

Pimpri Chinchwad Education Trust's
PIMPRI CHINCHWAD COLLEGE OF ENGINEERING

SECTOR NO. 26, PRADHIKARAN, NIGDI, PUNE 411044

(An Autonomous Institute Approved by AICTE and Affiliated to SPPU, Pune)



**Curriculum Structure and Syllabus
Of
Second Year (S.Y. B. Tech) Working Professionals
(Civil Engineering)
(Regulations 2024)**



Effective from Academic Year 2026-27

Institute Vision

To be one of the top 100 Engineering Institutes of India in coming five years by offering exemplarily Ethical, Sustainable and Value-Added Quality Education through a matching ecosystem for building successful careers.

Institute Mission

1. Serving the needs of the society at large through establishment of a state-of-art Engineering Institute.
2. Imparting right Attitude, Skills, Knowledge for self-sustenance through Quality Education
3. Creating globally competent and Sensible engineers, researchers and entrepreneurs with ability to think and act independently in demanding situations

EOMS Policy

“We at PCCOE are committed to offer exemplarily Ethical, Sustainable and Value-Added Quality Education to satisfy the applicable requirements, needs and expectations of the Students and Stakeholders.

We shall strive for technical development of students by creating globally competent and sensible engineers, researchers and entrepreneurs through Quality Education.

We are committed for Institute’s social responsibilities and managing Intellectual property.

We shall achieve this by establishing and strengthening state-of-the-art Engineering Institute through continual improvement in effective implementation of Educational Organizations Management Systems (EOMS).”

Course Approval Summary

A. Board of Studies- Department of Civil Engineering

Sr. No.	Name of the Course	Course Code	Page No.	Signature & Stamp of BoS Chairman
1	Surveying	WCI23PC12	9	
2	Surveying Lab	WCI23PC13	11	
3	Transportation Engineering	WCI23PC14	12	
4	Transportation Engineering Lab	WCI23PC15	14	
5	Integrated Water Resources Management (PEC-I)	WCI23PE01	16	
6	Architecture & Town Planning (PEC-I)	WCI23PE02	18	
7	E-Waste Management (OEC-I)	WCI23OE01	20	
8	Massive Open Online Course (MOOC) (OEC-I)	WCI23OE02	22	
9	Techniques and Testing Lab in Civil Engineering	WCI23VS01	24	
10	Water and Wastewater Engineering	WCI24PC16	27	
11	Hydrology and Water Resources Engineering	WCI24PC17	29	
12	Hydrology and Water Resources Engineering Lab	WCI24PC18	31	
13	Dams and Hydraulic Structures (PEC II)	WCI24PE01	32	
14	Sustainable Engineering (PEC II)	WCI24PE02	34	
15	Building Services & Maintenance (OEC-II)	WCI24OE01	36	
16	Structural Health Monitoring & Audit (OEC-II)	WCI24OE02	38	
17	Structural Analysis & Design of Buildings using Software (STAAD.Pro)	WCI24VS02	39	

Approved by Academic Council:

Chairman, Academic Council

Pimpri Chinchwad College of Engineering

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CURRICULUM FRAMEWORK (2024 Course)

LIST OF ABBREVIATIONS

Sr. No.	Abbreviation	Type of Course
1	BSC	Basic Science Course
2	ESC	Engineering Science Course
3	PCC	Programme Core Course
4	PEC	Programme Elective Course
5	MDM	Multidisciplinary Minor
6	OEC	Open Elective Course
7	VSEC	Vocational and Skill Enhancement Course
8	AEC	Ability Enhancement Course
9	MOOC	Massive Open Online Course
10	EEM	Entrepreneurship/Economics/Management Course
11	IKS	Indian Knowledge System
12	VEC	Value Education Course
13	ELC	Experiential Learning Courses
14	LLC	Liberal Learning Courses

COURSE WISE CREDIT DISTRIBUTION

Sr. No.	Type of Course	No. of Courses	Total Credits	
			No.	%
1	Basic Science Course	1	3	2.5
2	Engineering Science Course	1	3	2.5
3	Programme Core Course	20	33	27.5
4	Programme Elective Course	6	14	11.7
5	Multidisciplinary Minor	5	11	9.2
6	Open Elective	3	6	5.0
7	Vocational and Skill Enhancement Course	3	6	5.0
8	Ability Enhancement Course	1	2	1.7
9	Entrepreneurship/Economics/Management Course	1	2	1.7
10	Indian Knowledge System	1	2	1.7
11	Value Education Course	2	4	3.3
12	Experiential Learning Courses	4	30	25.0
13	Liberal Learning Courses	2	4	3.3
	Total	50	120	100

SEMESTER-WISE COURSE DISTRIBUTION

Course Distribution: Semester Wise										
S. N.	Type of Course	No. of Courses / Semester								Total
		1	2	3	4	5	6	7	8	
1	Basic Science Course (BSC)	1								1
2	Engineering Science Course (ESC)	1								1
3	Programme Core Course (PCC)	5	6	4	3	1	1			20
4	Programme Elective Course (PEC)			1	1	2	2			6
5	Multidisciplinary Minor (MDM)			1	1	1	1	1		5
6	Open Elective (OEC)			1	1	1				3
7	Vocational and Skill Enhancement Course (VSEC)			1	1	1				3
8	Ability Enhancement Course (AEC)								1	1
9	Entrepreneurship/Economics/Management Course (EEMC)					1				1
10	Indian Knowledge System (IKS)		1							1
11	Value Education Course (VEC)							2		2
12	Experiential Learning Courses (ELC)						2	1	1	4
13	Liberal Learning Courses (LLC)	1	1							2
Total		8	8	8	7	7	6	4	2	50

SEMESTER-WISE CREDIT DISTRIBUTION

Credit Distribution: Semester Wise										
S. N.	Type of Course	No. of Credits / Semester								Total
		1	2	3	4	5	6	7	8	
1	Basic Science Course	3								3
2	Engineering Science Course	3								3
3	Programme Core Course	8	10	6	5	2	2			33
4	Programme Elective Course			3	3	4	4			14
5	Multidisciplinary Minor			2	2	3	2	2		11
6	Open Elective			2	2	2				6
7	Vocational and Skill Enhancement Course			2	2	2				6
8	Ability Enhancement Course								2	2
9	Entrepreneurship/Economics/Management Course					2				2
10	Indian Knowledge System		2							2
11	Value Education Course							4		4
12	Experiential Learning Courses						7	9	14	30
13	Liberal Learning Courses	2	2							4
Total		16	14	15	14	15	15	15	16	120

Curriculum Structure

**Second Year B. Tech.
Working Professionals
(Civil Engineering)
Semester III and IV**

CURRICULUM STRUCTURE																	
Second Year B. Tech. (Civil Engineering) (Regulations 2024) Working Professionals Semester – III																	
(With effect from Academic Year 2026-27)																	
Course Code	Course Type	Course Name	Credit Scheme				Teaching Scheme (Hours/Week)				Evaluation Scheme and Marks						
			L	P	T	Total	L	P	T	Total	FA		SA	TW	P R	O R	Total
											FA1	FA2					
WCI23PC12	PCC	Surveying	2	–	–	2	2	–	–	2	10	10	30	–	–	–	50
WCI23PC13	PCC	Surveying Lab	–	1	–	1	–	2	–	2	–	–	–	50		–	50
WCI23PC14	PCC	Transportation Engineering	2	–	–	2	2	–	–	2	10	10	30	–	–	–	50
WCI23PC15	PCC	Transportation Engineering Lab	–	1	–	1	–	2	–	2	–	–	–	50		–	50
WCI23PE01/ WCI23PE02	PEC	Professional Elective – I	3	–	–	3	3	–	–	3	20	20	60	–	–	–	100
-	# MDM	Multidisciplinary Minor – I	2	–	–	2	2	–	–	2	10	10	30	–	–	–	50
WCI23OE01/ WCI23OE02	OEC	Open Elective – I	2	–	–	2	2	–	–	2	10	10	30	–	–	–	50
WCI23VS01	VSEC	Techniques and Testing Lab in Civil Engineering	–	2	–	2	–	4	–	4	–	–	–	50		–	50
	Total		11	4	-	15	11	8	-	19	60	60	180	150	-	-	450

Note: # Refer separate booklet for Multidisciplinary Minor (MDM) courses.

L-Lecture, **P**-Practical, **T**-Tutorial, **FA**-Formative Assessment, **SA**-Summative Assessment, **TW**-Term Work, **OR**-Oral, **PR**-Practical

Semester – III

List of Courses – Professional Elective Course (PEC)-I:

Course Code	Course Name	Remark
WCI23PE01	Integrated Water Resources Management	Select any one
WCI23PE02	Architecture & Town Planning	

List of Open Elective Courses (OEC)-I:

Course Code	Course Name	Remark
WCI23OE01	E-Waste Management	Select any one
WCI23OE02	Massive Open Online Course (MOOC) (OEC-I)	

CURRICULUM STRUCTURE																	
Second Year B. Tech. (Civil Engineering) (Regulations 2024) Working Professionals Semester – IV (With effect from Academic Year 2026-27)																	
Course Code	Course Type	Course Name	Credit Scheme				Teaching Scheme (Hours/Week)				Evaluation Scheme and Marks						
			L	P	T	Total	L	P	T	Total	FA		SA	TW	PR	OR	Total
											FA1	FA2					
WCI24PC16	PCC	Water and Wastewater Engineering	2	–	–	2	2	–	–	2	10	10	30	–	–	–	50
WCI24PC17	PCC	Hydrology and Water Resources Engineering	2	–	–	2	2	–	–	2	10	10	30	–	–	–	50
WCI24PC18	PCC	Hydrology & Water Resources Engineering Lab	–	1	–	1	–	2	–	2	–	–	–	50	–	–	50
WCI24PE01/ WCI24PE02	PEC	Professional Elective – II	3	–	–	3	3	–	–	3	20	20	60	–	–	–	100
-	# MDM	Multidisciplinary Minor – II	2	–	–	2	2	–	–	2	10	10	30	–	–	–	50
WCI24OE01/ WCI24OE02	OEC	Open Elective – II	2	–	–	2	2	–	–	2	10	10	30	–	–	–	50
WCI24VS02	VSEC	Structural Analysis & Design of Buildings using Software (STAAD.Pro)	–	2	–	2	–	4	–	4	–	–	–	50	–	–	50
Total			11	3	–	14	11	6	–	17	60	60	180	100	–	–	400

Note: # Refer separate booklet for Multidisciplinary Minor (MDM) courses.

