Walchand College of Engineering, Sangli

(Government Aided Autonomous Institute)

Course Contents (Syllabus) for

Third Year B. Tech.
(Civil Engineering)
Sem - V to VI

AY 2020-21

Title of the Course: Soil Mechanics (4CV301)	L	T	P	Cr
	2	1	0	3

Desirable Courses: Fluid mechanics

Textbooks:

1. Das B. M., "Principles of Geotechnical Engineering", Cengage Learning, 7th Edition, 2002.
2. Murthy, V. N. S., "Textbook of Soil Mechanics and Foundation Engineering Geotechnical Engineering Series", CBS publishing; 1st edition, 2007.
3. Ranjan Gopal and Rao A.S.R., "Basic and Applied Soil Mechanics", New Age International Publishers, 3rd Edition, 2016.

References:

1. Gulhati S. K. and Datta M., "Geotechnical Engineering", Tata McGraw-Hill, 1st Edition, 2005
2. Couduto, Donald P., "Geotechnical Engineering – Principles and Practices", Prentice-Hall.,2nd Edition, 2017.
3. Muni Budhu, "Soil Mechanics and Foundations", John Wiley & Sons, Inc, 3rd Edition, 2011.

Course Objectives :

1. To provide the knowledge of engineering properties of soil and soil classification.
2. To prepare students for competitive examinations and higher studies in the field of geotechnical engineering.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	**Explain** the index properties, engineering properties, concept of earth pressure and consolidation	II	Understanding
CO2	**Solve** problems associated with term 'compaction, shear strength of soil and earth pressure'.	III	Applying
CO3	**Analyse** soil properties based on shear strength, earth pressure, and degree of consolidation of soil.	IV	Analyzing

CO-PO Mapping :

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1	**3**												**2**	**3**
CO2		**3**											**2**	**3**
CO3			**3**										**2**	**3**

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	**Marks**
ISE 1	10

Title of the Course: Water Supply and Treatment Technology (4CV 302)	L	T	P	Cr
	3	0	0	3

Desirable Courses: Basic hydraulics and Engineering Chemistry

Textbooks:

1. Raju, B.S.N., "Water Supply and Wastewater Engineering" Tata McGraw Hill Private limited, New Delhi, 2nd Edition, 2000.
2. Garg, S. K. "Water Supply Engineering", Khanna Publishers, 33rd Edition, 2010.
3. Modi, P. N., "Water Supply Engineering (Environmental Engineering I)", Standard Book House, 6th Edition, 2018.

References:

1. "Manual on Water Supply and Treatment", CPHEEO, Ministry of Housing and Urban Affairs Development, Govt., of India, New Delhi, 1999.
2. Hammer M, J and Hammer M, J, "Water and Wastewater Technology", PHI learning private limited, 7th Edition, 2018.
3. Davis, M, L, and Cornwell, D, A, "Introduction to Environmental Engineering", Tata McGraw Hill Publishing Company, Special Indian Edition, 2010.
4. Nathanson, J. A., "Basic Environmental Technology", PHI Learning private limited, 5th Edition, 2009.

Course Objectives :

1. To provide the pertinent knowledge on water supply and treatment systems.
2. To impart necessary skill for the design and operation of water treatment units.
3. To prepare students for higher studies and research in the field of water treatment technology.
4. To familiarize the students with latest trends in water treatment.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	**Explain** water quality, water supply system and treatment technologies.	II	Understanding
CO2	**Solve** the problems on water related to quality, quantity, conveyance and treatment.	III	Applying
CO3	**Design** water treatment units, and pipeline system.	VI	Creating

CO-PO Mapping :

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1	3												2	3
CO2		3											3	3
CO3			3										3	3

Assessments :

Teacher Assessment:

Title of the Course: **Design of steel Structures (4CV303)**	L	T	P	Cr
	2	1	-	3

Desirable Courses: Solid Mechanics & Structural Mechanics

Textbooks:

1. Duggal S.K., "Limit state design of steel structures", Tata McGraw-Hill Publications, New Delhi, 2nd Edition, 2014.
2. Shiyekar, M.R., "Limit state design in structural steel", PHI learning Pvt.Ltd Publications 2nd Edition 2013.
3. Subramanian N., "Design of steel structures", Oxford University Press, 2010.

