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

B. Tech in Civil Engineering

for

Working Professionals

(Regulations 2024)

Effective from Academic Year 2025-26

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 an 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

Board of Studies - Department of Civil Engineering

Sr. No.	Name of the Course	Course Code	Page Number	Signature and stamp of BoS Chairman
1.	Engineering Geology	WCI21ES01	09	
2.	Fluid Mechanics	WCI21PC01	11	
3.	Fluid Mechanics Lab	WCI21PC02	13	
4.	Building Planning and Construction	WCI21PC03	14	
5.	Building Planning and Construction Lab	WCI21PC04	16	
6.	Strength of Materials	WCI21PC05	17	
7.	Soil Mechanics	WCI22PC05	22	
8.	Soil Mechanics Lab	WCI22PC06	24	
9.	Concrete Technology	WCI22PC07	25	
10.	Concrete Technology Lab	WCI22PC08	27	
11.	Structural Analysis-I	WCI22PC09	29	
12.	Elements of Earthquake Engineering	WCI22PE01	31	

Chairman
BoS, Civil Engineering
PCET's, Pimpri Chinchwad College of Engineering
Sector No. 26, Pradhikaran, Nigdi, Pune-44

Board of Studies - Department of Applied Science and Humanities

Sr. No.	Name of the Course	Course Code	Page number	Signature and stamp of BoS Chairman
1.	Computational Mathematics	WCI21BS01	07	
2.	Life Skills 1	WCI21CC01	19	
3.	Indian Knowledge System	WCI21IK01	33	
4.	Life Skills 2	WCI21CC02	35	

Chairman
BoS, Applied Sciences & Humanities
PCET's, Pimpri Chinchwad College of Engineering
Sector No. 26, Pradhikaran, Nigdi, Pune-44

Approved by Academic Council:

PCET's Pimpri Chinchwad College of Engineering ★ An Autonomous Institute ★ Nigdi, Pune-44

Director
PCET's, Pimpri Chinchwad College of Engineering
Sector No. 26, Pradhikaran, Nigdi, Pune-44

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	22	34	28.3
4	Programme Elective Course	6	14	11.7
5	Multidisciplinary Minor	6	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	2	2	1.7
10	Indian Knowledge System	1	2	1.7
11	Value Education Course	2	4	3.3
12	Experiential Learning Courses	5	30	25.0
13	Liberal Learning Courses	2	3	2.5
	Total	**55**	**120**	**100.0**

SEMESTER-WISE COURSE DISTRIBUTION

Course Distribution: Semester Wise										
Sr. No.	Type of Course	No. of Courses / Semester								Total
		1	2	3	4	5	6	7	8	
1	Basic Science Course	1								1
2	Engineering Science Course	1								1
3	Programme Core Course	5	5	4	4	2	2			22
4	Programme Elective Course		1	1	2	2				6
5	Multidisciplinary Minor			1	1	1	1	2		6
6	Open Elective			1	1	1				3
7	Vocational and Skill Enhancement Course			1		1	1			3
8	Ability Enhancement Course								1	1
9	Entrepreneurship/Economics/Management Course				1			1		2
10	Indian Knowledge System		1							1
11	Value Education Course							2		2
12	Experiential Learning Courses						2	2	1	5
13	Liberal Learning Courses	1	1							2
Total		**8**	**8**	**8**	**9**	**7**	**6**	**7**	**2**	**55**

SEMESTER-WISE CREDIT DISTRIBUTION

Credit Distribution: Semester Wise										
Sr. No.	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	8	6	6	3	3			34
4	Programme Elective Course		3	3	4	4				14
5	Multidisciplinary Minor			2	2	2	2	3		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	1							3
Total		**16**	**14**	**15**	**16**	**13**	**14**	**16**	**16**	**120**

Curriculum Structure
First Year B. Tech.
Civil Engineering
Semester I and II

CURRICULUM STRUCTURE

First Year B. Tech. (Civil Engineering) (Regulations 2024) Working Professionals Semester – I
(With effect from Academic Year 2025-26)

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					
WCI21BS01	BSC	Computational Mathematics	3	-	-	3	3	-	-	3	20	20	60	-	-	-	100
WCI21ES01	ESC	Engineering Geology	3	-	-	3	3	-	-	3	20	20	40	-	-	-	80
WCI21PC01	PCC	Fluid Mechanics	2	-	-	2	2	-	-	3	10	10	30	-	-		50
WCI21PC02	PCC	Fluid Mechanics Lab	-	1	-	1	-	2	-	3	-	-	-	50	-	25	75
WCI21PC03	PCC	Building Planning and Construction	2	-	-	2	2	-	-	3	10	10	30	-	-		50
WCI21PC04	PCC	Building Planning and Construction Lab	-	1	-	1	-	2	-	3	-	-	-	50	-	25	75
WCI21PC05	PCC	Strength of Materials	2	-	-	2	2	-	-	3	10	10	30	-	-		50
WCI21CC01	LLC	Life skills 1	-	2	-	2	-	4	-	4	-	-	-	100	-	-	100
	Total		**12**	**4**	**-**	**16**	**12**	**8**	**-**	**25**	**70**	**70**	**190**	**200**	**-**	**50**	**580**

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

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CURRICULUM STRUCTURE

First Year B. Tech. (Civil Engineering) (Regulations 2024) Working Professionals Semester – II
(With effect from Academic Year 2025-26)

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					
WCI22PC05	PCC	Soil Mechanics	2	-	-	2	2		-	2	10	10	30	-	-	-	50
WCI22PC06	PCC	Soil Mechanics Lab		1		1		2	-	2	-	-	-	50	-	25	75
WCI22PC07	PCC	Concrete Technology	2	-	-	2	2		-	2	10	10	30		-	-	50
WCI22PC08	PCC	Concrete Technology Lab		2		2		2	-	2	-	-	-	50	-	25	75
WCI22PC09	PCC	Structural Analysis-I	2	-	-	2	2		-	2	10	10	30	-	-	-	50
WCI22PC10	PCC	Elements of Earthquake Engineering	2	-	-	2	2		-	2	10	10	30	-	-	-	50
WCI22IK01	IKS	Indian Knowledge System	2	-	-	2	2		-	2	10	10	30	-	-	-	50
WCI22CC02	LLC	Life skills 2	-	1	-	1	-	4	-	2	-	-	-	50	-	-	50
	Total		**10**	**4**	**-**	**14**	**10**	**8**	**-**	**16**	**50**	**50**	**150**	**150**	**-**	**50**	**450**

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

Curriculum
Semester I
First Year B. Tech.
Civil Engineering

Program:	B. Tech. (Working Professionals)			Semester:		I	
Course:	Computational Mathematics			Code:		WCI21BS01	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	Formative Assessment-I	Formative Assessment-II	Summative Assessment	Total
3	-		3	20	20	60	100

Prior knowledge: Basic Mathematical Calculations

Course Objectives:

After completion of the course, students will have adequate background, conceptual clarity and knowledge of mathematical principles related to

1. Present, analyze and interpret data.
2. Statistical techniques, Probability theory, and hypothesis techniques.
3. Numerical techniques to approximate solutions for algebraic and transcendental equations, interpolation, integration and ordinary differential equations.

Course Outcomes:

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

1. **Analyze** a set of data using standard procedure of statistical modelling and estimate the outcomes.
2. **Evaluate** Correlation, regression coefficients for the given data.
3. **Analyze** the data using probability theory and distributions.
4. **Make predictions** for the numerical data using hypothesis testing.
5. **Solve** Algebraic, Transcendental Equations and interpolation.
6. **Compute** approximate solution for integration and ordinary differential equations using numerical methods.