L-Lecture, P-Practical, T-Tutorial, FA-Formative Assessment, SA-Summative Assessment, TW-Term Work, OR-Oral, PR-Practical

Semester – IV

List of Courses – Professional Elective Course (PEC)– II:

Course Code	Course Name	Remark
WCI24PE01	Dams and Hydraulic Structures	Select any one
WCI24PE02	Sustainable Engineering	

List of Open Elective Courses (OEC)-II:

Course Code	Course Name	Remark
WCI24OE01	Building Services & Maintenance	Select any one
WCI24OE02	Structural Health Monitoring & Audit	



Curriculum

Semester – III

Second Year B. Tech.
Working Professionals
(Civil Engineering)
(Regulations 2024)

Program:	B. Tech. Working Professionals (Civil Engineering)			Semester:	III		
Course:	Surveying (PCC)			Code:	WCI23PC12		
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA1	FA2	SA	Total
2	2	-	-	10	10	30	50
Prior Knowledge of: Basic Civil Engineering. (Principles of survey, applications of survey, scale, use of tape, dumpy level etc., is essential)							
Course Objectives: 1. To develop an ability in students to apply knowledge of mathematics, science, and engineering to understand the measurement techniques in surveying. 2. To make student competent to use techniques, methods and equipment/tools necessary for linear and angular measurement in horizontal and vertical plane.							
Course Outcomes: After learning the course, the students will be able to: 1. Draw the traverse using compass or plane table and apply corrections if any. 2. Prepare contour plan for an area and also estimate earthwork in road work by leveling. 3. Measure horizontal and vertical angles after performing temporary adjustments on theodolite and tacheometer. 4. Prepare data for curve setting through various methods.							
Detailed Syllabus:							
Unit	Description						Duration (H)
1.	Compass and Plane Table Surveying a) Concept of ranging, chaining, offsetting and traversing. b) Concept of bearing, meridian and their types, construction and use of prismatic compass, local attraction and correction, dip, declination and calculation of true bearings, area calculation of traverse. c) Plane table surveying: Principle, accessories and their uses, advantages and disadvantages, methods-Radiation, intersection, traversing, resection.						8
2.	Levelling and Contouring a. Levelling: Introduction, types, benchmarks, use of auto level, digital level and laser level in the construction industry, principal axes of dumpy level, testing and permanent adjustments, reciprocal levelling, curvature and refraction corrections, distance to the visible horizon. Contouring – direct and indirect methods of contouring, uses of contour maps, study and use of topo-sheets, Profile leveling and cross-sectioning and their applications.						7
3.	Theodolite Surveying and Tacheometry a. Study of vernier transit 20” theodolite, uses of theodolite for angle measurement: horizontal angle, vertical angles, deflection angles. Magnetic bearing, prolonging a line, lining in and setting out an angle with a theodolite. Fundamental axes of theodolite: testing and permanent adjustments of a transit theodolite. b. Theodolite traversing – computation of consecutive and independent coordinates, adjustment of closed traverse by transit rule and Bowditch’s rule, Gale’s traverse table. Checks, omitted measurements, area calculation by independent coordinates. c. Tacheometry – Principle of stadia tacheometry, fixed hair method with vertical staff to determine horizontal distances and elevations of points, finding tacheometric constants. Tacheometric contouring.						8

4.	Curves & Total Station Survey a) Introduction to horizontal and vertical curves (no numerical and derivations to be asked on vertical curves and reverse curves), different types and their applications, simple and compound circular curves, elements and setting out by linear methods such as radial and perpendicular offsets, offsets from long chord, successive bisection of chord and offsets from chords produced. b) Angular methods: Rankine's method of deflection angles (one and two theodolite methods). (Numerical on simple circular curves to be asked), Transition curves: necessity and types. c) Surveying using total station – Study and use of Electronic Total Station (ETS) and its types, functions: missing lines, remote elevation measurements, remote distance measurements, area measurement.	7
Total		30
Text Books:		
1. Surveying and Levelling Vol. I and Vol. II by T. P. Kanetkar and S.V. Kulkarni, PVG Prakashan. 2. Surveying and Levelling by Subramanian, Oxford University Press. 3. Surveying, Vol. I & II by Dr. B. C. Punmia, Ashok K. Jain, Arun K. Jain, Laxmi Publications. 4. Surveying, Vol. I & II by S. K. Duggal, Tata Mc-Graw Hill.		
Reference Books:		
1. Plane Surveying by A. M. Chandra, New Age International Publishers. 2. Surveying and Levelling by N. N. Basak, Tata McGraw Hill. (2013) 3. Surveying Vol. I & II by Dr. K. R. Arora, Standard Book House. (2013, 2014) 4. Surveying: Theory and Practice by James M. Anderson, Edward M. Mikhail, Tata McGraw Hill. (2013) 5. Plane and Geodetic Surveying for Engineers. Vol. I by David Clark, Constable. (2013)		
nptel: https://archive.nptel.ac.in/courses/105/104/105104101/		

Program:	B. Tech. Working Professionals (Civil Engineering)			Semester:	III		
Course:	Surveying Lab			Code:	WCI23PC13		
	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
Credit	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	1	2	50	-		50
Course Objectives: To develop the ability to carry out survey work, and carry out required analysis required for construction projects.							
Course Outcomes: After learning the course, the students will be able to: 1. Evaluate required distances, angles and reduced levels using various instruments. 2. Analyze data required for setting out buildings and roads. 3. Estimate earthwork for profile and cross-section levelling.							
Note: Practical (PR) Examination is based on performance of any three practical (10 marks each) with 20 marks oral examination, based on practical performed.							
List of Laboratory Assignments							
Perform any Six out of Ten lab assignments and all projects are mandatory: 1. Measurement of magnetic bearings of sides of a triangle /polygon, correction for local attraction and calculations of true bearings using prismatic compass. 2. Plane table survey by intersection method. 3. Simple and differential levelling (with at least three change points) using auto / digital level. 4. Measurement of horizontal angles (by repetition method) using 20” vernier transit theodolite. 5. Finding horizontal and vertical distance using tacheometer. 6. Setting out a building from a given foundation plan (minimum six coordinates), using Auto-level / Total Station. 7. Setting out a circular curve by Rankine’s method of deflection angles. 8. Determination of distance of any two points on the surface of earth using (any) android App and comparing it with the actual distance on ground to know the accuracy. 9. Study and use of total station, boundary Survey of minimum 500 Sq.m area. 10. Study and use of Differential Global Positioning System (DGPS).							
Project I: Road project using Auto level for a minimum length of 100 m including fixing of alignment, profile levelling, cross-sectioning, plotting of L section and Cross Section. (One full imperial sheet including plan, L-section and any three typical Cross-sections).							
Project II: Tachometric contouring project with at least two instrument stations about 60 m to 100 m apart and generating contours using any software (minimum contour interval 1 meter).							
Reference Books: 1. Plane Surveying by A. M. Chandra, New Age International Publishers. 2. Surveying and Levelling by N. N. Basak, Tata McGraw Hill. (2013) 3. Surveying Vol. I & II by Dr. K. R. Arora, Standard Book House. (2013, 2014) 4. Surveying: Theory and Practice by James M. Anderson, Edward M. Mikhail, Tata McGraw Hill. (2013) 5. Plane and Geodetic Surveying for Engineers. Vol. I by David Clark, Constable. (2013)							

Program:	B. Tech. Working Professionals (Civil Engineering)			Semester:	III		
Course:	Transportation Engineering			Code:	WCI23PC14		
Credits	Teaching Scheme (Hrs/Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA1	FA2	SA	Total
2	2	-	-	10	10	30	50
Prior Knowledge: 1. Basic Civil & Environmental Engineering 2. Geotechnical Engineering for characteristics of soil 3. Engineering Geology & Rock Mechanics for design of road geometry							
Course Objectives: After Completing this course, student will have adequate background to understand and/or solve the problem involving: 1. Surveys needed for collecting different kinds of data related to highways 2. Geometric design and pavement design of highways.							
Course Outcomes: After learning the course, the students should be able to: 1. Explain the importance of highway development, pavement materials, their properties, and relevant tests used in highway construction. 2. Calculate design traffic parameters for flexible/Rigid pavements. 3. Apply geometric design principles for highway alignment, sight distance, and drainage design. 4. Explain different pavement construction techniques and their applications.							
Detailed Syllabus							
Unit	Description						Duration (H)
1	Highway Development & Planning: Historic development of road construction, highway development in India. Necessity of highway planning, classification of roads, road patterns, planning surveys, Highway planning in India. Pavement Materials and Mix Design: Materials used in highway construction and related tests: Subgrade Soil and CBR Test on it, stone aggregates; Bituminous binders; Bituminous paving mixes; Viscosity based grading of bitumen; Modified Bitumen (Cutbacks, Emulsions, Crumbed Rubber Modified Bitumen – CRMB, Polymer Modified Bitumen-PMB, Foamed Bitumen); Marshall Stability Mix Design and Test (All 5 test parameters). Introduction to Superpave Mix design.						8
2	Pavement Design: Computation of design traffic for flexible pavements: Vehicle Damage Factor VDF, Lane distribution factor LDF, Traffic growth rate. Stresses in flexible pavements and design guidelines as per IRC 37-2018. Components and factors affecting design of rigid pavements. Stresses in rigid pavements (ESWL) and design guidelines as per IRC 58-2015. Joints in concrete pavements and related problems. Introduction to Pavement design Software.						9
3	Geometric Design of Highways: Introduction; highway cross section elements, typical cross section (TCS) for different types of roads; Sight distances, Design of horizontal alignment: horizontal curve, superelevation& its attainment, transition curves, widening on curves; Design of vertical alignment: gradients, grade compensation, design of summit curves & valley curves; Highway drainage: importance of highway drainage, subsurface and surface drainage systems. Introduction to Geometric Design Software.						8