References:

1. Dayaratnam, P., "Design of steel structures", S. Chand Publication, New Delhi, 2008.
2. Englekirk, Robert, "Steel structures: controlling behavior through design", John Wiley and Sons, 2003.
3. Gaylord, Edwin and Gaylord, Charles, "Design of steel structures", Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rdEdition, 2010.
4. IS 800-2007 'Code of Practice for General Construction in steel', and IS 875-1987 part 1 to 5; Code of Practice for Design Loads (other than earthquake) for building structures, Bureau of Indian Standards, New Delhi.

Course Objectives:

1. To illustrate various design philosophies and concept of plastic analysis.
2. To impart the knowledge of design of various steel members and their connections.
3. To provide knowledge of design practical steel structures such as industrial sheds, steel buildings etc.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	**Apply** the concept of limit state for design of steel structures.	IV	**Applying**
CO2	**Calculate** the strength of steel structural members and connections.	V	**Evaluating**
CO3	**Design** steel structures such as industrial sheds, steel buildings etc.	VI	**Creating**

CO-PO Mapping : (Use 1, 2, 3 as Correlation Strengths)

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1	**3**												**1**	**1**
CO2		**3**											**2**	**2**
CO3			**3**										**3**	**3**

Assessments: Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	**Marks**
ISE 1	10
MSE	30

Title of the Course: **Professional Elective-I Construction Equipment and Techniques (4CV311)**	L	T	P	Cr
	2	1	0	3

Desirable Courses: NIL

Textbooks:

1. Kumar NeerajZha, "Construction Project Management", Pearson India Education, 2nd edition,2015
2. Robert Peurifoy, Clifford J. Schexnayder, AviadShapira, Robert Schmitt, "Construction planning, equipment, and methods", McGraw-Hill, 8thedition, 2010.
3. Sharma S.C. "Construction Equipment and Management", Khanna Publishers New Delhi, 1988.

References:

1. Kumar Neeraj Zha, "Formwork for construction" McGraw-Hill, 3rd reprint, 2019.

Course Objectives :

1. This course aims at making civil engineering students who need to understand the breadth and depth of construction field for possible engagement.
2. To introduce various construction equipment and techniques,
3. To provide knowledge about efficient utilization of the equipment and techniques.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Describe different construction equipment and plants.	2	**Understanding**
CO2	Explain different construction techniques.	2	**Understanding**
CO3	Choose suitable equipment, formwork and technique based on project requirements.	3	**Applying**

CO-PO Mapping :

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1	**3**										**1**	**1**	**1**	
CO2		**2**	**2**										**2**	**2**
CO3			**2**								**2**		**2**	

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	**Marks**
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

Title of the Course:	L	T	P	Cr
Professional Elective-I: Structural Geology 4CV312	2	1	-	3

Desirable Courses: Engineering Geology

Textbooks:

1. Gokhale N. W. , "Theory of Structural Geology", CBS Publishers, Delhi, 2019.
2. Marland P Billings,"Structural Geology", Pearson Education, Third edition,2016.
3. Philip Kearly, Keith A. Klepeis, Frederick J. Vine, "Global Tectonics", John Wiley & Sons Ltd,Third Edition,2009.

References:

1. Leo A. W. Wiegman, "Earth Structure : An Introduction To Structural Geology And Tectonics" , W. W. Norton & Company, Inc., 2nd ed. 2004.
2. Marshak Stephen and MitraGautum, "Basic Methods of Structural Geology",Pearson Education; 2017.
3. Gokhale N. W., "A Manual of Problems in Structural Geology", CBS Publishers, Delhi.2019.

Course Objectives :

1. Introduce students the necessary knowledge and concepts of structural geology and geotectonics.
2. Make the student able in recognizing, classifying and describing various geological structures and structural phenomena.
3. Enable students to understand geological problem before undertaking any civil engineering project.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	**Describe** the geotectonic especially continental drift and plate tectonics.	II	Understanding
CO2	**Explain**the mechanism of geological structures in the field.	II	Understanding
CO3	**Apply**the knowledge of structural geology to **solve** the problems related with foundation or excavations.	III	Applying

CO-PO Mapping : (Use 1, 2, 3 as Correlation Strengths)

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	1													1
CO2	1	2												2
CO3	2	2											1	2

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.