Detailed Syllabus:

Unit	Description	Duration (Hrs)
1.	**Descriptive Statistic** Measures of central tendency: Mean, Mode, Median, and Measures of Variability: Standard Deviation, Variance, Quartiles, and Interquartile Range, Coefficient of variation, Moments, Skewness and Kurtosis.	7
2.	**Regression Analysis** Coefficient of correlation, rank correlation, Standard error of estimation, Regression Analysis, application of regression analysis for demand forecasting.	7
3.	**Probability distribution** Probability, Discrete & Continuous random variable, Theorems on Probability, Bayes Theorem, Mathematical Expectation, Probability density function, Probability distributions: Binomial, Poisson and Normal distributions.	8
4.	**Hypothesis testing** Sampling Distribution, Hypothesis testing, Types of errors, level of significance, Critical value (p-test), Chi-Square test, z test, t-test, ANOVA, Application of hypothesis testing to Design Optimization.	8
5.	**Numerical Methods-I** **Algebraic, Transcendental Equations:** Introduction, The Bisection Method, The Method of False Position, Newton-Raphson Method. **Interpolation:** Finite Differences, Newton's and Lagrange's interpolation formula	7
6.	**Numerical Methods-II** **Numerical Integration:** Trapezoidal and Simpson's rule	8

	Ordinary differential equations: Euler's, Modified Euler's and Runge-Kutta fourth order methods	
	Total	**45**

Text Books:

1. Montgomery and Runger, "Applied Statistics and Probability for Engineers", Wiley, India, 6 Edition, ISBN: 9788126562947
2. R. Johnson, "Probability and Statistics for Engineers", Prentice India Ltd, 8 Edition, ISBN 13:978-8120342132
3. S.S. Sastry, "Introductory Methods of Numerical Analysis", PHI learning Pvt Ltd, 5th Edition, ISBN 10: 9788120345928

Reference Books

1. P. Newbold, W. Carlson, B. Thorne, "Statistics for Business and Economics", Pearson India, 6 Edition, ISBN 9788131719275
2. S. P. Gupta and M. P. Gupta, "Business Statistics", Sultan Chand & sons, 19 Edition, ISBN 13:978-9351610120.
3. Walpole, R. Myers and S. Myers "Probability and Statistics for Engineers and Scientists", Pearson Education India, 9 Edition, ISBN 13:9780321629111
4. S.P.Gupta, "Statistical Methods", Papperbook publication, 43 edition, ISBN: 9788180549892, 8180549895
5. S.R.K. Iyengar, Rajendra K. Jain, "Advanced Engineering Mathematics", Alpha Science International, Ltd,4 Edition, ISBN 13: 9781842658468

e-sources:

1. **NPTEL Course lectures links:**
   https://nptel.ac.in/courses/111/105/111105090/ (Probability)
   https://nptel.ac.in/courses/111/105/111105077/ (Statistics)
   https://nptel.ac.in/courses/127/106/127106019/ (Methods of root finding)
2. **Coursera Corse**
   https://www.coursera.org/learn/probability-statistics (Statistics & Probability)
3. **V-lab (IIT-Bombay) link**: http://vlabs.iitb.ac.in/vlabs-dev/labs/numerical_lab/labs/explist.php

Program:	B. Tech. (Civil Engineering)				Semester:	I	
Course:	Engineering Geology				Code:	WCI21ES01	
Teaching Scheme				Evaluation Scheme			
Lecture	Tutorial	Credit	Hours	FA1	FA2	SA	Total
3	-	3	3	20	20	60	100

Prior Knowledge: Earth Science. (Physical Geography is essential)

Course Objectives:

1. To impart the knowledge of the physical properties of minerals, various rocks types, their inherent characteristics andits applications to civil engineering.
2. To introduce plate tectonics and comprehend structural geology applied to civil engineering projects.
3. To provide knowledge of geomorphic features formed by fluvial and marine processes, preliminary geologicalexploration.
4. To introduce the concepts of site selection of dams, reservoir and tunnels.
5. To understand the significance of geological factors in the planning and construction of dams and reservoirs.
6. To introduce the geological mechanisms involved in Tunnel constructions.

Course Outcomes:

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

1. Classify various rocks and minerals with their uses in civil engineering
2. Interpret the effect of plate tectonics and identify geological structures
3. Explain the geomorphology and process of subsurface geological investigations
4. Comprehend the importance of geological nature of the site, precautions and treatments to improve the siteconditions for dams, reservoirs and tunnels.
5. Explain the importance of geological factors in dam and reservoir construction.
6. Perform preliminary geological investigations for tunneling projects.

Detailed Syllabus:

Unit	Description	Duration (H)
1.	**Mineralogy, Petrology and General Geology** a) Scope and sub divisions of geology. b) Introduction to mineralogy: physical properties of minerals, classification of minerals. c) Introduction to petrology: rock cycle **Igneous Petrology**: plutonic, hypabyssal and volcanic rocks, mineral composition, structure, texture and classification of igneous rocks, commonly observed igneous rocks. **Sedimentary Petrology:** rock weathering, origin, mineral composition, genetic classification of secondary rocks, grain size classification and textures, sedimentary structures, digenesis process, commonly observed sedimentary rocks. **Metamorphic Petrology:** metamorphism, agents, types of metamorphism, texture and structures, mineral composition, commonly observed metamorphic rocks.	08
2.	**Plate Tectonics and Structural Geology** a) Introduction to plate tectonics theory and mountain building activity. b) Structural geology: out crop, dip and strike, conformable series, unconformity and overlap,faults and their types, folds and their types, inliers and outliers.	07
3.	**Geological Structures** Structures: structural features resulted due to igneous intrusions, concordant and discordant igneous intrusions, joints and their types.	08
4.	**Geomorphology and Preliminary Geological Studies** a) Geomorphology: geological action of river, coastal geology. b) Preliminary geological explorations: reconnaissance survey, desk study, surface and subsurfacegeological investigation: methods, significance and limitations, RQD, core recovery c) Techniques of correlation for surface and subsurface exploration for landforms, geology andgroundwater studies	07

5.	**Role of Engineering Geology in Reservoirs and Dams** a) Geology of dams & reservoir: strength, stability and water tightness of foundation rocks, influence of geological conditions on the choice and type of dams, preliminary geological work on dams and reservoir sites, precautions to be taken to counteract unsuitable conditions and their relevant treatments with case studies.	08
6.	**Role of Engineering Geology in Tunneling.** Tunneling: Preliminary geological investigations, important geological considerations while choosing alignment, difficulties during tunneling as encountered due to various geological conditions.	07
	Total	**45**

Text Books:

1. Text Book of Engineering Geology by R. B. Gupte, P.V.G. Publications, Pune, 2001.
2. A Text Book of Engineering Geology by N. Chenna Kesavulu, McMillan India Ltd, 2010.
3. Principles of Engineering Geology by D. Venkat Reddy, Vikas Publishers, 2010.
4. Engineering and General Geology by Parbin Singh, S.K. Kataria & Sons, 2013.
5. Principles of Engineering Geology by K.M. Bangar, Standard Publishers, 2020.
6. Structural Geology by Marland P. Billings, Pearson Education, 3rd Edition, 2016.

Reference Books:

1. Physical Geology by P. K. Mukherjee, World Press, 2013.
2. Physical Geology by Arthur Holmes, ELBS Publication, 2016.
3. Principles of Engineering Geology and Geotechniques by D. P. Krynine & W. R. Judd. CBS Publishers, New Delhi, 2018.
4. Engineering Geology by F. G. H Blyth and De Frietus, Reed Elsevier India Ltd, 7th Edition, 1984.

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Program:	B. Tech. (Civil Engineering)			Semester:		I	
Course:	Fluid Mechanics			Code:		WCI21PC01	
Credits	Teaching Scheme (Hrs/Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	10	10	30	50

Prior Knowledge:

1. Knowledge of physics, engineering mechanics
2. Knowledge of engineering mathematics

Course Objectives: This course aims at enabling students,

1. To impart knowledge of fluid properties, dimensional analysis using Buckingham Π theorem, fluid statics, buoyancy and floatation
2. To build the concept of fluid kinematics and fluid dynamics with reference to modified Bernoulli's equation, laminar and turbulent flow through pipes and flow around submerged bodies
3. To get acquainted with open channel flow

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

1. Calculate fluid properties and carry out dimensional analysis using Buckingham theorem
2. Solve problems involving fluid statics, buoyancy and floatation
3. Explain fluid kinematics, fluid dynamics and flow around submerged bodies
4. Solve problems on open channel flow