4	Modern Trends in Highway Materials & Construction. Introduction to GSB, WBM, WMM, cemented base. Understanding bituminous works: prime coat, tack coat, seal coat. Study of different types of asphalt mixes: BSG, AC, BM, DBM, premix carpet.	5
Total		30
Self-directed learning: Highway Development in India - Importance of Transportation, Different modes of Transportation, Characteristics of road transport, importance of roads in India, Scope of highway engineering.		
Text Books: Books by Indian Authors: 1. Khanna, S. K., Justo, C. E. G. & Veeraragavan, A. (2018). <i>Highway engineering</i> (10th ed.). New Delhi: Nem Chand & Bros. 2. Kadiyali, L. R. (2017). <i>Principles and practices of highway engineering</i> (9th ed.). Delhi: Khanna Publishers. Books by International Authors: 1. Garber, N. J., & Hoel, L. A. (2014). <i>Traffic and highway engineering</i> (4th ed.). Cengage Learning. 2. Mannering, F. L., & Washburn, S. S. (2020). <i>Principles of highway engineering and traffic analysis</i> (7th ed.). John Wiley & Sons.		
Reference Books: 1. Bindra, S. P. (2003). <i>A course in highway engineering</i>. Dhanpat Rai & Sons. 2. Rao, G. V. (2007). <i>Principles of transportation engineering</i>. Tata McGraw-Hill. 3. Rangwala, S. C. (2017). <i>Highway engineering</i>. Charotar Publishing House. 4. Chakraborty, P., & Das, A. (2017). <i>Principles of transportation engineering</i>. Prentice Hall of India. 5. Gupta, B. L., & Gupta, A. (2005). <i>Highway and bridge engineering</i>. Standard Publishers Distributors. 6. Hancock, M. W., & Wright, B. (2018). <i>A policy on geometric design of highways and streets</i> 7th Edition. American Association of State Highway and Transportation Officials: Washington, DC, USA, 3, 20.		
Codes: 1. Aggregate Tests: IRC SP 72-2015, IS 2386 (Part 1, 3, 4, 5)-1963, IS 6241-1971, IS 6241-2024. 2. Bitumen Tests: IS 1202-1978, IS 1203-1978, IS 1205-1978, IS 1208-1978, IS 1209-1978, IS 2720 (Part 27)-1977, IRC SP 11-1988, IRC SP 53-2010 3. Aggregate-Bitumen Combined Test: ASTM D1559, IRC SP 53-2010, IS 1206 (Part 1 & 2)-1978 4. Soil Subgrade Test: IS 2720 (Part 16)-1987, IRC 37-2012, IRC SP 72-2015 5. Flexible Pavement Design: IRC 37-2018- Guidelines for the Design of Flexible Pavements. 6. Rigid Pavement Design: IRC 58-2015- Guidelines for the Design of Plain Jointed Rigid Pavements 7. Design standards for rural highways: IRC:73-2023: Geometric design standards for rural (non-urban) highways. 8. Design standards for urban highways: IRC:86-1983: Geometric design standards for urban roads in plains. 9. AASHTO-The Green Book: A policy on geometric design of highways and streets (2018). American Association of State Highway and Transportation Officials: Washington, DC, USA, 3, 20.		
e-Resources 1. https://archive.nptel.ac.in/courses/105/101/105101087/ (NPTEL- By: Dr. Tom V Mathew) 2. https://ocw.mit.edu/collections/transportation (MIT- Open courseware) 3. https://www.icevirtuallibrary.com		

Program:	B. Tech. Working Professionals (Civil Engineering)			Semester: III			
Course:	Transportation Engineering Lab			Code: WCI23PC15			
Credits	Teaching Scheme (Hrs/Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	50	-	-	50
Prior Knowledge: Nil							
Course Objectives: - To impart the knowledge related to standard methods of testing of Aggregate/ Bitumen/Soil. - To Make students aware about the Codal provisions and test method for the designing of bituminous mix							
Course Outcomes: After learning the course, the students should be able to: - Identify the quality of aggregates by performing standard tests as per IS codes - Evaluate the strength characteristics of bitumen by performing tests as per IS codes - Determine the strength of bituminous mix as per standard test procedure - Calculate the bearing capacity of soil required for designing a pavement.							
Detailed Syllabus (Any Ten)							
A. Lab Experiments: I. Tests on Aggregate: - Aggregate Impact Value Test - Aggregate Crushing Strength Test - Los Angeles Abrasion Test - Shape Test (Flakiness Index and Elongation Index) - Specific Gravity and Water Absorption Test by basket method - Stripping Value Test - Soundness Test II. Tests on Bitumen: - Penetration Test - Ductility Test - Softening Point Test - Flash Point & Fire Point Test - Specific Gravity Test - Bitumen Extraction Test - Viscosity Test III. Tests on Aggregate Bitumen Combined: - Marshall Stability Test IV. Tests on Soil Subgrade: (Not Mandatory): - California Bearing Ratio Test (CBR Test) B. Technical site visits to - Road Construction and/or RAP Site. - Cold or Hot mix Plant.							
Text Books: - Khanna, S. K., Justo, C. E. G., & Veeraragavan, A. (2013). Highway materials and pavement testing. Nem Chand & Bros. - Khanna, S. K., & Justo, C. E. G. (2018). <i>Highway engineering</i> (10th ed.). New Delhi: Nem Chand & Bros. - Roess, R. P., Prassas, E. S., & McShane, W. R. (2019). <i>Traffic engineering</i> (5th ed.). Pearson.							

4. Kadiyali, L. R. (2017). *Principles and practices of highway engineering* (9th ed.). Khanna Publishers, Delhi.

Reference Books:

1. Bindra, S. P. (2003). *A course in highway engineering*. Dhanpat Rai & Sons.
2. Rao, G. V. (2007). *Principles of transportation engineering*. Tata McGraw-Hill.
3. Rangwala, S. C. (2017). *Highway engineering*. Charotar Publishing House.
4. Chakraborty, P., & Das, A. (2017). *Principles of transportation engineering*. Prentice Hall of India.
5. Gupta, B. L., & Gupta, A. (2005). *Highway and bridge engineering*. Standard Publishers Distributors.

Codes:

1. **Aggregate Tests:** IRC SP 72-2015, IS 2386 (Part 1, 3, 4, 5)-1963, IS 6241-1971, IS 6241-2024.
2. **Bitumen Tests:** IS 1202-1978, IS 1203-1978, IS 1205-1978, IS 1208-1978, IS 1209-1978, IS 2720 (Part 27)-1977, IRC SP 11-1988, IRC SP 53-2010
3. **Aggregate-Bitumen Combined Test:** ASTM D1559, IRC SP 53-2010, IS 1206 (Part 1 & 2)-1978
4. **Soil Subgrade Test:** IS 2720 (Part 16)-1987, IRC 37-2012, IRC SP 72-2015

e-Resources

1. <https://archive.nptel.ac.in/courses/105/101/105101087/> (NPTEL- By: Dr. Tom V Mathew)
2. <https://ocw.mit.edu/collections/transportation> (MIT- Open courseware)
3. <https://www.icevirtuallibrary.com>

Program:	B. Tech. Working Professionals (Civil Engineering)			Semester:	III		
Course:	Integrated Water Resources Management (PEC-I)			Code:	WCI23PE01		
Credits	Teaching Scheme (Hrs/Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA1	FA2	SA	Total
3	3	-	-	20	20	60	100
Prior Knowledge: Water Resources Engineering, Public Health Engineering, Remote sensing and GIS							
Course Objectives: This course aims at enabling students, 1. To Introduce student about concept of IWRM and its necessity in view of climate change, components of IWRM, decision support system 2. To make them competent to prepare IWRM plan 3. Impart knowledge about legal aspects, Decision support system, System engineering							
Course Outcomes: After learning the course, the students should be able to: 1. Understand principles, challenges, application of IWRM approaches and prepare strategic plan. 2. Examine crop water requirements under varying climatic conditions and design effective irrigation planning models. 3. Assess the impact of anthropogenic activities on surface and ground water quality, and formulate strategies for sustainable water management, comparing with the standards. 4. Interpret economic theories related to water resources and justify their application in sustainable water management. 5. Understand legal regulatory settings, and guidelines of inter-basin water transfers for IWRM 6. Examine the impact of hydraulic structures on river surface profiles and sediment transport and recommend optimization strategies							
Detailed Syllabus							
Unit	Description						Duration (H)
1	Introduction to IWRM: Concept, definitions, objectives, principles, challenges and needs, components, approaches of IWR& M, water as a global issue, introduction of global water partnership (GWP), introduction of central water commission (CWC), national water policy (only introductory), Various govt institutions and regulatory authorities viz. MWRRA, MMISF ACT, CWC, WORLD BANK, GWP etc.						7
2	Irrigation planning & IWRM: Irrigation in the concept of integrated water resources, water requirement for crops, irrigation methods and efficiencies of these methods, current water pricing, ground water quality protection, sea water intrusion into fresh water aquifers due to human activities, ground water recharge, participatory irrigation management (PIM), water distribution society's (WDS), introduction of water and land management institute (WALMI).						8
3	Considerations for Water Supply & Health: Importance of assessment of river water quality, prevention & control of surface & ground water pollution, cost effective water quality monitoring for basins, environmental impact assessment (EIA), central pollution control board (CPCB) regulations, need of training to water users for sustainability, application of polluters pays principle, need of treatment facilities for domestic sewage and industrial effluents, effluent quality standards as per CPCB and its strict implementation and monitoring, discussion of one case study.						7
4	Water Economics and Sustainability: Water as economic good, economic value of water, water scarcity, importance of Water to the Indian economy, principles of planning						8