MSE: Assessment is based on 50% of course content (Normally first three modules)

Title of the Course: Professional Elective-I Computational Methods and Optimization Techniques (4CV313)	L	T	P	Cr
	2	1	0	3

Desirable Courses: All Courses in Mathematics for UG

Textbooks:

1. Chapra S.C. and Canale R.P., "Numerical Methods for Engineers", Tata McGraw Hill Publications, 4th Edition, 2002.
2. Babu Ram "Numerical Methods", Pearson, 1st Edition, 2010.
3. Taha Hamdy A., "Introduction to O.R.", 6th edition, (PHI)

References:

1. Balguruswamy, E. "Numerical Methods", Tata McGraw-Hill Publishing Co. Ltd., 2nd Edition, 2009.
2. Jain M.K., Iyengar S. R., Jain R. K., "Numerical Methods", New Age International (P) limited, 5th Edition, 2007.

Course Objectives :

1. To provide knowledge of numerical approach and significance of error analysis.
2. To provide necessary knowledge of numerical tools required for analyzing and solving problems in the field of engineering.
3. To provide pre-requisite statistical knowledge to the students for analyzing the data/results.
4. To deliver know-how of typical optimization techniques applicable to engineering problems.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	Summarize elements of Computational Methods and Optimization Techniques	2	understanding
CO2	Solve linear, nonlinear, and differential equations by numerical methods and analyze data using various methods of regression.	3,4	applying and analyzing
CO3	Recommend optimal solution to linear programming problems	5	evaluating

CO-PO Mapping : (Use 1, 2, 3 as Correlation Strengths)

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1	**3**													**3**
CO2		**3**												**3**
CO3			3										**3**	**3**

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	**Marks**
ISE 1	10
MSE	30

Title of the Course:	L	T	P	Cr
Professional Elective-I Structural Mechanics (4CV314)	2	1	-	3

Desirable Courses: Solid Mechanics, Structural Analysis

Textbooks:

1. Gere, J. M. & Weaver, W.,"Matrix Analysis of Framed Structures", CBS Publishers and Distributor, 2nd Edition, 2004.
2. Godbole, P. N., "Introduction to Finite Element Methods", I K International Publishing House Pvt. Ltd., 1stEdition, 2013.
3. Reddy, C. S., "Basic Structural Analysis", McGraw Hill Education, 3rd edition, 2017.

References:

1. Cook, Robert D., Malkus, David S., Plesha, Michael E., and Witt, Robert J., "Concepts and Applications of Finite Element Analysis", 2003.
2. McGuire, William, Gallaghar, Richard H. and Ziemian, Ronald D., "Matrix Structural Analysis", John Wiley, 2nd Edition, 2000.
3. Meghare A. S.&Deshmukh S. K.,"Matrix Methods of Structural Analysis" Charotar Publishing House, 2nd Edition, 2016.

Course Objectives:

1. To explain the concept of matrix methods of structural analysis.
2. To inculcate applications of flexibility and stiffness methods to solve indeterminate structures.
3. To illustrate the concept and applications of finite element method in structural engineering.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive Level	Bloom's Cognitive Descriptor
CO1	**Apply** the conceptsof matrix methods ofstructural analysis.	III	Applying
CO2	**Analyze**indeterminate structures by using structure oriented and element approach.	IV	Analyzing
CO3	**Calculate** thenodal displacements and member forces by using finite element method.	V	Evaluating

CO-PO Mapping : (Use 1, 2, 3 as Correlation Strengths)

PO	1	2	3	4	5	6	7	8	9	10	11	12	PSO1	PSO2
CO1	3													2
CO2		3												3
CO3		2			2									1

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	Marks
ISE 1	10
MSE	30
ISE 2	10
ESE	50

Title of the Course: Environmental Engineering Laboratory (4CV 351)	L	T	P	Cr
	0	0	2	1

Desirable Courses:

Engineering Chemistry Laboratory and Water supply and Treatment Technology

Textbooks:

1. Metcalf and Eddy, "Wastewater Engineering Treatment and Reuse", Tata McGraw Hill Publication, 5th Edition, 2014.
2. Sawyer. C.N. And McCarty. P.L., "Chemistry for Environmental Engineers", Tata McGraw-Hill Publishing Company Limited, 5th Edition, 2003.

References:

1. IS 3025 (Relevant parts), Bureau of Indian Standards.
2. Standard Methods for the Examination of Water and Wastewater, APHA, 23rd Revised Edition, 2017.
3. User manual of EPANET and WATERGEMS.

