders and comparative statement, Contract performance, Contract correspondence and contract closure.	**(08 Hours)**
UNIT - II	**Indian Contract Act (1872):** Definition of the contract as per the ACT. Valid, Voidable, Void contracts, Objectives of the act. Contract formation, Contract performance, Valid excuses for non-performance, Breach of contract, Effects of breach: understanding the clauses and applying them to situations/scenarios on construction projects.	**(08 Hours)**
UNIT - III	**Introduction to E-Tendering:** Basic Concept of Tender, Difference between E-Tendering and Manual Tendering, Various normal contract terms and condition comes under tendering process, Registration as Contractor-Process of Civil Contractor license for various Departments, Data or tools require for E-Tender Filling, Tender Searching, Documentation for E-Tendering, E-Tender Filling Process.	**(08 Hours)**

Term Work: (Any Six)

1	Collect essential documents for lump sum and item rate contract.
2	Collect and prepare a note on FIDIC documents.

3	Write a brief summary on procedure of opening of tenders.
4	Write a brief report on Indian Contract Act 1872.
5	Prepare report on tender filling procedure by taking one sample tender.
6	Write a brief summary on procedure of opening of tenders.
7	Write a brief note of license process for various departments.
8	Preparing report on BOT type contract works executed at nearby location.
Oral:	
	The oral examination will be based on above term work and course content.
Textbooks:	
1	B. S. Patil, "Civil Engineering Contracts and Estimates", Universities Press- 2006 Edition, reprinted in 2009.
2	B. N. Dutta, "Estimating and Costing in Civil Engineering", USB Publishers Pvt. Ltd. New Delhi.
3	S. C. Rangwala, "Estimating and Costing", Charotar Publishing House Pvt. Ltd., 2011.
4	"The Indian Contract Act (9 of 1872), 1872- Bare Act- 2006", Professional Book Publishers.
Reference Books:	
1	The Workmen's Compensation Act, 1923 (8 of 1923) Bare Act- 2005, Professional Book Publishers.
2	Standard General Conditions for Domestic Contracts- 2001 Edition- Published by Ministry of Statistics and Program Implementation, Government of India.
3	International Federation of Consulting Engineers (FIDIC) Document (1999).
4	G. S. Birdie, "Estimating Costing", Dhanpat Rai Publishing New Delhi, 2016.
5	V. K. Raina, "Construction Management and Contracts", Shroff Publishers & Distributors, New Delhi.

Programme: B. Tech. (Civil) Sem – VI (2021)

COURSE: MOOCs-II		
TEACHING SCHEME:	**EXAMINATION SCHEME:**	**CREDITS:**
		Total: 02

Course Pre-requisites: The students should have basic knowledge of	
1	Engineering subjects.
Course Objective:	
	To inculcate the self-learning approach amongst the students, proposed curriculum has introduced Massive Open Online Course to all the students. It will provide an affordable and flexible way to learn new skills, advance the career and deliver quality education experiences at scales.
Course Outcomes: The student will be able to	
1	execute e-learning through online web and video courses in Engineering.
2	develop self–learning approach.
3	develop platform for knowledge enhancement as per their area of interest.
4	value themselves with advanced technologies.
5	make the students for more employable.
6	develop themselves for competitive exams like GATE and also for higher studies.
Methodology of Assessment	
1	Department shall publish list of NPTEL courses in every semester. Student can refer any one of them in respective semester.
2	Keeping pre-requisite in mind, proposed curriculum has provided with the various subject baskets as per the course available
3	Students need to enrol for the course in each academic year as mentioned in the structure
4	Students need to attend all online lectures and complete all assignments on time for registered course.
5	Students will register and appear for exam conducted by NPTEL and shall submit the copy of course completion certificate received after passing the exam for registered course
6	Accordingly , the credits will be allocated to the students for respective MOOCs Program to earn the credits of respective MOOCs
7	NPTEL course relevant to respective branches related to your past and present semester are only expected to select by students , credits will not be awarded if general/ non engineering courses opted
8	To get continuous assessment marks students have to show progress which is based on the assignment submitted by you- submit print of progress report of course to concerned faculty
Assignments: Submit all assignment to the department coordinator with progress which is shared by **Swayam/MOOCs faculty conducting course.**	

B. Tech. – 2021 Course

Rules and Regulations

B. Tech. – 2021 Course

Rules and Regulations

(I) Theory

(A) Theory Examination

Theory examination consists of: (i) End semester examination (ESE), and (ii) Internal assessment (IA).

(i) ESE is of 60 marks for theory courses.