	and financing of water resources project: discussion on any two case studies, sustainability principles for water management, framework for planning a sustainable water future, economics and decision making.	
5	Legal Regulatory Settings & IWRM: Global and national perspectives of water crisis, UN laws on non-navigable uses of international water courses, current water laws and regulation (national, state & local), water rights & priorities, CWC laws & guidelines, inter-basin water transfers and integrated water resources management, importance of arbitration in IWRM, Dublin Principles (1992), discussion of one case study.	7
6	Flood Control & Power Generation: Role of dams in flood control and power generation and its importance in IWRM, management of flood plains, flood risk mapping, flood forecasting and disaster relief, coordination between co-basins for flood management, use of QGIS for IWRM, effects of hydraulic structures on river surface profiles and sediment transport, hydro power generation, basic introduction of soft computing techniques for flood forecasting (only introductory).	8
Total		45
Text Books: 1. Integrated Water Resources Management: Water in South Asia Volume I, Peter P Mollinga, Ajaya Dixit and Kusum Athukorala, Sage Publications 2. Ecosystem Principles and Sustainable Agriculture, Sithamparanathan, Rangasamy A. and Arunachalam, N, Scitech Publications (India) Pvt. Ltd, Chennai.		
Reference Books: 1. Water Resources System Planning & Management, M. C. Chaturvedi, Tata McGraw-Hill. 2. Water Resources Systems Engg, D. P. Loucks, Prentice Hall 3. Economics of Water Recourses Planning, L. D. James & R. R. Lee, McGraw Hills, New York 4. Integrated Water Resources Management: Global Theory, Emerging Practice and Local Needs, Peter P Mollinga, SAGE Publication 5. Principles of Water Resources: History, Development, Management and Policy, Thomas V., John Wiley and Sons Inc., New York. 2003. 6. Watershed Management in India, Murthy, J. V. S., Wiley Eastern Ltd., New York, 1995. 7. Soil Conservation and Land Management, Dalte, S.J. C., International Book Distribution		
e-Resources: 1. https://www.unep.org/explore-topics/disasters-conflicts/where-we-work/sudan/what-integrated-water-resources-management 2. https://www.unep.org/explore-topics/disasters-conflicts/where-we-work/sudan/what-integrated-water-resources-management		

Program:	B. Tech. Working Professionals (Civil Engineering)			Semester:	III		
Course:	Architecture & Town Planning (PEC-I)			Code:	WCI23PE02		
	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
Credit	Lecture	Practical	Tutorial	FA1	FA2	SA	Total
3	3	-	-	20	20	60	100
Prior Knowledge of: Fundamentals of Building Technology and Architectural Planning.							
Course Objectives: This course aims to enable students, - To study the history of various architectural designs and their preservation. - To build the concepts of architectural and urban planning principles and understand the futuristic needs of users. - To impart the knowledge of landscaping and sustainable settlement planning. - To build the concept of town planning and the requirements of a smart city. - To appraise the planning strategies concerning various guidelines and government norms. - To impart the knowledge of legal provisions in governments acts and laws for town planning.							
Course Outcomes: After learning the course, the students should be able to: - Illustrate the history of civilization, various forms of architectural designs, and their conservation. - Apply architectural and urban planning principles to improve the quality of life. - Apply landscaping principles and sustainability in town planning to improve the quality of life. - Identify the requirements of town planning and smart cities for the futuristic development. - Illustrate and defend various planning strategies to develop the area under guidelines and government norms. - Identify various legal acts and laws in town planning.							
Detailed Syllabus							
Unit	Description						Duration (Hr.)
1.	History of Architecture and Planning: Evolution of Architecture, Western Architecture: Egyptian, Greek, Roman Architectures- Orders. Indian Architecture: Vedic age, Indus Valley civilization – Buddhist period: Stambas, Stupas, Toranas, Chaityas, Viharas – Hindu temples: Dravidian and Indo-Aryan (Nagara) Styles. Indo-Saracenic (Islamic) Architecture: Mosque – Palace – Fort – Tomb. A case study on any architectural style reflecting its significance and history. Case study on advanced technologies in conserving the history of architecture.						07
2.	Architecture and Urban Planning: Elements of Designing, Principles of Composition, and relevant case studies. Qualities of Architecture: user-friendly, contextual, eco-friendly, useful for spaces, and future growth, with a case study. Role of Architect in Planning and Designing spatial organization, utility, the demand of the area, and supply, etc., considering situations like disaster conditions with case study, importance of sustainable architecture, Introduction to theories, objectives, and principles of urban planning, urban conservation, urban renewal with case study.						08
3.	Principles of Landscaping: Objectives, principles, elements, material (soft and hard), landscaping styles, green roofs, and vertical gardens: need, means, outcome, impact on ecology and environment, quality of life and livability, case study on the impact of landscaping.						07
4.	Town Planning and Smart City requirements: Scope, purpose, and benefits of town planning, components of town planning, planning levels: regional plan, development plan, town planning scheme, neighborhood planning, Horizontal and vertical expansion of towns- satellite towns- floating towns- Industrial Towns- skyscrapers- pyramidal cities, Special purpose plan -Smart cities. Special townships: SEZ, application of GIS, GPS, remote sensing in Town planning, integration of Internet of Things (IoT) technologies in town planning. Case study on any smart city.						08
5.	Civic Survey: Civic surveys and their utility for DP proposal: demographic, housing, land use, water supply,						08

	sanitation, flora and fauna, natural elements, etc. Planning agencies for various levels of planning and organizational details with the purpose (CIDCO, MHADA, MIDC, MMRDA/PMRDA, SRA, and HUDCO), Traffic transportation systems: hierarchy of roads, traffic management, intelligent transport systems. Case study on various planning agencies.	
6.	Legal provisions in Acts: The administrative level of planning (neighborhood, local, district, state, and national), Land Acquisition Rehabilitation and Resettlement Act, 2013, Real Estate (Regulation and Development) Act 2016, and MAHA-RERA, URDPFI Guidelines (for land use, infrastructure, etc.), AMRUT Guidelines (water/sewerage, transport, etc.), and a legislative mechanism for preparation of DP: MRTTP Act 1966.	07
Total		45

Textbooks:

1. Town Planning, G. K. Hiraskar, Dhanpat Rai Publications
2. Town Planning, S. C. Rangwala, Charotar Publishing House Pvt. Ltd.
3. Planning and Design of Buildings by Section of Architecture' by Y. S. Sane.
4. Indian Architecture – Vol. I & II' by Percy Brown, Taraporevala Publications, Bombay.
5. Fundamentals of Town Planning' by G.K. Haraskar

Reference Books:

1. MRTTP Act 1966: The director, government printing, stationery and publications, Maharashtra state, Mumbai.
2. URDPFI & AMRUT Guidelines: Ministry of housing and urban affairs, Government of India.
3. LARR Act 2013: Ministry of law and justice, Government of India
4. An Introduction to Landscape Architecture, Michael Laurie, American Elsevier Publishing Company
5. Town and Country Planning by A.J. Brown and H.M. Sherrard

E-Resources:

1. https://onlinecourses.nptel.ac.in/noc22_ar18/preview (Introduction to Urban Planning by Prof. Harshit Lakra, IIT Roorkee)
2. <http://www.digimat.in/nptel/courses/video/124107001/L16> html NPTEL Video Course: NOC: Housing Policy and Planning by Dr. Uttam K. Roy, IIT Roorkee
3. <https://mohua.gov.in/upload/uploadfiles/files/URDPFI%20Guidelines%20Vol%20I>
4. http://amrut.gov.in/upload/uploadfiles/files/designandStandards_AMRUT
5. <https://mmrda.maharashtra.gov.in/home>
6. <https://www.pmrda.gov.in/index> <https://maharera.mahaonline.gov.in/>
7. <https://smartcities.gov.in/>
8. <https://blog.emb.global/urban-planning-through-iot/>

Program:	B. Tech. Working Professionals (Civil Engineering)			Semester:	III		
Course:	E-Waste Management (OEC-I)			Code:	WCI23OE01		
Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
Credit	Lecture	Practical	Tutorial	FA1	FA2	SA	Total
2	2	-	-	10	10	30	50
Prior Knowledge of: Fundamentals of environmental science and sustainable development.							
Course Objectives: 1. To impart the knowledge of issues and challenges of e-waste management. 2. To create awareness of potential health effects and risks associated with e-waste. 3. To build knowledge of e-waste legislation (policy and guidelines) and the circular economy. 4. To get acquainted with recycling, recovering, recovering and disposal techniques.							
Course Outcomes: After learning the course, the students should be able to: 1. Identify the issues and challenges of e-waste management for a sustainable environment. 2. Evaluate the potential health effects and risk assessment. 3. Illustrate e-waste laws and guidelines and apply a circular economy road map for an e-waste sustainable future. 4. Identify the e-waste recycling, recovery, and disposal techniques and their significance for a sustainable future.							
Detailed Syllabus							
Unit	Description						Duration (H)
1.	Electronic Waste Management – Issues and Challenges: Introduction to E-Waste, classification and composition, need to manage/recycle, E-Waste generation in India and comparison with world scenario; facts & figures, estimation of waste electronic and electrical equipment (WEEE), economic assessment of E-Waste (Rare earth minerals, precious metals), effluents (solid, liquid and gas) generated during recycling, quantification of health hazard due to informal recycling of E-Waste, (Case study-based learning)						07
2.	E-Waste: Environmental and Public Health Issue: Characteristics of Hazardous Substances, toxicity concerns, potential health effects and symptoms of long-term exposure, case study of heavy metal contamination due to E-Waste recycling, Introduction to risk assessment, epidemiologic data analysis and parameter for determining exposure and disease (numerical), classification of potential carcinogens, dose-response assessment, Potency Factor for Carcinogens (numerical), Hazard Index (HI) and Hazard Quotient (HQ) (numerical)						08
3.	E-waste (Management & Handling) Rules / Guidelines and circular economy Regulatory frameworks in India, objectives of e-waste rules, hazardous and other wastes (Management and Transboundary Movement) Rules, 2016, 2018, and 2024, application of rules to stakeholders, objectives of e-waste rules, India’s stand on liberalizing import rules, UN Sustainable Development Goals (SDGs) and e-Waste, circular economy startup in India with a case study						07
4.	Recycling and Recovery of Metals from Electronic Waste and Disposal Techniques: E-waste recycling machineries, recycling process of E-Waste, existing E-Waste recycling Techniques, case study/ examples (metal recovery process), mechanism of extraction of precious metal from leaching solution, recovery of precious metals from solutions by solvent extraction, extraction of precious and rare earth metals from End-of-Life (EOL) electronic products, disposal techniques, role and responsibility of extended producers’ responsibility (EPR), E-Waste economy in the organized and unorganized sector, Case study on recycling and precious metal recovery from E-Waste.						08