Course Objectives :

1. To provide the students hands-on practice for analyzingphysical, chemical and bacteriological quality of water.
2. To develop the skills required for applying knowledge to decide the chemical dose requirements.
3. To expose the students for computer applications in water network analysis.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Apply the analysis techniques to determine the physical, chemical and bacteriological water quality parameters.	III	Applying
CO2	Design experiment/s to address real-life cases pertinent to water quality.	VI	Creating
CO3	Apply modern engineering tool/software to analyse water distribution system.	III	Applying
CO4	Analyze and interpret the results to assess the quality of water for potability.	IV	Analyzing

CO-PO Mapping :

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1				**2**									**2**	**2**
CO2				**2**										
CO3					**2**								**2**	
CO4				**2**									**2**	**2**

Title of the Course: **Soil Mechanics Laboratory (4CV352)**	L	T	P	Cr
	0	0	2	1

Desirable Courses: Soil Mechanics.

Textbooks:

1. Lambe T.W., Soil Testing, Willey Eastern Ltd., New Delhi, 1978, 1st Edition.
2. Murthy, V. N. S., "Textbook of Soil Mechanics and Foundation Engineering Geotechnical Engineering Series", CBS publishing; 1st edition, 2018.

References:

1. Bowles J.E., Engineering Properties of Soil & Their Measurement, Tata - McGraw-Hill Publishing Co., 4th Edition, 1992.
2. Beauro of Indian Standards, I.S.2720 (Various sections / parts)

Course Objectives :

1. To develop the skills to find Index properties and engineering properties of soil and the classification of soil.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	**Demonstrate** the experimental data to assess index properties and engineering properties of soil.	III	Applying
CO2	**Analyze**and interpret the behaviour of soils based on the experimental data.	IV	Analyzing

CO-PO Mapping :

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1				**3**									**3**	**3**
CO2				**3**									**3**	**3**

Assessments :

Lab Assessment: There are four components of lab assessment, LA1, LA2, LA3 and Lab ESE.IMP: Lab ESE is a separate head of passing.

Assessment	Based on	Conducted by	Conduction and Marks Submission	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 4 Submission at the end of Week 5	25
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 5 to Week 8 Submission at the end of Week 9	25
LA3	Lab activities, attendance, journal	Lab Course Faculty	During Week 10 to Week 14 Submission at the end of Week 14	25
Lab ESE	Lab Performance and related documentation	Lab Course faculty	During Week 15 to Week 18 Submission at the end of Week 18	25

Title of the Course: **Estimating and Contracts (4CV321)**	L	T	P	Cr
	3	0	0	3

Desirable Courses: Building Materials and Construction, Building Planning and Design

Textbooks:

1. Dutta, B. N., "Estimating & Costing in Civil Engineering," UBS Publishers, 28th Revised Edition, 2016.
2. Birdi G.S., "Text book of Estimating & Costing", Dhanapat Rai Sons, 7th Edition, 2015.
3. Patil B. S., "Civil Engineering Contracts & Estimates", Orient Longman Ltd., 4th Edition, 2015.

References:

1. I.S. code 1200 (Part I to XXX) B.I.S., Delhi
2. "Standard Specification Vol. I & II", PWD Maharashtra.
3. "D.S.R.", PWD Maharashtra for the recent year.

Course Objectives :

1. To provide students with necessary knowledge and skills in specification writing, estimating, costing, methods of execution of works.
2. To make students aware of prevailing professional practices.
3. To acquaint the students with estimation software.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	**Explain** elements of estimating as well as contracting.	2	understanding
CO2	**Construct** specifications and quantity sheets for various items of traditional as well as unconventional civil works.	3, 6	applying, creating
CO3	**Analyze** rates and estimate costs of different civil works; and identify an appropriate method for execution of a civil work.	4	analyzing

CO-PO Mapping : (Use 1, 2, 3 as Correlation Strengths)

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1	**3**													
CO2		**3**											**3**	**2**
CO3			3								**2**		**3**	**2**

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	**Marks**
ISE 1	10
MSE	30
ISE 2	10

Title of the Course: Foundation Engineering (4CV322)	L	T	P	Cr
	2	1	0	3

Desirable Courses: Soil Mechanics, Soil Mechanics Lab

Textbooks:

1. Dr. Arora K. R. ," Soil Mechanics and Foundation Engineering", Standard Publishers and distributors, 2nd edition, 1989.
2. Gulhati S. K., Datta Manoj, "Geotechnical Engineering", Tata McGraw Hill Delhi, 1st edition, 2005.
3. Punmia B. C., Jain Ashok Kumar, Jain Arun Kumar, "Soil Mechanics and Foundations", Laxmi Publications Pvt Ltd, 16th Edition, March 2005.