Detailed Syllabus

Unit	Description	Duration (H)
1	**Properties of Fluids:** Definition of fluid and fluid mechanics, examples and practical applications involving fluids at rest and in motion, classification of fluids, physical properties of fluids, Newton's law of viscosity. **Dimensional Analysis and Model studies:** Dimensions of physical quantities, Dimensional homogeneity, dimensional analysis using Buckingham's π theorem method, geometric, kinematic and dynamic similarity, important dimensionless numbers and their significance. Model laws, scale effect, distorted and undistorted models.	07
2	**Fluid Statics:** Basic equation of hydrostatics, concept of pressure, pressure head, Pascal's law, measurement of pressure, principle of manometers for balancing liquid column, dead weight, pressure measuring devices, pressure transducers and their types, practical applications. **Buoyancy and Floatation:** Principle of floatation and buoyancy, stability of floating and submerged bodies.	07
3	**Fluid kinematics and fluid dynamics:** Classification of flows, continuity equation, Euler's equation of motion along a stream line, Bernoulli's equation, applications of Bernoulli's equation, Laminar and turbulent flow through pipe, concept of HGL and TEL, major and minor losses in pipe flow, Water hammer phenomenon, Surge Tank and its functions. **Fluid flow around submerged objects:** Definitions of drag and lift, types of drag, drag and lift on cylinder and Aerofoil, introduction to Magnus effect**,** polar diagram, concept of boundary layer theory, methods to control separation.	08

4	**Flow through open channel** Classification of flow, concept of uniform flow, hydraulically efficient trapezoidal channel cross sections, concept of specific energy, and specific energy curve, hydraulic jump; Location and examples of hydraulic jump, application of momentum equation to hydraulic jump, energy dissipation in hydraulic jump, basics of weirs and notches. **Gradually Varied Flow in Open Channels-**Definition and types of non-uniform flow; introduction to Gradually Varied Flow (GVF) and Rapidly Varied Flow (RVF); Basic Assumptions of GVF.	08
	Total	**30**

Text Books:

1.Hydraulics and Fluid Mechanics including Hydraulic Machine by Dr P. N. Modi & S. M. Seth 21st Edition, Standard book house publication, 2017.

2. Flow in Open Channels by K Subramanya, 5th Edition, Pub: Tata McGraw Hill, 2019.

Reference Books:

1. Fluid Mechanics by R. J. Garde and A.J. Mirajgaonkar Pub : SCITECH Publications(India)Pvt.Ltd, Chennai,2010
2. Fluid Mechanics by Streeter Wylie and Bedford – Pub : McGraw Hill International ,New Delhi,2017
3. Open Channel Hydraulics by Ven Tee Chow,Pub : McGraw Hill Book Company , Koga,2009
4. A Text Book of Fluid Mechanics and Hydraulic Machines,by Dr. R.K.Rajput,Pub S Chand and Co.Ltd,2015
5.Fluid Mechanics,Fundamentals and applications by Yunus A. Cengel and John M.Cimbala,Mc Graw Hill International ,2019
6. Fluid Mechanics and its Applications,Vijay Gupta,Santosh K Gupta,New Age International pvt.Ltd,2012

Hand books:

1. http://www.engmatl.com/home/viewdownload/10-engineering-handbooks-pocketbooks/123- fluid-mechanics-handbook
2. http://www.springer.com/materials/mechanics/book/978-3-540-25141-5.

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Program:	B. Tech. (Civil Engineering)			Semester:			I
Course:	Fluid Mechanics Lab			Code:			WCI21PC02
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	-	02	-	50	25	-	75

Prior Knowledge:

1. Knowledge of fundamentals of physics is essential

Course Objectives:

1. To impart knowledge of properties of fluid, pressure measurement and buoyancy
2. To provide Knowledge of fluid kinematics, fluid dynamics and fluid flow around submerged bodies
3. To impart knowledge of open channel flow.

Course Outcomes:

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

1. Demonstrate viscosity, pressure, discharge measurement and seepage below weir.
2. Apply basic principle of stability of floating bodies, Bernoulli's theorem, Darcy-Weisbach friction factor
3. Analyze flow around circular cylinder or Aerofoil, velocity distribution and uniform flow in open channel

Detailed Syllabus

A) List of Laboratory Experiments: (Any ***eight*** out of the following)

1. Measurement of viscosity of fluid by Redwood viscometer
2. Measurement of pressure using different pressure measuring devices (including Transducers /state of arts digital instruments also).
3. Determination of stability of floating bodies using ship model
4. Experimental verification of Bernoulli's theorem with reference to loss of energy
5. Calibration of venturimeter / orifice meter.
6. Determination of minor loss in a pipe system /Darcy- Weisbach friction factor (f) for a given pipe and study of variation with Reynolds number (Re)
7. Flow around a circular cylinder/Aerofoil
8 Study of uniform flow formulae for open channel
9. Velocity distribution in open Channel Flow.
10. Drawing flow net by Electrical Analogy for flow below Weir (with and without sheet pile)

B) Assignments: (Any ***two*** out of the following)

1. Applications of WaterGEMS/EPANET in pipe flow analysis
2. Study of Specific Energy Diagram and plotting it for given problem statement
3. Developing a demo model related to any fluid flow phenomenon (physical model/soft model)

C) Site visit: Report on Site visit to hydropower plant or any one of the Research Institute (CWPRS, WALMI, NWA etc.)

Reference Books:

1. Fluid Mechanics by R.J.Garde and A. J. Mirajgaonkar Pub : SCITECH Publications(India)Pvt.Ltd, Chennai,2010
2. Fluid Mechanics by Streeter Wylie and Bedford – Pub : McGraw Hill International ,New Delhi,2017
3. Open Channel Hydraulics by Ven Tee Chow,Pub : McGraw Hill Book Company , Koga,2009
4. A Text Book of Fluid Mechanics and Hydraulic Machines, by Dr. R.K.Rajput,Pub S Chand and Co.Ltd,2015
5. Fluid Mechanics, Fundamentals and applications by Yunus A. Cengel and John M.Cimbala, Mc Graw Hill International , 2019
6. Fluid Mechanics and its Applications, Vijay Gupta, Santosh K Gupta, New Age International pvt.Ltd,2012

Hand books:

1. **http://www.engmatl.com/home/viewdownload/10-engineering-handbooks-pocketbooks/123- fluid-mechanics-handbook**
2. **http://www.springer.com/materials/mechanics/book/978-3-540-25141-5**

Program:	B. Tech. (Civil Engineering)			Semester:		I	
Course:	Building Planning and Construction			Code:		WCI21PC03	
Credits	Teaching Scheme (hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	--	--	10	10	30	50

Prior Knowledge:

1. Knowledge of fundamentals of various aspects of civil engineering like components of building, Bye laws, different materials used in construction is essential.

Course Objectives: This course aims at enabling students,

1. To Plan residential and public building according to the norms.
2. To suggest right construction material and process of building construction.

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

1. Explain the process of plan and design of building
2. Explain the material and process of building construction.

Detailed Syllabus

Unit	Description	Duration (H)
1	**Building Planning:** Principles of Building & Architectural Planning, Importance of building drawing, Types of building drawings, concept of line plan, presentation drawings, developed plan, sanction plan- elevation, section, selection of scales for various drawings, abbreviations and symbols as per IS 962. Building by-laws- set back distance, open spaces, floor area ratio (F.A.R.), building line, control line, height regulations, standard room sizes, minimum ventilation, and parking space requirement. Introduction to UDCPR.	8
2	**Architectural planning of buildings**: Functional requirements and dimensions of various units of residential and public buildings. Development of plan, elevation, sectional elevation, and schedule of opening from the given line plan of residential buildings. Prepare water supply, sanitary and electrical layout for residential buildings. Planning of public buildings like primary health center, school building, college canteen, office building. NBC-2016 Guidelines for the planning.	7
3	**Masonry construction & Form work:** Building components and their basic construction requirements. Foundation- relevance with geotechnical investigation. Masonry- its type, construction procedure and supervision. Scaffolding requirement and types. Recent trends in lightweight masonry, Form work and casting procedure for reinforced concrete columns, R.C.C. beams, R.C.C. slabs.	8
4	**Building Construction:** Various components of building, their functions, types and method of construction of - foundation, plinth, plinth filling, column, beam, slab/roof, flooring, lintel, arches, weather shed, waterproofing treatments, parapet wall, windows, doors, stairs, elevators, escalators etc. Design of dog legged stairs and quarter turn stairs. Process of construction of various building components. Reuse of C&D waste.	7
	Total	**30**

Text Books:

1. Building Materials by S.S. Bhavikatti, Vikas Publication House Private Ltd. First Edition (2014)
2. Building Materials by S.V. Deodhar, Khanna Publication
3. Building Construction by B.C. Punmia, Laxmi Publications.11th Edition (2016)
4. Building Materials by B.C. Punmia, Laxmi Publications.11th Edition (2016)
5. Building Materials by S. K. Duggal, New Age International Publishers. 5th Edition (2019)
6. Building Construction by S.C. Rangwala, Charotar Publications.33rd Edition (2016).
7. Building Construction by Bindra and Arora, DhanpatRai Publications.11th Edition (2010)
8. Building Drawings with an integrated Approach to Built-Environment by M. G. Shah, C. M. Kale and S. Y. Patki, New Delhi, Tata McGraw Hill.5th Edition (2017)

Reference Books:

1. The construction of buildings; seventh edition, Vol.1 & Vol.2 by R. Barry, Oxford: Blackwell Science.5th Edition (1999) ISBN-13
2. Building Materials Technology by Ruth T. Brantley & L. Reed Brantley, Tata McGraw Hill. (1995).
3. National Building Code (R 2016).
4. Building Design and construction by Frederick Merrit, Tata McGraw Hill.5th Edition (1994) Hand Book. 5. I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings, Revision-2 (R 2017)

e-Resources

1. https://www.bis.gov.in/standards/technical-department/national-building-code/
2. https://mohua.gov.in/upload/uploadfiles/files/Chap-4.pdf
3. https://mohua.gov.in/

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Program:	B. Tech. (Civil Engineering)			Semester:			I
Course:	Building Planning and Construction Lab			Code:			WCI21PC04
	Teaching Scheme (Hrs/Week)			Evaluation Scheme and Marks			
Credits	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	--	2	--	50	25	--	75

Prior Knowledge:
Knowledge of fundamentals of various aspects of civil engineering like components of building, Bye laws, different materials used in construction is essential is essential

Course Objectives:
1. To provide knowledge of planning of residential and commercial building.
2. To provide knowledge of material and processes adopted on the field for building construction.

Course Outcomes:
After learning the course, the students should be able to:
1. Plan and Prepare drawings of residential and public buildings.
2. Suggest suitable material and process for building construction.

Detailed Syllabus

Term work consists of a journal containing details of assignments and visit report.

1. Assignment: Drafting following sketches using CAD a) Types of Foundation b) Entrance Steps- Plan & Elevation c) Types of Arches
2. Draw the line plans of any one residential building and any two public buildings (Using AutoCAD)
3. Floor Plan/ Typical floor plan, elevation and section, area statement with construction notes, schedule of openings, site plan indicating water supply and drainage line of any type of building (with, make group of max. four students) (Using CAD)
4. Introduction to working drawings and selection of scale
5. Visit any commercial building and prepare a report based on the actual guidelines.
6. Report file:
   a) It shall consist of data used for the project, Planning considerations and line plans & Design calculations.
   b) The collection of documents is required to sanction the plan.
   c) Dimension standards of Residential building.
7. Conduct a market survey for different civil engineering materials with respect to application, cost and quality and prepare a report on the same. Also, collect brochures of building materials.
8. Site visit: the student shall visit the construction site and write a detailed report on the processes/ methods adopted for the construction of various building components like footings, staircase, slab, columns, beams, etc.

Reference Books:
1. Building Drawings with an integrated Approach to Build-Environment by M. G. Shah, C. M. Kale and S. Y. Patki, New Delhi, Tata McGraw Hill.5th Edition (5 th July 2017)
2. Auto CAD 2019 Fundamentals Part 1- Autodesk Authorized Publisher.
3. Engineering Graphics Essentials with AutoCAD 2019 Instruction – Kirstie Plantenberg.
4. Beginning Auto CAD 2020 Exercise Workbook – Cherly R. Shrock, Steve Heather.
5. Auto CAD 2018, 3D Modeling – Munir Hamad.

Program:	B. Tech. (Civil Engineering)			Semester:			I
Course:	Strength of Materials			Code:			WCI21PC05
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	CIE		SA	Total
				FA1	FA2		
02	02	NA	NA	10	10	30	50

Prior Knowledge:
Engineering Mathematics, Engineering Mechanics. (Derivative, integration, mathematical calculations, equilibrium conditions, types of supports and analysis of beams is essential)

Course Objectives: This course aims at enabling students,

1. To impart knowledge of stresses and strains for determinate structural members.
2. To build concept of shear force and bending moment diagram for determinate beams.
3. To provide knowledge of slope and deflection for determinate structural members.

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

1. Calculate different types of stresses, strains in determinate and indeterminate structures.
2. Develop shear force and bending moment diagram for determinate beams and calculate the torsional stresses in circular shaft.
3. Calculate shear & bending stresses and Principle Stresses & Strains.
4. Determine the slopes and deflection of determinate beams.

Detailed Syllabus

Unit	Description	Duration (H)
1	**Simple stresses and strains**: a) Stress and strain -linear, lateral, shear and volumetric, generalized Hooke's law. Elastic constants and their relationship for isotropic materials. b) Axial force diagram, stresses, strains and deformation in determinate and indeterminate homogeneous and composite bars under concentrated loads, self-weight and temperature changes.	8
2	**Shear force, bending moment diagram and torsion of circular shafts:** a) Concept and definition of shear force and bending moment. Beams under various types of loading, shear force and loading diagram from given bending moment diagram. b) Stresses, strains and deformation in determinate and indeterminate shafts of hollow and solidsections of homogenous and composite materials subjected to torsion.	8
3	**Stresses in beams due to shear & bending and Principal Stresses & Strains.** a) Shear stress distribution diagram for standard sections, maximum and average shear stress. Theory of pure bending, flexure formula, bending stress distribution diagram, moment ofresistance and section modulus b) Introduction to principal stresses and strains (member subjected to a Uniaxial Force System)	7
4	**Slope and deflection of determinate beams:** a) Double integration method (Macauley's method). b) Moment Area method, Conjugate beam method.	7
	Total	**30**

Text Books:

1. Mechanics of Structures Vol. I by S. B. Junnarkar and Dr. H. J. Shah, Charotar Publishing House Pvt Ltd., 23rd Edition, 2013.
2. Strength of Materials by R. Subramanian, Oxford University Press, 4th Edition, 2012 Strength of Materials by S. S. Ratan, Tata McGraw Hill.2nd Edition, 2011

Reference Books:

1. Elements of Strength of Materials by Timoshenko and Young, East-West Press Ltd. 5th Edition, 2013.
2. Strength of Materials by F.L. Singer and Andrew Pytel, Harper and Row Publication.
3. Mechanics of Materials by Beer and Johnston, McGraw Hill Publication. 7th Edition, 2017
4. Introduction to Mechanics of Solids by E.P. Popov, Prantice Hall Publication. 2nd Edition, 2011
5. Mechanics of Materials by Gere & Timoshenko, CBC publisher. 8th Edition, 2013
6. Elementary Structural Analysis by Norris, Wilbur and Utku, Tata McGraw Hill Publisher.
   Intermediate Structural Analysis by R. C. Hibbler, Pearson Education Publishers.

e-Resources

https://nptel.ac.in/courses/105/105/105105108/
https://nptel.ac.in/courses/112/107/112107146/

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Program: B. Tech. (Civil Engineering)						Semester: I	
Course: Life Skills 1						Code: WCI21CC01	
Teaching Scheme				Evaluation Scheme			
Lecture	Practical	Tutorial	Credit	TW	Practical	Oral	Total
-	4	-	2	100	-	-	100

Prior Knowledge: Nil

Course Objectives: This course aims at enabling students,

1) To equip them with essential skills and knowledge that complement their academic education, preparing them to excel not only as engineers but also as well-balanced individuals
2) To develop students' vital life skills that promotes personal growth, resilience, and success in their academic journey and beyond

Course Outcomes: After learning the course, the students will be able to:

1. Understand the true essence of happiness by being harmony with oneself.
2. Explore skills to get along with others to create and maintain healthy relationships.
3. Apply different ways of rational thinking.
4. Develop emotional intelligence.