Total	30
Textbooks: 1. E-waste management challenges and opportunities in India, Varsha Bhagat Ganguly, Routledge India, 1st edition 2021. 2. E-waste Management and Procurement of Environment, Dr. Suresh Kumar and Dr. Jitendra Kumar Pradhan, Authorpress, 2021 edition. 3. E-waste in India: Management, challenges, and opportunities (Volume I & II), Dr. Suresh Kumar, Authorspress, September 2021 edition.	
Reference Books: 1. Fowler B, Electronic Waste – 1st Edition (Toxicology and Public Health Issues), 2017 Elsevier 2. Johri R., E-waste: implications, regulations, and management in India and current global best practices, The Energy and Resources Institute (TERI), TERI Press, New Delhi, 2008. 3. The Complete Technology Book on E-Waste Recycling (Printed Circuit Board, LCD, Cell Phone, Battery, Computers), ASIA PACIFIC BUSINESS PRESS Inc., 2015.	
E-Resources: 1. https://cpcb.nic.in/e-waste/ 2. https://courses.iid.org.in/course/e-waste-recycling-business 3. https://www.suritex.co.in/ 4. http://greenscape-eco.com/ 5. https://onlinecourses.nptel.ac.in/noc20_ce12/preview 6. https://nielit.gov.in/gangtok/content/paid-course-e-waste-management 7. https://www.semanticscholar.org/paper/Electronic-waste-management/HesterHarrison/bc34471b0f9d94b0656b43df6b322116f2a7175c	

Program:	B. Tech. Working Professionals (Civil Engineering)			Semester:	III		
Course:	Massive Open Online Course (MOOC) (OEC-I)			Code:	WCI23OE02		
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Tutorial	Hours	FA1	FA2	SA	Total
2	2	-	2	10	10	30	50

Prior Knowledge of:

Basic understanding of construction materials and structures Fundamentals of concrete technology (desirable)

Course Objectives:

1. To embed self-learning attitude in students.
2. To develop basic understanding of structural health monitoring and audit.

Course Outcomes:

After learning the course, the students should be able to:

1. Build self-learning skills.
2. Discuss the application of modern tools and techniques in civil engineering.

Detailed Syllabus

Component	Description	Duration
MOOC Learning	Online course from platforms such as NPTEL, Coursera, SWAYAM, Udemy, etc. (minimum 8–12 weeks, ~45 hrs content)	Equivalent to 24 Hrs
Assignments & Practice	Completion of quizzes, assignments, and exercises as per course	Equivalent to 4 Hrs
Report Preparation	Preparation of 3–4-page technical report / summary	Equivalent to 2 Hrs

Guidelines for Students:

1. The MOOC course shall be chosen from recognized online platforms such as NPTEL / SWAYAM / Coursera / Udemy, etc.
2. Each student must take prior approval from the course coordinator/mentor before registration. The selected MOOC must be unique and not previously completed (repetition is not allowed).
3. The selected course should be in emerging or interdisciplinary areas relevant to Civil Engineering or professional practice, and should not duplicate courses already included in the curriculum.
4. The course duration should be 8–12 weeks with a minimum of ~45 hours of learning content, ensuring sufficient depth for a 2-credit course.
5. Students must regularly complete all assignments, quizzes, and learning activities as specified in the MOOC.
6. Timely submission of assignments on the respective platform is mandatory and will be considered for internal evaluation.
7. At the end of the course, students must submit:
 - A 3–4-page MOOC report (practical/learning-based summary)
 - Course completion certificate (mandatory)
8. Evaluation Weightage:

Internal Evaluation (40%) → 20 Marks (FA1 & FA2)

- Based on assignment completion, consistency, and performance

MOOC Report (30%) → 15 Marks (SA)

- Based on quality, technical content, and presentation

External Evaluation (30%) → 15 Marks (SA)

- Based on course completion certificate and performance in final assessment conducted by the platform

Note: Final examination/certification from the platform is mandatory.

9. Since this is a 2-credit course, successful completion of the MOOC and submission of all required components is mandatory to earn credits.

Evaluation Guidelines & Rubrics (Mapped to FA1, FA2 & SA)

FA1 (10 Marks) – (Continuous Internal Evaluation)

- Timely completion of assignments – 5 Marks
- Progress and performance in assignments – 5 Marks

FA2 (10 Marks) – (Continuous Internal Evaluation)

- Timely completion of assignments – 5 Marks
- Progress and performance in assignments – 5 Marks

SA (30 Marks) – (Report + Certification)

MOOC Report Submission (30%) – 15 Marks

- Report drafting, structure & presentation – 5 Marks
- Content, learning outcomes & application – 5 Marks

Final Examination / Certificate (30%) – 15 Marks

- Appeared for MOOC final exam – 5 Marks
- Performance in certification exam – 10 Marks

e-Resources: NPTEL:

<https://nptel.ac.in/courses>

<https://www.coursera.org/search?query=construction%20management&>

<https://www.udemy.com/topic/construction/>

Program:	B. Tech. Working Professionals (Civil Engineering)			Semester:	III		
Course:	Techniques and Testing Lab in Civil Engineering			Code:	WCI23VS01		
Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
Credit	Lecture	Practical	Hours	TW	PR	OR	Total
2	-	2	4	50	-	-	50
Prior Knowledge of: Strength of Materials, Soil Mechanics, Fluid Mechanics.							
Course Objectives: This course aims at enabling students 7. To provide the knowledge of characteristics and behavior of civil engineering materials used in buildings and Infrastructure.							
Course Outcomes: After learning the course, the students should be able to: 1. Determine the characteristics/properties of construction materials and interpret the results. 2. Analysis of results in comparison with the standards. 3. Application of results for appropriate decision.							
Detailed Syllabus							
A. Testing of Materials: 1. Tension test on mild and TMT steel. 2. Shear (Single & Double) test on mild steel. 3. Torsion test on mild steel. 4. Impact (Izod & Charpy) test on mild steel, aluminum, brass. 5. Compression test on timber (Parallel & Perpendicular) 6. Bending test on timber and plywood. 7. Abrasion test of flooring tiles. 8. Rapid Chloride Permeability Test (RCPT) on Concrete.							
B. Geotechnical Engineering: (Any Two) 1. Study of soil classification systems (AASHTO, IS, Unified, GI) 2. Determination of specific gravity of soil using density bottle method. 3. Determination of field density of soil using water displacement method.							
C. Transportation Engineering: (Any Three) 1. Aggregate impact value test. 2. Aggregate crushing strength test. 3. Specific gravity and water absorption test by basket method. 4. Shape test (Flakiness and elongation index)							
D. Fluid Mechanics: (Any Three) 1. Study of Hydraulic jump as Energy Dissipater 2. Impact of Jet 3. Basic Characteristics of Pelton Wheel Turbine and Centrifugal Pump 4. Calibration of Notch							
E. Environmental Engineering Field Laboratory: (Any Three) 1. Water quality analysis – Water Testing kit 2. Determination of presence of bacteria in water and residual chlorine 3. Measurement of sound level 4. Measurement of ambient air quality							
F. Advanced 3-D Printing Laboratory: 1. Fused Deposition Method (FDM) 3 D Printing- Drafting /. STL/ Slicing/ Printing. 2. Concrete Element 3 D Printing from .dwg files at large scale.							

Reference Books:

1. S. Timoshenko and Young, Engineering Mechanics, Tata McGraw Hill, 4th Edition, 2013.
2. W. A. Nash Strength of Material, Schaum's Outline Series, McGraw Hill, 4th edition, 1998.
3. S. Timoshenko and Gere, Mechanics of Materials, PWS Publication Co. Ltd., 3rd edition, 1997.
4. J. M. Gere, Mechanics of Materials, Brooks/Cole. Publishing Co. 6th edition, 2008.
5. G.H. Ryder, Strength of Materials, Prentice Hall Publications, 3rd edition, 2002.
6. Partha Chakraborty and Animesh Das, Principles of Transportation Engineering, Prentice Hall Publications, 2nd edition, 2027
7. Standard Methods for examination of water and wastewater, Mary Franson, American Public Health Association.
8. Water Supply and Sanitary Engineering, G. S. Birdie and J. S. Birdie, Dhanpat Rai Publishing Company, New Delhi, 9th Edition, (2010).
9. Air pollution and Control KVS G Murali Krishna, University Science Press, 2015
10. Air Pollution, H. V. N. Rao and M. N. Rao, TMH, Pub., 2004
11. Fluid Mechanics by R. J. Garde and A.J. Mirajgaonkar Pub: SCITECH Publications (India) Pvt. Ltd, Chennai, 2010
12. Fluid Mechanics by Streeter Wylie and Bedford – Pub: McGraw Hill International, New Delhi, 2017
13. Open Channel Hydraulics by Ven Tee Chow, Pub: McGraw Hill Book Company, Koga, 2009
14. Flow in Open Channels by K Subramanya, 5th Edition, Pub: Tata McGraw Hill, 2019
15. Geotechnical Engineering by C. Venkatramaiah, New Age International Publishers, 5th Edition, 2017.
16. Principles of Geotechnical Engineering by Braja M. Das, Cengage Learning, 8th Edition, 2020.
17. Geotechnical Engineering by P Purushothma Raj, Tata McGraw Hill, 2017.
18. Geotechnical Engineering by Principles & Practices by Donald. P. Coduto, Pearson Education, 2nd Edition, 2017.
19. Basic and Applied Soil Mechanics by Gopal Ranjan and A. S. R. Rao, Newage International, 3rd Edition, 2016.
20. Physical and Geotechnical Properties of Soils by Joseph E. Bowles, International Students Edition.