References:

1. Bowles J.E.,"Foundation Analysis and Design", McGraw Hill International Edition, 4th edition, 1988.
2. Kaniraj S. R., "Design Aids in Soil Mechanics and Foundation Engineering", TMH New Delhi, 2004.
3. Nayak N. V., "Foundation Design Manual", DhanpatRai and Sons, N Delhi.
4. Tomlinson M. J., "Foundation Design and Construction", ELBS, 6th edition, 1995.
5. Murthy V. N. S., "Soil Mechanics and Foundation Engineering", Saikripa Technical Consultants, Bangalore, 2007.

Course Objectives :

1) To provide the basic knowledge of the Foundation and interaction with soil.
2) To impart the designing of foundation.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	**Explain** the concept of bearing capacity, foundation types and their suitability	II	**Understanding**
CO2	**Analyse** Shallow and deep foundations and evaluate stability of given soil slope configuration	IV	**Analyzing**
CO3	**Design** the Shallow and deep foundations on the basis of soil parameters.	VI	**Creating**

CO-PO Mapping :

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1	3												3	3
CO2		3											3	3
CO3			3										3	3

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one

Title of the Course: **Waste Management and Pollution Control (4CV323)**	L	T	P	Cr
	2	1	0	3

Desirable Courses: Water Supply and Treatment Technology, Environmental Science

Textbooks:

1. Nathanson, J. A., "Basic Environmental Technology", PHI Learning private limited, 5th Edition, 2009.
2. Modi, P. N., "Wastewater Engineering" Standard Book House, 6th Edition, 2018.
3. Peavy H, S, Rowe D, R, and Tchobanoglous G, "Environmental Engineering", McGraw-Hill Book Company, Indian Edition, 2017.

References:

1. Hammer M, J and Hammer M, J, "Water and Wastewater Technology", PHI learning private limited, 7th Edition, 2018.
2. "Manual on Sewerage and Sewage Treatment", CPHEEO, Ministry of Housing and Urban Affairs Development, Govt., of India, New Delhi, 2013.
3. "Manual on Municipal Solid Waste Management", CPHEEO, Ministry of Housing and Urban Affairs Development, Govt., of India, New Delhi, 2016.

Course Objectives :

1. To introduce concepts of wastewater engineering, solid waste processing, air and noise pollution control.
2. To provide pertinent knowledge for the design and operation of waste management facilities.
3. To prepare students for higher studies and research in the field of waste management and pollution control.
1. To make students aware of recent advances in waste management.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	**Explain** collection and characteristics of wastewater and solid waste; monitoring air quality and meteorological impact; treatment/processing/control technologies for prevention of pollution associated with wastewater, solid waste, air and noise.	II	Understanding
CO2	**Solve** the problems on wastewater and solid waste associated with generation, characteristics, collection and treatment/processing; air and noise pollution.	III	Applying
CO3	**Design** sewerage and wastewater treatment system.	VI	Creating

CO-PO Mapping :

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1	3												2	3
CO2		3											3	3
CO3			3										3	3

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	**Marks**
ISE 1	10
MSE	30

Title of the Course: Design of Concrete Structures (4CV324)	L	T	P	Cr
	2	1	-	3

Desirable Courses: Solid Mechanics, Structural Analysis

Textbooks:

1. Punmia, B. C. and Jain, A. K. "Limit state design of reinforced concrete", Laxmi Publication, 1st Edition, 2013.
2. Shah, V. and Karve, S. "Limit state theory and design of reinforced concrete", Structures Publications, 4th Edition, 2003.
3. Varghese, P. C. "Limit State Design of Reinforced Concrete Structures", Prentice Hall, 4th Edition, 2010.

References:

1. IS 456:2000– Code of Practice for Plain and Reinforced Concrete, BIS and SP 34-1987 – Handbook on concrete reinforcement and detailing.
2. Pillai, S. V. and Menon. D, "Reinforced concrete design", Tata McGraw Hill Book Co., 5th Edition, 2006.
3. Ramamruthm, S. "Design of reinforced concrete structures", Dhanpat Rai Publishing, 17th Edition, 2010.