Unit	Description	Duration (Hrs.)
1	**Happy You, Happy Life!** (i) Healthy Mind - Music Therapy, Yoga, Meditation, Happiness and Success. (ii) Self-Awareness - Know your personality, Develop yourSelf- Esteem, Johari Window, SWOT, Setting goals for yourself (SMART). (iii) Healthy Lifestyle - Nutrition, Significance of Physical Activity in Daily routine.	7
2	**Building Relationships** (i) People Skills - Networking, Developing Healthy Relationships, Collaboration, Reliability, Respectfulness, Open- Mindedness (ii) Effective Communication in Relationships-My Relationship Web, Relationship Recipe, Active Listening and Conflict Resolution (iii) Embracing Diversity: Respect for Different Perspectives and Cultures.	8
3	**The Reflective Engineer** (i) Critical Thinking - Fact or Fiction, Convergent & Divergent Thinking (ii) Creative Thinking - Imagination, Formulate and Articulate Ideas (iii) Perspective Thinking – Understanding others view Points, Respecting Others' Opinions (iv) Decision Making – Rational, Analytical & Ethical Solutions.	7
4	**You CAN DO IT…** (i) Managing Stress - Good Stress, Bad Stress, Anxiety (ii) Managing time - Planning, Prioritization, Delegation, Productivity and Positivity (iii) Managing Emotions – Self- Regulation, Self-Motivation, Empathy, Assertiveness, Anger Management (iv) Handling Peer Pressure- Types of Peer Pressure: Spoken Peer Pressure, Unspoken Peer Pressure, Direct Peer Pressure, Indirect Peer Pressure, Positive Peer Pressure, Negative Peer Pressure.	8
	Total	**30**

Reference Books

1) The 7 Habits of Highly Effective Teens" by Sean Covey Publisher: Simon & Schuster, 2017
2) How to Win Friends and Influence People" by Dale Carnegie Publisher: Simon & Schuster. 2020
3) Emotional Intelligence: Why It Can Matter More Than IQ" by Daniel Goleman Publisher: Bantam Books, 2021
4) Mindset: The New Psychology of Success" by Carol S. Dweck Publisher: Ballantine Books, 2019
5) The Power of Habit: Why We Do What We Do in Life and Business" by Charles Duhigg Publisher: Random House, 2016

Weblinks

1. Psychology Today (www.psychologytoday.com): Psychology Today publishes articles and insights from psychologists and mental health experts that can be useful for improving life skills and emotional intelligence.

2. Lifehack (www.lifehack.org): Lifehack shares practical tips, techniques, and advice on personal development, productivity, and life skills improvement.

3. Coursera (www.coursera.org): Coursera offers online courses on various life skills topics, often provided by universities and experts, to help individuals develop essential skills

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Curriculum
Semester II
First Year B. Tech.
Civil Engineering

Program:	B. Tech. (Civil Engineering)			Semester:	II		
Course:	Soil Mechanics			Code:	WCI22PC05		
Credits	Teaching Scheme (hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
02	02	--	--	10	10	30	50

Prior Knowledge:

1. Knowledge of fundamentals of fluid mechanics
2. Engineering Geology

Course Objectives:

1. To make aware of soil classification and provide the knowledge of methods for determination of index and engineering properties of soil.
2. To impart the knowledge of the soil-water interaction and the effects of static vs flowing water on soil strength.
3. To provide the knowledge of soil behavior under stress regime.

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

1. Explain index properties of soil, permeability concepts in seepage analysis.
2. Determine the compaction parameters, vertical stress, and its influence on soil behavior.
3. Determine shear strength parameters using various tests.
4. Calculate the lateral thrust due to backfill on retaining wall, factor of safety for slope stability.

Detailed Syllabus

Unit	Description	Duration (H)
1	**Index properties of soil and Soil water** a) Introduction to geotechnical engineering and its applications to civil engineering, three phase soil system, weight volume relationships, index properties of soil: methods of determination and their significance, IS and Unified soil classification systems. b) Permeability definition and necessity of its study, Darcy's law, factors affecting permeability, laboratory measurement of permeability: constant head method and falling head method, Seepage and seepage pressure, quick sand phenomenon, critical hydraulic gradient, flow net, properties and application.	08
2	**Compaction and Stress Distribution in soils** a) Introduction, comparison between compaction and consolidation, compaction tests- standard proctor test, modified proctor test, zero air void line, factors affecting compaction, effect of compaction on soil properties, field compaction methods and compaction equipment for different types of soil, placement water content, proctor needle in field compaction control. b) Boussinesq's theory with assumptions for point load and circular load (with numerical), pressure bulb and its significance, Westergaard's theory, equivalent point load method.	07
3	**Shear Strength of Soil** a) Mohr-Coulomb failure theory, effective stress principle- total stress, effective stress, pore water pressure, factors affecting shear strength. b) Measurement of shear strength- direct shear test, triaxial compression test, unconfined compression test, vane shear test, different drainage conditions for shear tests.	07
4	**Earth Pressure and Stability of Slopes** a) Earth Pressure: introduction, Rankine's state of plastic equilibrium in soils- active and passive states due to wall movement, earth Pressure at rest, Rankine's theory: earth pressure on retaining wall due to submerged backfill, backfill with uniform surcharge, backfill with sloping surface, Coulomb's wedge theory. b) Stability of slopes: classification of slopes and their modes of failure, Taylor 's stability number.	08
	Total	**30**

Text Books:

1. Soil Mechanics and Foundation Engineering by B. C. Punmia, Laxmi Publications, 16th Edition, 2017.
2. Geotechnical Engineering by Shashi K. Gulhati & Manoj Datta, Tata McGraw Hill, 2017.
3. Principles of Soil Mechanics and Foundation Engineering by V.N.S. Murthy, UBS Publishers, 2018.
4. Soil Mechanics and Foundation Engineering by K. R. Arora, Standard Publisher, 7th Edition, 2019.

Reference Books:

1. Geotechnical Engineering by C. Venkatramaiah, New Age International Publishers, 5th Edition, 2017.
2. Principles of Geotechnical Engineering by Braja M. Das, Cengage Learning, 8th Edition, 2020.
3. Geotechnical Engineering by P Purushothma Raj, Tata McGraw Hill, 2017.
4. Geotechnical Engineering by Principles & Practices by Donald. P. Coduto, Pearson Education, 2nd Edition, 2017.
5. Basic and Applied Soil Mechanics by Gopal Ranjan and A. S. R. Rao, Newage International, 3rd Edition, 2016.
6. Physical and Geotechnical Properties of Soils by Joseph E. Bowles, International Students Edition.

IS Codes: SP36 Compendium of Indian Standards on Soil Engineering, Part 1:1987 Laboratory Testing of soils for Civil Engineering Purposes

E-resource:

1. http://ascelibrary.org/page/books/s-gsp.
2. http://accessengineeringlibrary.com/browse/geotechnical-engineersportable-handbook-second **edition.**
3. http://nptel.ac.in/courses/105101084/
4. http://nptel.ac.in/courses/105106142/

Program:	B. Tech. (Civil Engineering)			Semester:			II
Course:	Soil Mechanics Lab			Code:			WCI22PC06
Credits	Teaching Scheme (hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
1	--	02	--	50	25	--	75

Course Objectives:

To make aware of soil classification and provide the knowledge of methods for determination of index and engineering properties of soil.

Course Outcomes:

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

1. Determine index properties of soil.
2. Determine engineering properties of soil.
3. Calculate shear strength parameters, earth pressure using graphical methods.

Detailed Syllabus

Lab Experiments

The term work shall consist of a journal giving details of 10 out of 12 of the following experiments. Assignments are compulsory.

1. Water content determination by two methods a) oven drying method, b) calcium carbide method
2. Specific gravity determination by pycnometer.
3. Sieve analysis, particle size determination and IS classification as per I.S. Codes.
4. Determination of consistency limits and their use in soil classification as per I.S. Codes.
5. Field density test by a) core cutter b) sand replacement
6. Determination of coefficient of permeability by a) constant head and b) variable head method.
7. Direct shear test.
8. Unconfined compression test.
9. Vane shear test.
10. Standard proctor test / Modified proctor test.
11. Differential free swell test.
12. Triaxial test

Assignments:

1. Solution of problems on shear strength parameters using graph.
2. Rehbann's and Culmann's graphical method for determination of earth pressure.
3. Flow net construction for sheet pile or earthen dam.