IS Codes:

1. I.S. 1608:1995 Method for tensile testing of steel products.
2. 5242:1979 Methods of test for determining shear strength of metals
3. 1717 Method of simple torsion test.
4. 1598 For Izod impact test
5. 1727 For Charpy impact test.
6. 1708 (part 8) – 1986 Compression test on timber (Parallel to grain)
7. 1708 (part 9)- 1986 Compression test on timber (Perpendicular to grain)
8. 1708 and 883 Bending strength and modulus of elasticity of timber
9. 3495 (part III)- 1976 Water absorption capacity of bricks, Efflorescence test on bricks
10. 3495 (part-I) Compressive strength of bricks
11. IS 10500:2012 Drinking water specifications.
12. IS 3025: 2013, Methods of Sampling and Test (Physical, Chemical and Biological) for Water and Wastewater,
13. Bureau of Indian Standards, New Delhi.
14. I.S. 5182 (all parts)
15. SP36 Compendium of Indian Standards on Soil Engineering, Part 1:1987 Laboratory Testing of soils for Civil Engineering Purposes.

Curriculum

Semester – IV

**Second Year B. Tech.
Working Professionals
(Civil Engineering)
(Regulations 2024)**

Program:	B. Tech. Working Professionals (Civil Engineering)			Semester:	IV		
Course:	Water and Wastewater Engineering			Code:	WCI24PC16		
	Teaching Scheme (Hrs/Week)			Evaluation Scheme and Marks			
Credits	Lecture	Practical	Tutorial	FA1	FA2	SA	Total
02	02	-	-	10	10	30	50
Prior Knowledge: 1. Fundamentals of Surveying, Building Planning and Fluid Mechanics 2. Basic Concepts of Engineering Sciences and Mathematics							
Course Objectives: This course aims at enabling students, 1. To discuss and demonstrate the principles of water treatment plant layout and working. 2. To inculcate and impart design principles and working of WTP components 3. To introduce students about the need of sanitation infrastructure, wastewater treatment, sludge management system and to identify wastewater as potential water source through recycle and reuse. 4. To inculcate an ability to learn the working principle, operation and design of various units of wastewater treatment plant.							
Course Outcomes: After learning the course, the students should be able to: 1. Design components of water treatment plant – aeration, sedimentation and estimating coagulant dose. 2. Design components of water treatment plant – flocculator, filtration, elevated service reservoir capacity. 3. Design preliminary and primary unit operations in waste water treatment plant. 4. Design suspended and attached growth wastewater treatment systems.							
Detailed Syllabus							
Unit	Description						Duration (H)
1	Principles of Water Treatment Components and layouts. Design periods, Quantity: rate of water consumption for various purposes, Domestic water standards, fire demand, factors affecting rate of demand, population forecasting. Government of India initiatives. principles of water treatment unit operations and processes, Aeration: principle and concept, necessity, methods, design of aeration fountain. Sedimentation: plain and chemically assisted, principle, efficiency of an ideal settling basin, types of sedimentation, settling velocity, types of sedimentation tanks, design of plain sedimentation tank, design of tube settlers. SDG6 Clean Water and Sanitation						07
2	Design of Water Treatment Plant Coagulation and flocculation: Principle of coagulation, design of flocculation chamber, design of clari-flocculator. Filtration: theory of filtration, mechanism of filtration, filter materials, types of filters and design of rapid sand gravity filters, membrane filtration. Disinfection: mechanism, types of disinfectants, types and methods of chlorination, bleaching powder estimation. Water distribution system: system of water supply: continuous and intermittent system, design of elevated storage reservoir capacity. AI in water treatment plant						08
3	Preliminary and Primary Wastewater Treatment Collection and conveyance, quantitative estimation of wastewater, characteristics of wastewater, hydraulic design of circular sanitary sewer, Self-purification of natural streams, Wastewater recycle and reuse, sewage, emerging contaminants, screens: types, design of screens, disposal of screenings. Grit chamber: sources of grit, types, proportional flow weir, Parshall flume, design of grit chamber, skimming tanks, Equalization and neutralization tanks, types of settling, design of primary sedimentation tank.						07
4	Secondary and tertiary Treatment: Aerobic secondary treatment: unit operations and processes Principle of biological treatment, Activated sludge process (ASP): design of ASP, modifications in ASP. Concept of SBR & UASBR. Oxidation pond: bacteria – algae symbiosis,						08

	design of oxidation pond, Constructed wetlands, phytoremediation: principle, advantages, disadvantages, trickling filter: principle, different TF media & their characteristics, design TF using NRC formula, operational problems, and control measures. Sludge management system. Tertiary treatment – principle and methods, concept of Zero Liquid Discharge (ZLD). AI in a wastewater treatment plant	
Total		30
Self-directed learning- Tertiary treatment for water and wastewater, Package sewage Treatment plant, operation and maintenance of water and wastewater treatment plant, energy estimation for water and wastewater treatment plant.		
Text Books: 1. Water Supply Engineering, S. K. Garg, Khanna Publishers, New Delhi, 35th Edition (2015). 2. Water Supply and Sanitary Engineering, G. S. Birdie and J. S. Birdie, Dhanpat Rai Publishing Company, New Delhi, 9th Edition, (2010). 3. Environmental Engineering-1: Water Supply Engineering, B. C. Punmia, Ashok Jain and Arun Jain. Laxmi Publications (P) Ltd, 2nd Edition, Reprint (2016). 4. Sewage Disposal & Air Pollution Engineering, S. K. Garg, Khanna Publication, 41st Edition, (2018).		
Reference Books: 1. Environmental Engineering, Peavy and Rowe, McGraw Hill Publications, (2017). 2. Waste Water Treatment & Disposal, Metcalf & Eddy, McGraw Hill Education (India) Private Limited, 4th Edition, (2017). 3. Manual on Sewerage & Sewage Treatment published by Ministry of Urban Development, New Delhi, Third Edition, (1993). 4. Wastewater Treatment for Pollution Control and Reuse, Arceivala and Asolekar, McGraw Hill Education (India) Private Limited, 3rd Edition, (2017). 5. Standard Methods for examination of water and wastewater, Mary Franson, American Public Health Association IS Codes 01 6. IS 3025: 2013, Methods of Sampling and Test (Physical, Chemical and Biological) for Water and Waste Water, Bureau of Indian Standards, New Delhi.		
e-Resources 1. http://cpheeo.gov.in/cms/manual-on-water-supply-and-treatment.php 2. http://cpheeo.gov.in/cms/manual-on-sewerage-and-sewage-treatment.php 3. http://cpheeo.gov.in/cms/manual-on-storm-water-drainage-systems---2019.php 4. http://cpheeo.gov.in/cms/manual-on-operation--and-maintenance-of-water-supply-system-2005.php		

Program:		B.Tech. Working Professionals (Civil Engineering)		Semester:		IV	
Course:		Hydrology and Water Resources Engineering		Code:		WCI24PC17	
Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
Credit	Lecture	Practical	Tutorial	FA1	FA2	SA	Total
2	2	-	-	10	10	30	50
Prior Knowledge of: Fluid Mechanics, Geology and Statistics							
Course Objectives: 1. To impart knowledge of precipitation and runoff 2. To build the concept of groundwater hydrology 3. To make aware of reservoir planning and irrigation concepts 4. To get acquainted with hydraulic structures							
Course Outcomes: After learning the course, the students should be able to: 1. Analyze precipitation and runoff 2. Evaluate yield through Aquifer 3. Evaluate reservoir capacity and water requirement of crops 4. Gain the knowledge of hydraulic structures							
Detailed Syllabus							
Unit	Description						Duration (H)
1	Introduction to Hydrology and Runoff Hydrological cycle, precipitation, analysis of precipitation data, runoff hydrograph, unit hydrograph, flood frequency analysis, Introduction to flood routing.						06
2	Groundwater Hydrology Occurrence and distribution of ground water, specific yield of aquifers, Darcy 's law, permeability, safe yield of basin, hydraulics of wells under steady flow condition in confined and unconfined aquifers, specific capacity of well, tube wells, open wells and their construction, Groundwater recharge methods.						08
3	Reservoir Planning and Irrigation Investigation for reservoir planning, applications of mass curve and demand curves, reservoir sedimentation, useful life of reservoir. Methods of irrigation, water requirements of crops, Piped distribution network for irrigation (PDN): Introduction, advantages and disadvantages of PDN over conventional						08
4	Introduction to Hydraulic Structures Gravity dam, various components of dam, forces acting on gravity dam, low and high gravity dam. Earth dam: Introduction, causes of failure of earthen dam. Spillways and energy dissipaters (Introduction), Diversion head works – Weir and barrages. Canal and canal structures, Introduction to cross drainage works.						08
Total							30
Textbooks: 1. Engineering Hydrology by K. Subramanya,6 th Edition, Tata McGraw Hill, 2024 2. Hydrology and Water Resources Engineering, Vol-1, S. K. Garg, 27 th Edition, Khanna Publishers, New Delhi, 2023. 3. Irrigation Engineering and Hydraulic Structures, Vol.II, S. K. Garg, 38 th Edition, Khanna Publishers, New Delhi, 2023.							