(ii) IA is of 40 marks. Out of 40 marks, 20 marks will be for Unit Tests and 20 marks will be for Project Based Learning for a given course. Two Unit Tests, each of 20 marks, will be conducted. Average of marks obtained in these two unit tests will be considered as UT marks. Roll numbers allotted to the students shall be the examination numbers for the conduction of unit tests.

(B) Standard of Passing

(i) There is a separate passing of 40% of 60 marks, i.e. 24 marks, for ESE for a given course.

(ii) There is a separate passing of 40% of 40 marks, i.e. 16, for IA for a given course.

(iii) A student who fails at ESE in a given course has to reappear only at ESE as a backlog student and clear the head of passing. Similarly, a student who fails at IA in a given course has to reappear only at IA as a backlog student and clear the head of passing

(II) Practical

(A) Practical Examination

Practical examination consists of: (i) Term work, and (ii) Practical/Oral examination for a given course based on term work.

(i) Term work (TW): TW marks are as mentioned in the curriculum structure.

(ii) Practical/Oral (PR/OR): PR/OR marks are as mentioned in the curriculum structure.

(B) Conduction of practical/oral examination

(i) A student will be permitted to appear for practical/oral examination only if he/she submits term work of a given course.

(ii) Practical/oral examination shall be conducted in the presence of internal and external examiners appointed by university.

(B) Standard of Passing

(i) A student shall pass both heads TW and PR/OR separately with minimum 40% of total marks of respective head.

(III) MOOC and Social Activity Course

(i) If a student completes one MOOC during a programme, he/ she will earn additional TWO credits, subjected to submission of the certificate of completion of the respective course. It is mandatory for a student to complete atleast two MOOC to obtain degree in a given discipline. Students shall register to MOOCs which are offered by any one the following agencies:

(a) SWAYAM : www.swayam.gov.in
(b) NPTEL : www.onlinecourse.nptel.ac.in
(c) Course Era : www.coursera.org
(d) edX online learning : www.edx.org
(e) MIT Open Course ware : www.ocw.mit.edu
(f) Udemy : www.udemy.com
(g) Spoken tutorial : www.spoken-tutorial.org

(ii) If a student completes social activity, he/she will earn additional TWO credits, subjected to submission of the certificate of completion of the respective course/ activity from the relevant authorities. It is mandatory for a student to complete atleast one social activities to obtain degree in a given discipline.

(iv) The additional credits for MOOC and Social Activity will be given only after verification of the authentic document by the Head of the Department and a separate mark-sheet will be submitted by the Head of the Department along with the course examiner.

(IV) A. T. K. T

(i) A student who is granted term for B. Tech. Semester-I, III, V, VII will be allowed to keep term for his/her B. Tech. Semester-II, IV, VI, VIII examination, respectively even if he/she appears and fails or does not appear at B. Tech. Semester-I,III, V, VII examination respectively.

(ii) A student shall be allowed to keep term for the B. Tech. Semester-III course if he/she has a backlog of any number of Heads of passing at B. Tech. Semester-I & II taken together.

(iii) A student shall be allowed to keep term for the B. Tech. Semester-V of respective course if

he/she has no backlog of B. Tech. Semester-I & II and he/she has a backlog of any number of Heads of passing at B. Tech. Semester-III & IV taken together.

(iv) A student shall be allowed to keep term for the B. Tech. Semester- VII of respective course if he/she has no backlog of B. Tech. Semester-I, II, III, IV and he/she has a backlog of any number of Heads of passing at B. Tech. Semester-V & VI taken together.

(V) Grade Point, Grade Letter and Equivalent Marks

The student must obtain a minimum Grade Point of 5.0 (40% marks) in ESE and also in combined ESE + IA. A student who fails in ESE of a course has to reappear only to ESE as a backlog student and clear that head of passing.

Award of the Class for the Degree considering CGPA: A student who has completed the minimum credits specified for the programme shall be declared to be passed in the programme. The CGPA will be computed every year of all the courses of that year. The grade will be awarded according to the CGPA of every year.

Range of CGPA	**Final Grade**	**Performance Descriptor**	**Equivalent range of Marks (%)**
$9.50 \leq$ CGPA ≤ 10.00	O	Outstanding	$80 \leq$ Marks ≤ 100
$9.00 \leq$ CGPA ≤ 9.49	A+	Excellent	$70 \leq$ Marks <80
$8.00 \leq$ CGPA ≤ 8.99	A	Very Good	$60 \leq$ Marks < 70
$7.00 \leq$ CGPA ≤ 7.99	B+	Good	$55 \leq$ Marks < 60
$6.00 \leq$ CGPA ≤ 6.99	B	Average	$50 \leq$ Marks < 55
$5.00 \leq$ CGPA ≤ 5.99	C	Satisfactory	$40 \leq$ Marks < 50
CGPA below 5.00	F	Fail	Marks Below 40