Text Books:

1. Soil Mechanics and Foundation Engineering by B. C. Punmia, Laxmi Publications, 16th Edition, 2017.
2. Geotechnical Engineering by Shashi K. Gulhati & Manoj Datta, Tata McGraw Hill, 2017.
3. Principles of Soil Mechanics and Foundation Engineering by V.N.S. Murthy, UBS Publishers, 2018.
4. Soil Mechanics and Foundation Engineering by K. R. Arora, Standard Publisher, 7th Edition, 2019.
5. Foundation Design Manual by N. V. Nayak, Dhanpat Rai Publications, 7th Edition, 2019.

Reference Books:

1. Geotechnical Engineering by C. Venkatramaiah, New Age International Publishers, 5th Edition, 2017.
2. Principles of Geotechnical Engineering by Braja M. Das, Cengage Learning, 8th Edition, 2020.
3. Geotechnical Engineering by P Purushothma Raj, Tata McGraw Hill, 2017.
4. Geotechnical Engineering by Principles & Practices by Donald. P. Coduto, Pearson Education, 2nd Edition,2017.
5. Basic and Applied Soil Mechanics by Gopal Ranjan and A. S. R. Rao, Newage International, 3rd Edition, 2016.
6. Physical and Geotechnical Properties of Soils by Joseph E. Bowles, International Students Edition.

IS Codes: SP36 Compendium of Indian Standards on Soil Engineering, Part 1:1987 Laboratory Testing of soils for Civil Engineering Purposes

e-Resources:

1. http://ascelibrary.org/page/books/s-gsp.
2. http://accessengineeringlibrary.com/browse/geotechnical-engineersportable-handbook-second edition.
3. http://nptel.ac.in/courses/105101084/
4. http://nptel.ac.in/courses/105106142/

Program:	B. Tech. (Civil Engineering)			Semester:			II
Course:	Concrete Technology			Code:			WCI22PC07
Credits	Teaching Scheme (hrs./Week)			Evaluation Scheme and Marks			
				FA		SA	Total
	Lecture	Practical	Tutorial	FA1	FA2		
02	02	--	--	10	10	30	50

Prior Knowledge:
Engineering geology and materials in construction **is essential**

Course Objectives: This course aims at enabling students,
1. To make aware of properties of concrete ingredients and fresh and hardened concrete
2. To build their ability to design concrete mix.
3. To impart knowledge of concrete equipment 's, special concrete and repairs of concrete.

Course Outcomes: After learning the course, the students should be able to:
1. Explain the properties of various concrete ingredients.
2. Evaluate the various tests and properties of fresh and hardened concrete
3. Design a concrete mix as per IS guidelines and describe special concrete.
4. Explain the concrete equipment 's, technique and repairing techniques for deteriorated concrete

Detailed Syllabus

Unit	Description	Duration (H)
1	**Concrete Ingredients:** a) Cement- Manufacturing, chemical composition, hydration of cement and tests on cement. Aggregate- mechanical and physical classification, properties and tests, alkali-aggregate reaction, Grading of aggregates, b) Water and admixtures: Quality of water for concrete, Function and classification of admixture, Types-i) Chemical admixtures: Plasticizers, super plasticizers, accelerators, retarders, air entraining ii) Mineral admixtures-fly ash, silica fume, ground granulated blast furnace slag.	08
2	**Properties and Tests on Fresh and Hardened Concrete:** a) Factors affecting workability, segregation, effect of temperature, concept of maturity, measurement of workability using slump cone, compaction factor, Vee-Bee consistometer and flow table apparatus. b) Factors affecting concrete strength, relation between tensile and compression strength, creep and shrinkage, Destructive tests: compression strength, flexural strength and tensile strength. Nondestructive tests: core test, rebound hammer and ultrasonic pulse velocity.	07
3	**Concrete Mix Design and special concretes:** a) Concrete Mix Design–objectives of mix design, factors to be considered, statistical quality control, concrete mix design by IS code method. b) Special concretes: lightweight concrete, self-compacting concrete, fiber reinforced concrete, Introduction to UHPC.	07
4	**Concreting Equipment's, Techniques and durability:** a) Concreting Equipments: concrete mixers, pumps, vibrators and compaction equipment's. concreting techniques- Ready mix concrete, under water concreting, cold and hot weather concreting. b) Factors affecting durability and permeability, acid attack on concrete, carbonation of concrete, corrosion of reinforcement and controlling measures. Cracks in concrete and its diagnosis, common repair techniques, shotcrete and grouting.	08
	Total	**30**

Text Books:

1. Concrete Technology by M. L. Gambhir, 5th Edition, Tata McGraw-Hill Publication,2013.
2. Concrete Technology: Theory and practice by M. S. Shetty and A. K. Jain, 8th Edition, S Chand Publication,2018.
3. Properties of Concrete by A. M. Neville – 5th Edition, Pearson Publication,2012.

Reference Books:

1. Concrete Technology by A.R. Santhakumar, 2nd Edition, Oxford University Press,2018.
2. Concrete : Microstructure, Properties and Materials by P. Kumar Mehta, Paulo J. M. Monteiro, 4th Edition, McGraw-Hill Education,2014.
3. Concrete Structures, Repair, Rehabilitation and Retrofitting by J. Bhattacharjee, 1st Edition, CBS Publishers & Distributors Pvt. Ltd,2017.

IS Codes:

- IS 383:2016- Coarse and Fine Aggregate for Concrete Specification
- IS 456:2000 with Reaffirmed 2016-Plain and Reinforced concrete- code of practice IS 516 : 1959 with Reaffirmed 2018- Methods of tests for strength of concrete
- IS 1489 (Part 1) : 2015(4 Revision)- Portland pozzolana cement - Specification: Part 1 fly Ash Based IS 2386 (Part 1 to 5):1963 with Reaffirmed 2021 -Methods of Test for Aggregates for Concrete
- IS 4031 (Part 1,10 to 13):1996 with Reaffirmed 2021 -Methods of physical tests for hydraulic cement IS 9103 : 1999 (1 Revision) with Reaffirmed 2018- Specification for Concrete Admixtures
- IS 1199: Part 1 to 5: 2018 - Fresh Concrete Methods of Sampling, Testing and Analysis IS 10262 : 2019 (2 Revision)- Concrete Mix Proportioning Guidelines
- IS 13311: Part 2 : 1992 with Reaffirmed 2018- Method of Non-destructive Testing of Concrete-methods of Test : Part 1Ultrasonic Pulse Velocity
- IS 13311: Part 2 : 1992 with Reaffirmed 2018- Method of Non-destructive Testing of Concrete-methods of Test : Part 2 Rebound Hammer

E-resource:

https://www.concrete.org/ **https://archive.nptel.ac.in/courses/105/102/105102012/**

Program:	B. Tech. (Civil Engineering)			Semester:			II
Course:	Concrete Technology Lab			Code:			WCI22PC08
Credits	Teaching Scheme (hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	TW	OR	PR	Total
01	--	02	--	50	25	--	75

Prior Knowledge:
Knowledge of fundamentals of fluid mechanics and geology **is essential**

Course Objectives:
To develop the ability to perform various tests and interpret results of ingredients of concrete and properties of fresh and hardened concrete.

Course Outcomes:
After learning the course, the students will be able to:
1. Evaluate the different properties of concrete ingredients.
2. Design a concrete mix as per code.
3. Analyze the test on fresh and harden concrete.

Detailed Syllabus

Lab Experiments
Tern work and oral exam based on syllabus and following experiments. Students have to review code provisions for all the practicals and include conclusions and recommendations based on the observed readings/results and code specifications.

Part A- Tests on Cement
1. Determination of consistency of standard Cement Paste.
2. Determination of Initial and Final Setting times of Cement and soundness of cement.
3. Determination of Compressive Strength of Cement.

Part B- Fine & coarse aggregate
4. Determination of Fineness modulus of Coarse and Fine Aggregates.
5. Moisture content, density and Specific gravity of fine aggregate
6. Moisture content , density and Specific gravity of coarse aggregate

Part C- Test on Concrete
7. Workability of concrete by slump cone and compaction factor.
8. Determination of Uniaxial Compressive strength test of concrete by crushing and Rebound hammer.
9. Determination of Indirect tensile strength and flexural strength of hardened concrete

Assignments
10. Concrete mix design by IS code method
11. Site visit to RMC plant and preparation of report

Text Books:

1. Concrete Technology by M. L. Gambhir, 5th Edition, Tata McGraw-Hill Publication,2013.
2. Concrete Technology: Theory and practice by M. S. Shetty and A. K. Jain, 8th Edition, S Chand Publication,2018.
3. Properties of Concrete by A. M. Neville – 5th Edition, Pearson Publication,2012.