Course Objectives:

1. To introduce the fundamental concepts of limit state method for the design of reinforced concrete components.
2. To impart knowledge for strength determination of different kinds of RC components using IS code.
3. To provide knowledge for design of the various structural members in the building system as per IS code.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	**Apply** the concept of limit state for design of reinforced concrete components.	III	Applying
CO2	**Calculate** the strength of reinforced concrete members.	V	Evaluating
CO3	**Design** various components of reinforced concrete structures	VI	Creating

CO-PO Mapping : (Use 1, 2, 3 as Correlation Strengths)

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1	**3**												**1**	**1**
CO2		**3**											**2**	**2**
CO3			**3**										**3**	**3**

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	**Marks**
ISE 1	10
MSE	30
ISE 2	10

Title of the Course: **PE-II: Design of Hydraulic Structures (4CV331)**	L	T	P	Cr
	2	1	0	3

Desirable Courses: Water Resources Engineering

Textbooks:

1. Garg, S.K., "Irrigation Engineering*",* Khanna publisher, Delhi, 11th Edition, 2014.
2. Modi, P.N.,"Water Recourses Engineering and Water Power Engineering*",* Standard Book House, 10th Edition, 2008.
3. Punmia,B.C. andPande, B.B., *"*Irrigation Water Power Engineering*"*,Laxmi Publication Private Limited, 4th Edition, 2009.

References:

1. Sharma, R.K,"Hydrology and Water Resources", Dhanpatrai and sons Delhi,8th Edition,2007
2. Sahasrabudhe, S.R.,"Irrigation and Hydraulic structures", S.K Kataria and Sons Dehhi,3rd Edition,2011
3. Varshney and Gupta "Theory Design of Irrigation Structures", Vol. I, II, III, Nemechand and Brothers,6th Edition,2008

Course Objectives :

1. To introduce students the concepts of reservoir planning and irrigation engineering
2. To provide students with necessary skill for the design of various hydraulic structures.
3. To prepare the students for higher studies and research in the field of water resources and irrigation engineering.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	**Explain**basics of reservoir, gravity dam, earth dam, spillway, weirs, canal,river training work and water power.	II	Understanding
CO2	**Apply** theknowledge of hydraulic structures to solve/analyze the problems associated with.	III, IV	Applying Analyzing
CO3	**Design** hydraulic structures inirrigation engineering.	VI	Creating

CO-PO Mapping : (Use 1, 2, 3 as Correlation Strengths)

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1	**3**													
CO2		**3**											**3**	**3**
CO3			3										**3**	**3**

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	**Marks**
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1: Assignment on problem pertaining to modules 1 to 3 and evaluated by test/quiz/presentation/oral.

ISE 2: Assignment on design of various hydraulics structure problem and evaluated by test/quiz/presentation/oral.

MSE: Assessment is based on 50% of course content (Normally first three modules)

ESE: Assessment is based on 100% course content with 60-70% weightage for course content (normally last three

Title of the Course:	L	T	P	Cr
PE-II: Advanced Surveying (4CV332)	2	1	-	3

Pre-Requisite Courses: Engineering Surveying

Textbooks:

1. Chandra A.M., Higher Surveying, New Age International Private Limited, 2015
2. K. R. Arora "Surveying", Vol. 1 & 2, Standard Book House, 16th edition, 2018, Kota.
3. Agrawal N.K., "Essentials of GPS" Spatial Network Pvt. Ltd., Hydrabad.

References:

1. James Anderson and Edward Mikhail, Surveying: Theory and Practice, McGraw Hill Education; 7th edition, 2017
2. Lillesand T. M. and Kiefer. R.W., "Remote Sensing and Image Interpretation", 4th Edition, John Wiley and Sons, New York, (2002).
3. R. E. Davis, F. Foote and J. Kelly, "Surveying; Theory and Practice", McGraw Hill Book Company, New York.