Reference Books:

1. Irrigation, Water Resources and Water Power Engineering, P. N. Modi, 8th Edition, Standard Book House, 2012.
2. Irrigation and Water power Engineering, Dr. Punmia and Dr. Pande, 16th Edition, Standard Publisher, 2016.
3. Groundwater Hydrology, Todd, 3th Edition, John Wiley & Sons, 2011.
4. Irrigation Engineering, H.M. Raghunath, 1st Edition, Wiley India Pvt. Ltd., 2016.

e-Resources

1. <https://www.imd.pune.gov.in/>
2. <https://old.amu.ac.in/emp/studym/99994128.pdf>
3. <https://pubs.usgs.gov/wsp/2220/report.pdf>
4. <https://indiawris.gov.in/wris/>
5. <http://www.cwc.gov.in/water-resources-information-system-wris>



Program:	B. Tech. Working Professionals (Civil Engineering)			Semester:	IV		
Course:	Hydrology and Water Resources Engineering Lab			Code:	WCI24PC18		
Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
Credit	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	2	-	50	-	-	50
Prior Knowledge of: Fundamentals of fluid mechanics and Statistics is essential							
Course Objectives: 1. To impart knowledge of rainfall data, measurement of infiltration and evaporation 2. To provide knowledge of catchment area and application of Q-GIS software in hydrology 3. To impart knowledge of runoff and storage capacity of reservoir.							
Course Outcomes: After learning the course, the students should be able to: 1. Demonstrate measurement of evaporation and infiltration and get awareness of hydraulic structures 2. Apply the principle of delineating catchment area on topo sheet and using Q-GIS software 3. Analyze rainfall data, runoff and determine reservoir capacity							
Detailed Syllabus							
Term work consists of a journal containing details of assignments and visit report (Any eight, site visit and assignment 4 & 12 is compulsory). 1. Analysis of rainfall data (double mass curve technique/missing rainfall data) 2. Measurement of / video demonstration of evaporation by pan evaporimeter 3. Measurement of / video demonstration of infiltration by infiltrometer 4. Marking catchment area on a topo-sheet and working out average annual precipitation and determining yield by various methods - Application of open-source Q-GIS software for delineation of catchment/watershed. 5. Application of Q-GIS software in groundwater assessment 6. Experiment on determination of groundwater flow 7. Determination of peak flood discharge in a basin using unit hydrograph technique 8. Frequency analysis (return period, hydrologic event) 9. Determination of storage capacity of a reservoir using mass curve of inflow and outflow 10. Site visit to meteorological station. 11. Application of HEC-RAS for Hydrologic routing. 12. Literature collection of types of dams (minimum 5 dams) or case study of failure of any hydraulic structure							
Textbooks: 1 Engineering Hydrology by K. Subramanya, 6 th Edition, Tata McGraw Hill, 2024 2. Hydrology and Water Resources Engineering, Vol-1, S. K. Garg, 27 th Edition, Khanna Publishers, New Delhi, 2023. 3. Irrigation Engineering and Hydraulic Structures, Vol.II, S.K. Garg, 38th Edition, Khanna Publishers, New Delhi, 2023.							
Reference Books: . Irrigation, Water Resources and Water Power Engineering, P. N. Modi, 8th Edition, Standard Book House, 2012. 2. Irrigation and Water power Engineering, Dr. Punmia and Dr. Pande, 16th Edition, Standard Publisher, 2016. 3. Groundwater Hydrology, Todd, 3th Edition, John Wiley & Sons, 2011. 4. Q-GIS for Hydrological Applications: Recipes for Catchment Hydrology and Water Management, Hans Van Der Kwast, Kurt Menke-Locate Press 5. Irrigation Engineering, H.M. Raghunath, 1st Edition, Wiley India Pvt. Ltd., 2016.							
e-Resources: 1. https://www.imdpune.gov.in/ 2. https://old.amu.ac.in/emp/studym/99994128.pdf 3. https://pubs.usgs.gov/wsp/2220/report.pdf 4. https://indiawris.gov.in/wris/ 5. http://www.cwc.gov.in/water-resources-information-system-wris							

Program:	B. Tech. Working Professionals (Civil Engineering)			Semester:		IV	
Course:	Dams and Hydraulic Structures (PEC II)			Code:		WCI24PE01	
Credits	Teaching Scheme (Hrs/Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA1	FA2	SA	Total
3	3	-	-	20	20	60	100
Prior Knowledge: Fluid Mechanics, Hydrology and Water Resources Engineering, Engineering Geology (Geological investigations for suitable site selection)							
Course Objectives: This course aims at enabling students, 1. To make students aware of various types of dams and objectives of dam instrumentation 2. To impart knowledge of stability analysis of various hydraulic structures 3. To make students aware of designing lined canal and related structures 4. To impart knowledge for learning characteristics of river training works							
Course Outcomes: After learning the course, the students should be able to: 1. Classify dams and recognize to apply various instruments for Dam Safety 2. Analyze Stability of Concrete Gravity Dam 3. Classify Spillway, and Design the Ogee spillway with Energy Dissipaters 4. Analyze stability of Earthen Dam and Design the weir on permeable foundation 5. Design lined canals applying different theories 6. Identify the applications of appropriate Cross Drainage and River Training Works							
Detailed Syllabus							
Unit	Description						Duration (H)
1	Introduction to dams and Dam Instrumentation : Introduction, Historical development of dams, Different terms related to dams, Selection of site for dam, Factors governing selection of type of dam, Classification of dams, Dams and social issues, Large dams verses small dams, Displacement and rehabilitation, climate change impacts on dams, objectives of Dam instrumentation, Types of measurements, Instrumentation data system, Working principles of instruments, Selection of Equipments, Different Instruments.						7
2	Gravity Dams : Introduction, Components of gravity dam, Conditions favoring gravity dams, Forces acting on gravity dam, Combinations of loading for design, Seismic analysis of dam, Effect of horizontal earthquake acceleration, Effect of vertical earthquake acceleration, Stress analysis in gravity dam (Only concept, no derivations), Vertical or normal stress , Principal stresses, Shear stress (only Concept and equations), Middle third rule, Modes of failure of gravity dam, Elementary profile of gravity dam, Concept of low and high gravity dams, Various Design methods of gravity dam						8
3	Spillway : Concept, classification of spillway, Components of spillway, design of ogee spillway, Shape of crest, Equations for spillway profile on upstream and downstream, energy dissipation below spillway, classification of energy dissipation devices, Correlation between jump height and tail water depth, spillway gates, classification of spillway crest gates, requirements of spillway gates maintenance of gates, inspection of gates.						7
4	Earth Dam: Introduction, Classification of earth dam, selection of type of earth dam, components of an earth dam, requirements for safe design of earth dam, hydraulic (seepage) analysis, forces acting on earth dam, stability analysis of an earth dam, analysis by Swedish slip circle method, failure of earth dam, seepage control in earth dams, causes of seepage, seepage control measures, structural stability analysis of homogeneous and zoned earth dam, Forces acting on earth dam, method of stability analysis of an earth dam, procedure of analysis by Swedish slip circle method, Fellenius method of locating centre of Critical Slip circle.						8
5	Canal, Canal Structure: Introduction, Classification of canals, components of canal , data required for canal design, Selection of canal alignment, canal Lining design of lined canal, canal falls: Introduction, necessity, selection of site for canal fall, types of falls, canal outlets- Introduction of canal outlet or module, canal escapes- Introduction of escapes, significance of canal escape, canal regulators.						7

6	C.D. Works and River Training Works: Necessity of cross drainage works, site selection classification drain over canal-siphon, super passage, canal over drain - aqueduct, siphon aqueduct, canal and drain water mixed in each other--level crossing, inlet and outlet, design considerations for cross drainage works, River training works: Introduction, classification of rivers, classification based on topography, regime, alignment, source, behavior of rivers, river training, objectives classification, purpose, river training structures.	8
Total		45
Text Books: 1. Engineering hydrology, K. Subramanya, Tata McGraw- Hill, New Delhi, (4th Edition), 2013 2. Irrigation, water resources and water power Engineering, P. N. Modi, Standard book House 11th edition (2020) 3. Punmia, B.C. and Pande, B.B.L. "Irrigation and water power engineering", Laxmi Publications Pvt. Ltd, New Delhi 17th edition, 2016		
Reference Books: 1. Design of Small Dams- United States Department of the Interior, Bureau of Reclamation revised Third edition 1987, Oxford and IBH Publishing Co. 2. Irrigation and Water Resources Engineering- Asawa G.L- New Age International (P) Ltd. Publishers, 2008. 3. Engineering for Dams- Creager W.P, Justin J.D, Hinds J -Wiley Eastern Pvt. Ltd., New Delhi, 1968 4. Irrigation Engineering and Hydraulic Structures- Garg S.K. - Khanna Publishers New Delhi, 34th revised 2017edition,		
e-Resources 1. https://www.bis.gov.in/standards/technical-department/national-building-code/ 2. https://mohua.gov.in/upload/uploadfiles/files/Chap-4.pdf3		

Program:	B. Tech. Working Professionals (Civil Engineering)				Semester:	IV	
Course:	Sustainable Engineering (PEC-II)				Code:	WCI24PE02	
Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
Credit	Lecture	Practical	Tutorial	FA1	FA2	SA	Total
3	3	-	-	20	20	60	100
Prior Knowledge of:							
1. Fundamentals of Environmental Studies							
2. Introduction to the basic concept of sustainability							
Course Objectives:							
1. To provide the fundamental concepts of sustainable engineering and the roles and responsibilities of engineers in developing a sustainable society.							
2. To build conceptual knowledge of the circular economy and sustainable material management.							
3. To provide conceptual knowledge of the ISO framework of Life Cycle Assessment and LCA tools.							
4. To impart knowledge on energy conservation, carbon footprints, and carbon credits.							
5. To be aware of policies and clean development mechanisms for green energy.							
6. To provide conceptual knowledge on risk assessment, climate change mitigation, and environmental impact assessment.							
Course Outcomes:							
After learning the course, the students should be able to:							
1. Apply sustainable engineering principles in real-world scenarios for developing a sustainable society.							
2. To identify sustainable engineering solutions for waste management or the circular economy.							
3. Assess the life cycle assessment and associated tools for the sustainability approach.							
4. Explain the methods and policies for energy conservation or resource recovery.							
5. Identify the rules and regulations for clean energy production and its mechanism.							
6. Identify the risk assessment and EIA tools and climate change mitigation.							
Detailed Syllabus							
Unit	Description						Duration (H)
1.	Introduction to Sustainable Engineering: Introduction to sustainability -definitions, principles, and sustainability indicators, social and economic aspects of sustainability, Links between industrial activities and sustainability issues, Sustainable handling of waste (case study), Sustainable Development Goals, roles and responsibilities of engineers in developing a sustainable society. Sustainable infrastructure (case study), sustainable buildings (case study), sustainable recovery of degraded areas (case study)						7
2.	Circular Economy: Approaches /Technology Development: Environmental design for sustainability, economics, environmental and social performance indicators, sustainable engineering design principles, sustainable material management, material flow analysis, circular Bio-Economy, biodegradable and reusable polymers, Circular economy of construction material (case study), Impact of circular economy adoption on global sustainability (case study)						8
3.	Life Cycle Assessment: Life cycle analysis, methodology, ISO 14040:2006 for Life Cycle Assessment, benefits and drawbacks, life cycle inventory analysis (LCI) and impact assessment (LCIA), LCA tools (Sima Pro, Open LCA and The LCA Calculator), Case study to illustrate the LCA procedure and results.						7
4.	Energy Conservation and Environment: The significance of energy conservation and the environment, an overview of the global and Indian Energy scenarios, the environmental impact of energy conversion, its functions, policies, green energy, and sustainability, biofuels, and waste-to-energy systems (case study) Carbon footprint & carbon credits: introduction, carbon emission, carbon footprint, and carbon trading (case study)						8
5.	Green solutions: Importance, principles of cleaner production and its benefits, the role of industry, pollution prevention, and cleaner production awareness plan, waste audit, Government and institutes						8