Reference Books:

1. Concrete Technology by A.R. Santhakumar, 2nd Edition, Oxford University Press,2018.
2. Concrete: Microstructure, Properties and Materials by P. Kumar Mehta, Paulo J. M. Monteiro, 4th Edition, McGraw- Hill Education,2014.
3. Concrete Structures, Repair, Rehabilitation and Retrofitting by J. Bhattacharjee, 1st Edition, CBS Publishers & Distributors Pvt. Ltd,2017.

IS Codes:
IS 383:2016- Coarse and Fine Aggregate for Concrete Specification
IS 456:2000 with Reaffirmed 2016-Plain and Reinforced concrete- code of practice IS 516: 1959 with Reaffirmed 2018- Methods of tests for strength of concrete
IS 1489 (Part 1): 2015(4 Revision)- Portland pozzolana cement - Specification: Part 1 fly Ash Based IS 2386 (Part 1 to 5):1963 with Reaffirmed 2021 -Methods of Test for Aggregates for Concrete
IS 4031 (Part 1,10 to 13):1996 with Reaffirmed 2021 -Methods of physical tests for hydraulic cement IS 9103: 1999 (1 Revision) with Reaffirmed 2018- Specification for Concrete Admixtures
IS 1199: Part 1 to 5: 2018 - Fresh Concrete Methods of Sampling, Testing and Analysis IS 10262: 2019 (2 Revision)- Concrete Mix Proportioning Guidelines
IS 13311: Part 2: 1992 with Reaffirmed 2018- Method of Non-destructive Testing of Concrete-methods of Test: Part 1Ultrasonic Pulse Velocity
IS 13311: Part 2: 1992 with Reaffirmed 2018- Method of Non-destructive Testing of Concrete-methods of Test: Part 2 Rebound Hammer

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Program:	B. Tech. (Civil Engineering)			Semester:		II	
Course:	Structural Analysis I			Code:		WCI22PC09	
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	CIE		SA	Total
				FA1	FA2		
02	02	NA	NA	10	10	30	50

Prior Knowledge:
Engineering Mechanics, Strength of Materials. (Equilibrium conditions, types of supports and analysis of beams, basics of slope and deflection of beams is essential)

Course Objectives: This course aims at enabling students,
1. To impart the knowledge about the basic concepts required for analysis of structures.
2. To develop ability of analyzing structures.
3. To build concept of plastic analysis of structures.

Course Outcomes: After learning the course, the students should be able to:
1. Analyse the determinate structures by unit load method.
2. Analyze beams and frames by slope deflection method.
3. Analyze beams and frames by moment distribution method.
4. Analyze beams and frames by stiffness matrix method.

Detailed Syllabus

Unit	Description	Duration (H)
1	**Analysis of redundant pin jointed frames:** a) Analysis of redundant trusses by unit load method for external loading, b) Lack of fit, sinking of support and temperature changes (indeterminacy up to second degree).	8
2	**Slope-Deflection Method:** a) Slope-deflection equations, equilibrium equation of Slope-deflection method, application of Slope deflection method to beams without joint translation and rotation, yielding of support, application to non-sway rigid jointed rectangular portal frames, bending moment diagram. b) Sway analysis of rigid joint rectangular single bay single storey portal frames using Slope deflection method. (Involving not more than three unknowns)	7
3	**Moment Distribution Method:** a) Stiffness factor, carry over factor, distribution factor, application of Moment distribution method of analysis to beams without joint translation and yielding of support, application to non-sway rigid jointed rectangular portal frames, bending moment diagram. b) Sway analysis of rigid jointed rectangular single bay single storey portal frames using Moment distribution method (Involving not more than three unknowns).	8
4	**Stiffness Matrix Method:** a) Fundamental concepts of flexibility and stiffness, relation between them. Stiffness method of analysis- Structure approach only. Application to beams (Involving not more than three unknowns). b) Application of Stiffness structure approach to rigid jointed rectangular portal frames (Involving not more than three unknowns).	7
	Total	**30**

Text Books:

1. Theory of Structures by S. Ramamrutham and R. Narayan, Dhanpat Rai Publishing Company (P) Ltd.
2. Structural Analysis-I & II by S. S. Bhavikatti, Vikas Publishing House Pvt. Ltd, 4th Edition, 2014
3. Structural Analysis: A Matrix Approach by G.S.Pandit and S. P. Gupta, Tata McGraw Hill Education Pvt. Limited,2nd Edition, 2016

Reference Books:

1. Intermediate Structural Analysis by C. K. Wang, Tata McGraw Hill Education Pvt. Ltd. 7th Edition, 2013
2. Mechanics of Structures Vol. II (Theory and Analysis of Structures) by Dr. H. J. Shah and S. B. Junnarkar,Charotar Publishing House Pvt. Ltd, 23rd Edition, 2013
3. Basic Structural Analysis by C. S. Reddy, Tata McGraw Hill Education Pvt. Ltd.
4. Structural Analysis by R. C. Hibbler, Pearson Education. 3rd Edition, 2013

5. The Plastic Methods of Structural Analysis by B. G. Neal, Champman & Hall.
6. Structural Analysis by Aslam Kassimali, Cengage Learning India Private Limited

e-Resources:

https://nptel.ac.in/courses/105/101/105101086/
https://nptel.ac.in/courses/105/106/105106050/

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Program:	B. Tech. (Civil Engineering)			Semester:	II		
Course:	Elements of Earthquake Engineering			Code:	WCI22PC10		
Teaching Scheme (Hrs./Week)				Evaluation Scheme			
Credit	Lecture	Tutorial	Hours	FA1	FA2	SA	Total
2	2	-	2	10	10	30	50

Prior Knowledge of: Engineering Geology, Structural Analysis.

Course Objectives:

1. Understand fundamentals of earthquake engineering and seismic conditions of the country and world.
2. Identify and calculate the different types of earthquake intensity.
3. Interpret earthquake characteristics and associated effects on structures.
4. Examine concepts of dynamic analysis for civil engineering applications.

Course Outcomes:

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

1. Understand the fundamentals of earthquake engineering and seismicity conditions of the country and world.
2. Analyze site specific deterministic seismic hazard.
3. Analyze earthquake characteristics and associated effects on structures, including linear responses.
4. Apply the concepts of dynamic equations of motion and perform analysis for dynamic systems in civil engineeringapplications.

Detailed Syllabus

Unit	Description	Duration (H)
1.	**Origin of Earthquakes**: Engineering geology, Indian Seismic Map, Seismicity of the world, Faults, Propagation ofearthquake waves.	06
2.	**Quantification of Earthquake:** (magnitude, energy, intensity of earthquake), Measurements of earthquake (accelerograph,scalogram recording), Determination of magnitude, Epicentral distance, focal depth, etc. Ground motion and their characteristics, Factors affecting ground motions. Idealization of the building model and its dynamic properties.	08
3.	**Earthquake Resistant Design**: design philosophy, Four virtues of EQRD: Stiffness, Strength, ductility and Configurations.	08
4.	**Methods of Earthquake Analysis**: Introduction to Capacity design concepts, Introduction to IS:1893, Load combinations, concept of strong column weak beam design. Codal Coefficient and Response Spectrum Method. Equivalent linear static analysis (with numerical), modal spectrum analysis (with numerical).	08
	Total	**30**

Textbooks:

1. Earthquake resistant design of structures by Agrawal, P. and Shrikhande, M. Prentice Hall of India, Inc. (2011).
2. Dynamics of structures: Theory and application to earthquake engineering by Chopra, A.K, Prentice Hall of India, 5thedition (2017).
3. Dynamics of structure and foundation – A unified approach: 2 Applications by Chowdhary, I. and Dasgupta, S.P.CRC Press, Balkema. (2009).
4. Seismic analysis of structures by Datta, T. K. John Wiley & Sons (Asia) Pte Ltd. Singapore. (2010).
5. Geotechnical earthquake engineering Kramer, S. L. Prentice Hall, (2007).