	policies in cleaner production, clean development mechanisms, 5R: waste to wealth concept with a case study. Sustainable materials for reduction of carbon emission (case study), case studies on sustainable energies, green buildings, sustainable infrastructure, waste recycling and material conservation, and sustainable environmental remediation.	
6.	Risk Assessment and Environmental Impact Assessment: Introduction to Environmental Risk Assessment, Environmental Impact Assessment (EIA) Process: concept and objectives, stages of EIA, EIA methodologies, Identifying potential environmental hazards from a project (case study), Exposure assessment techniques (monitoring, modeling, sampling), Environmental Impact Areas, Climate change mitigation and management plans (case study)	7
Total		45
Text Books:		
1. Sustainable Engineering: Principles and Practice, Bhavik R. Bakshi, Cambridge University Press (2019) 2. Sustainable Engineering, Dr. Srinivas Vasam, Dr. K. Jagannadha Rao, S.K. Kataria & Sons, S.K. Kataria & Sons, 1st Edition (2021) 3. Introduction To Sustainable Engineering, Rag R. L. Remesh Lekshmi Dinachandran, PHI, (2016) 4. Sustainable and Resilient Engineering: Drivers, Metrics, Tools, and Applications, Reddy, K. R., Cameselle, C., & Adams, J. A. (2025), 2nd Edition, ISBN: 978-1-394-26768-2		
Reference Books:		
1. Engineering for Sustainability, Jonker Gerald, Elsevier Science & Technology 1st Edition (2012) 2. Cradle to Cradle: Remaking the Way We Make Things, William McDonough, North Point Press, (2002) 3. Circular Economy and Sustainability, Volume 1: Management and Policy, Alexandros Stefanakis, Ioannis Nikolaou, Elsevier, (2021)		
e-Resources:		
1. https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview 2. https://www.rit.edu/sustainabilityinstitute/blog/what-life-cycle-assessment-lca 3. https://link.springer.com/book/10.1007/978-3-319-56475-3#toc 4. https://archive.nptel.ac.in/courses/105/105/105105157/ 5. https://www.coursera.org/learn/global-sustainable-development		

Program:	B. Tech. Working Professionals (Civil Engineering)			Semester:	IV		
Course:	Building Services & Maintenance (OEC-II)			Code:	WCI24OE01		
Teaching Scheme (Hrs./Week)				Evaluation Scheme and Marks			
Credit	Lecture	Tutorial	Hours	FA1	FA2	SA	Total
2	2	-	2	10	10	30	50
Prior Knowledge of: Building Planning and Construction							
Course Objectives: This course aims at enabling students, 1. To impart knowledge about the building services 2. To examine the purpose and type of building maintenance.							
Course Outcomes: After learning the course, the students should be able to: 1. Understand different building services provisions. 2. Interpret the fundamental concepts relevant to functional requirements of building. 3. Relate the knowledge of Acoustic and Fire Protection. 4. Choose diverse maintenance methodologies applicable to building and infrastructure services.							
Detailed Syllabus							
Unit	Description						Duration (H)
1.	Introduction to Building Services: Definitions, Objective and uses of services, different types of building, Classification of based on Occupancy, FSI, Carpet area, built-up area, Standard of Accommodation, Classification of building services, Types of services and selection of appropriate services for given project, case studies.						07
2.	Escalator and Plumbing- Classification of different types of escalators, Lift codes and Rules, Design Features of Escalator, Plumbing- Common Sanitary Fixtures, Layout of Sanitary Fixtures, Water Pipe Sizing in Buildings, Building Services Detailing, Rain Water Harvesting, Sanitation in buildings.						08
3.	Acoustics and Ventilation- Material properties, acoustical design of assembly halls and buildings, noise and its control, measuring equipment, Ventilation- Ventilation systems, health and comfort ventilation, Fire protection and National Building Codes 2016- requirements, equipment and their applications, security systems.						08
4.	Building Maintenance: Role of maintenance in durability and serviceability of structures, Economic aspects of maintenance, Different types of maintenance and audits process. Infrastructures services: Different types of structures, infrastructure services, case studies.						07
						Total	30
Text Books: 1. Building Construction Dr. B. C. Punmia Laxmi Publications (P) Ltd., New Delhi 2. Building Construction P. C. Varghese PHI Learning (P) Ltd., New Delhi 3. Building repair and Maintenance Management P. S. Gahlot CBS Publishers & Distribution(P) Ltd.							

Reference Books:

1. Building Science & Planning by S.V. Deodhar, Khanna Publishers.
2. Design and Practical Hand Book on Plumbing by C.R Mohan, VivekAnand, Standard Publishers Distributors.
3. Hand book of Designing and Installation of Services in High Rise Building Complexes, by V.K. Jain, Khanna Publication



Program:	B. Tech. Working Professionals (Civil Engineering)			Semester:	IV		
Course:	Structural Health Monitoring & Audit (OEC-II)			Code:	WCI24OE02		
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Tutorial	Hours	FA1	FA2	SA	Total
2	2	-	2	10	10	30	50
Prior Knowledge of:							
Basic understanding of construction materials and structures Fundamentals of concrete technology (desirable)							
Course Objectives:							
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Program:	B. Tech. Working Professionals (Civil Engineering)			Semester:	IV		
Course:	Structural Analysis & Design of Buildings using Software (STAAD.Pro)			Code:	WCI24VS02		
Credit	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	PR	TW	OR	Total
2	-	4	-	-	50	-	50
Prior Knowledge of: Basic understanding of construction materials and structures Fundamentals of concrete technology (desirable)							
Course Objectives: </							

17. Create simple 3D frame
18. Assign floor loads
19. Model single-storey building
20. Analyze 3D structure

Section 5: Design Basics (5 Assignments)

21. Introduction to RCC design
22. RCC beam design
23. RCC column design
24. Introduction to steel design
25. Steel member design

Section 6: Mini Project (5 Assignments)

26. Model G+1 building
27. Assign loads and combinations
28. Perform analysis
29. Design structural members
30. Prepare report and presentation

Text Books:

1. Bentley Systems, *STAAD.Pro Technical Reference Manual* (Latest Version).
2. S. S. Bhavikatti, *Structural Analysis*, Vikas Publishing House.
3. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, *Theory of Structures*, Laxmi Publications.
4. Bansal, *Design of Steel Structures*, Laxmi Publications.
5. B. C. Punmia, Ashok Kumar Jain, Arun Kumar Jain, *Reinforced Concrete Structures*, Laxmi Publications.

Reference Books:

1. Pillai & Menon, *Reinforced Concrete Design*, McGraw Hill.
2. Duggal, S. K., *Limit State Design of Steel Structures*, McGraw Hill.
3. Hibbeler, R. C., *Structural Analysis*, Pearson.

e-Resources:

- **Bentley STAAD.Pro Official Tutorials and Documentation**
- **NPTEL Courses on Structural Analysis and Design**
- **SWAYAM Online Courses (Civil Engineering Domain)**
- **IS Codes (BIS): IS 456, IS 800, IS 875, IS 1893**

Vision and Mission of the Civil Engineering Department



To establish as a premier civil engineering department in Maharashtra in the coming five years by providing quality education, fostering innovation with ethical values to serve the society.

येत्या पाच वर्षांत महाराष्ट्रात एक प्रमुख स्थापत्य अभियांत्रिकी विभाग म्हणून स्थापन करणे, दर्जेदार शिक्षण देऊन, समाजाची सेवा करण्यासाठी नैतिक मूल्यांसह नाविन्यपूर्णतेला चालना देणे.



1. Fostering value-based education to achieve academic excellence with the right attitude and professional ethics.
१. योग्य दृष्टिकोन आणि व्यावसायिक नीतिमत्तेसह शैक्षणिक उत्कृष्टता प्राप्त करण्यासाठी मूल्यांवर आधारित शिक्षणाला चालना देणे.
२. Inculcating a culture of research and innovation, with an aim of serving society in a sustainable manner.
2. शाश्वत पद्धतीने समाजाची सेवा करण्याच्या उद्देशाने संशोधन आणि नवोपक्रमाची संस्कृती रुजवणे.
3. Developing skilled civil engineers with an ability to provide solutions to meet national and global Challenges in accordance with the needs of the society.
3. राष्ट्रीय आणि जागतिक स्तरावर उपाययोजना प्रदान करण्याची क्षमता असलेले कुशल सिव्हिल अभियंते विकसित करणे.

Program Educational Objectives

- 1. To impart sound academic fundamentals among the students to formulate, analyze and solve civil engineering problems.**
- 2. To develop student's ability to adopt and apply recent trends in Civil Engineering.**
- 3. To prepare students for the challenging needs of the civil engineering profession and higher academic pursuits.**

Program Specific Outcomes

PSO1: Graduates in Civil Engineering will demonstrate proficiency in practical applications for quality construction work in the domain of Structural Engineering, Water Resources-Environment Engineering, Geotechnical-Transport and Construction Management.

PSO2: A Graduate in Civil Engineering equipped with the necessary skills and technical knowledge, can become an entrepreneur in the field, capable of identifying business opportunities, developing business plans, managing resources, designing and executing sustainable construction projects for infrastructural development.