Reference Books:

1. Earthquake Resistance Design for Engineers and Architects by Dowrick, D. L. John Willey & Sons, 2nd Edition,(1987).
2. Housner, G. W. & Jenning, P.C. –Earthquake Design Criteria‖, Earthquake Engineering Research Institute, Oakland, California, USA, (1982).
3. Earthquake Engineering Research Institute, Oakland, California, USA, (1982).
4. Design of Earthquake Resistance Buildings Wakabayashi, M. McGraw Hill Books Company, (1986). Introduction to Earthquake Engineering by Okamoto, S. University of Tokyo press, 2nd Edition, (1984).

Program:	B. Tech (Civil).					Semester:	II
Course:	Indian Knowledge System (IKS)					Code:	WCI22IK01
Credits	Teaching Scheme (Hrs./Week)			Evaluation Scheme and Marks			
	Lecture	Practical	Tutorial	FA		SA	Total
				FA1	FA2		
2	2	-	-	25	25	-	50

Prior Knowledge: Nil

Course Objectives:

This course aims at enabling students,

1. To familiarize with the concepts of Indian Knowledge System
2. To get acquainted with the applications of Indian Knowledge System

Course Outcomes:

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

1. Explain the historical evolution, institutional frame works, and modes of transmission of the Indian Knowledge System.
2. Describe key scientific and technological contributions of ancient India.
3. Apply ethical and leadership insights from Indian literary and art traditions.
4. Use traditional ecological knowledge to promote sustainable practices.

Detailed Syllabus:

Unit	Description	Duration [Hrs.]
1	**Unit1: History and Development of the Indian Knowledge System** • Origins and Evolution: Vedic, Post-Vedic, Classical, and Medieval contributions to IKS • Introduction to Vedas and Shat Darshanas as foundational sources of Indian philosophy. • Transmission of Knowledge: Oral tradition, Shruti-Smriti, Guru-Shishya Parampara and Early Texts • Institutional Framework: Ancient Indian universities (Takshashila, Nalanda, Vikramshila, Vallabhi) • Revival: Modern relevance, and efforts towards restoration	7
2	**Unit 2: Scientific and Technological Contributions of IKS** • Contributions to Mathematics (Boudhayan, Aryabhata, Brahmagupta& Bhaskar Acharya -II) • Astronomy and Cosmology (Surya Siddhanta, JyotishShastra, Astronomical Observatories) • Metallurgy, Material Science, and Engineering (Iron Pillar, WootzStee, Zinc Distillation) • Civil Engineering and Architecture (Vastu Shastra, Water Management Systems, Temple and City Planning) • Ayurveda and Traditional Healthcare Systems	8

3	**Unit3: Literary, Performing and Artistic Traditions and festivals of India** • Contributions of Indian Literature to Ethics and Leadership (Ramayana, Mahabharata) • Folk Traditions and Oral Narratives: Preserving local culture and wisdom • Performing Arts and Knowledge Expression (Natya Shastra, Temple Art, Music and Dance Forms) • Indian festivals as vibrant expressions of cultural values, community bonding, and sustainable environmental practices	**7**
4	**Unit4: Indigenous Technologies, Sustainability, and Ecology in IKS** • Environmental Ethics and Sustainability Practices in Ancient India • Techniques for Conserving Water (Step wells, Temple Tanks, and Dams) • Agricultural Knowledge Systems (Crop Rotation, Indigenous Seeds, Zero Budget Natural Farming) • Indigenous Knowledge in Disaster Management and Climate Adaptation • Insights from IKS for Contemporary Sustainable Development	8
	Total	**30**

Text Books:

1. Mahadevan, B., Bhat Vinayak Rajat, Nagendra Pavanan R.N. (2022), "Introduction to Indian Knowledge System: Concepts and Applications", PHI Learning Private Ltd. Delhi.
2. Dharampal (2021), "Indian Science and Technology in the Eighteenth Century", ISBN10:8175310936.

Reference Books:

1. Kapil Kapoor, Avadhesh Kumar Singh. (2005), "Indian Knowledge Systems", (Vol.1 and Vol.2), ISBN-10:9788124603369.

"Knowledge Brings Freedom"

Program :	B. Tech. (Civil Engineering)			Semester:	II		
Course:	Life Skills 2			Code:	WCI22CC02		
Credits	Teaching Scheme			Evaluation Scheme			
	Lecture	Practical	Tutorial	TW	Practical	Oral	Total
1	-	2	-	50	-	-	50

Prior Knowledge: -Nil

Course Objectives: This course aims at enabling students,

1. To equip them with essential skills and knowledge that complement their academic education, preparing them to excel not only as engineers but also as well-balanced individuals
2. To develop students' vital life skills that promotes personal growth, resilience, and success in their academic journey and beyond

Course Outcomes: After learning the course, the students will be able to:

1) Understand the ways to nurture their passion.
2) Develop skills growth mindset to be successful in personal and professional life.
3) Demonstrate adaptability and flexibility for any environment.
4) Apply essential skills for successful and happy life management.

Unit	Description	Duration (Hrs.)
1	**Nurture Your Passion** (i) Developing Hobbies- Importance, Ways and Benefits (ii) Exploring Skills - Singing/Painting/Dancing etc (iii)Sports: Basketball, Table tennis, Football and Volleyball (iv) Performing Arts: Painting/ Sketching/ Drawing (v) Stage performance (vi) Let's Play to Learn - games and play forms possible, like, Puzzles & Brainteasers, quiz.	6
2	**Lead Yourself - Growth Mindset** (i) Understanding the concept for personal development. (ii) Embracing change: Coping with the dynamic nature of life (iii) Resilience and perseverance: Overcoming obstacles and setbacks (iv) Developing self-leadership skills and taking initiative/ responsibilities.	8
3	**Adaptability and Flexibility** (i) Adaptability in a rapidly changing world (ii) Problem-solving and decision-making in dynamic situations. Approaching Problem Differently (iii) Embracing uncertainty: Coping with ambiguity and making the most of new opportunities (iv) Flexibility in teamwork: Navigating diverse team dynamics effectively.	8
4	**Life Management** (i) Financial Literacy-Saving is earning, Value of money (ii) Coping up with Virtual Life and Reality (iii) Understanding the responsibilities and impact of Global Citizenship (iv) Environmental awareness and sustainable practices (v) Social responsibility: Contributing positively to the community.	6
	Total	**30**

Reference Books

1) "Mindset: The New Psychology of Success" by Carol S. Dweck Publisher: Ballantine Books
2) "The Financial Diet: A Total Beginner's Guide to Getting Good with Money" by Chelsea Fagan and Lauren VerHage
3) "Grit: The Power of Passion and Perseverance" by Angela Duckworth Publisher: Scribner, 2018

Weblinks

1) SkillsYouNeed (www.skillsyouneed.com): This website offers comprehensive information and practical guidance on a wide range of life skills, including communication, time management, problem-solving, and more

2) MindTools (www.mindtools.com): MindTools provides resources on personal effectiveness, leadership, communication skills, and other essential life skills to enhance professional and personal development
3) TED Talks (www.ted.com): TED Talks offer inspiring and informative speeches by experts and thought leaders covering various life skills topics, including resilience, emotional intelligence, and personal growth
Verywell Mind (www.verywellmind.com): This website covers mental health, emotional well-being, and self- improvement topics that contribute to overall life skills development

DEPARTMENT OF CIVIL ENGINEERING

VISION

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.

MISSION

1. **Fostering value-based education to achieve academic excellence with the right attitude and professional ethics.**

१. **योग्य दृष्टिकोन आणि व्यावसायिक नीतिमत्तेसह शैक्षणिक उत्कृष्टता प्राप्तकरण्यासाठी मूल्यांवर आधारित शिक्षणालाचालना देणे.**

२. **Inculcating a culture of research and innovation, with an aim of serving society in a sustainable manner.**

३. **शाश्वत पद्धतीने समाजाची सेवाकरण्याच्या उद्देशाने संशोधन आणि नवोपक्रमाची संस्कृती रुजवणे.**

2. **Developing skilled civil engineers with an ability to provide solutions to meet national and global Challenges in accordance with the needs of the society.**

४. **राष्ट्रीय आणि जागतिक स्तरावर उपाययोजना प्रदानकरण्याची क्षमता असलेले कुशल सिव्हिल अभियंते विकसित करणे.**

DEPARTMENT OF CIVIL ENGINEERING

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.