Course Objectives :

1. To understand advanced surveying techniques and geospatial techniques.
2. To develop an ability to analyze land profiles in logical manner and will be able to apply well understood principles in planning and design of engineering structures on the Earth's surface.
3. To adopt suitable survey technique and select equipment based on the required level of accuracy and prevailing field conditions.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	**Study** modern surveying equipment effectively to improve quality of surveys.	IV	Analyzing
CO2	**Analyze** and synthesize data from the aerial photographs and remote sensing images to prepare thematic maps.	IV	Analyzing
CO3	**Analyze and Solve** surveying problems by using remote sensing, GIS and GPS.	III IV	Applying, Analyzing

CO-PO Mapping : (Use 1, 2, 3 as Correlation Strengths)

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1	**1**	**1**			**3**								**1**	
CO2	**1**	**1**			**3**								**1**	
CO3	**3**	**1**			**3**								**1**	

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	**Marks**
ISE 1	10
MSE	30
ISE 2	10
ESE	50

ISE 1 and ISE 2 are based on assignment/declared test/quiz/seminar etc.
MSE: Assessment is based on 50% of course content (Normally first three modules)
ESE: Assessment is based on 100% course content with60-70% weightage for course content (normally last three modules) covered after MSE.

Title of the Course: **Professional Elective II- Concrete Engineering (4CV333)**	L	T	P	Cr
	2	1	-	3

Desirable Courses: Civil Engineering Materials

Textbooks:

1. Gambhir, M. L., "Concrete Technology", Tata Mc Graw Hill Publishers, 2012.
2. Nevelli, A.M., "Properties of Concrete", Prentice Hall Publishers, 5th Edition, 2012.
3. Shetty, M. S., "Concrete Technology", S. Chand and Company Ltd, New Delhi, 2014.

References:

1. Indian codes- IS: 456-2000, IS: 2250-1981, IS: 516-1959, IS: 5816 -1999, IS: 4031(Part 6) - 1988.
2. Kumar Neeraj Jha, " Formwork for Concrete Structures", https://www.amazon.in/Formwork-Concrete-Structures-Kumar-Neeraj/dp/1259007332
3. Perkins P.H., "Repair, Protection and Waterproofing of Concrete Structures" Elsevier Applied Science Publishers, 1986.
4. Krishna Raju. N, "Design of Concrete Mixes", 2nd Edition, CBS Publishers and Distributors, 2009.

Course Objectives:

1. To provide knowledge of advanced technique of making of concrete, application of concrete to roads and industrial floors, precast concrete, formwork.
2. To impart the knowledge of quality control and statistics
3. To illustrate various techniques for testing and repair of concrete structures.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	**Explain** advanced technique of making of concrete, application of concrete to roads and industrial floors, precast concrete, formwork.	II	Understanding
CO2	**Assess** quality of concrete through quality assessment techniques.	V	Evaluate
CO3	**Design** the formwork for concrete structures	VI	Creating

CO-PO Mapping :

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1	**2**													**2**
CO2			**3**											**3**
CO3			**3**											**3**

Assessments :

Teacher Assessment:

Two components of In Semester Evaluation (ISE), One Mid Semester Examination (MSE) and one End Semester Examination (ESE) having 20%, 30% and 50% weights respectively.

Assessment	**Marks**
ISE 1	10
MSE	30

Title of the Course: **Mini Project 2 -Estimating and Costing (4CV 371)**	L	T	P	Cr
	0	0	2	1

Desirable Courses: Building Materials and Construction, Building Planning and Design

Textbooks:

1. Dutta, B. N., "Estimating & Costing in Civil Engineering," UBS Publishers, 28th Revised Edition, 2016.
2. Birdi G.S., "Text book of Estimating & Costing", Dhanapat Rai Sons, 7th Edition, 2015.
3. Patil B. S., "Civil Engineering Contracts & Estimates", Orient Longman Ltd., 4th Edition, 2015.

References:

1. I.S. code 1200 (Part I to XXX) B.I.S., Delhi
2. "Standard Specification Vol. I & II", PWD Maharashtra.
3. "D.S.R.", PWD Maharashtra for the recent year.

Course Objectives :

1. To develop the skills required for formulating specifications and carrying out rate analysis.
2. To provide students hands-on practice for estimating cost of civil works.
3. To impart training to use computer for estimating and costing.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	Bloom's Cognitive	
		Level	Descriptor
CO1	Formulate specifications and analyze rates for different items of work	4,6	Analyzing, creating
CO2	Estimate costs of the different civil works	4	Analyzing
CO3	Demonstrate application of computer for estimating and costing	3	Applying

CO-PO Mapping : (Use 1, 2, 3 as Correlation Strengths)

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1			**3**										**2**	**2**
CO2			**3**								**2**		**1**	**2**
CO3					**2**								**2**	

Title of the Course: **Mini Project 3- Structural Steel Design & Drawing (4CV372)**	L	T	P	Cr
	-	-	2	1

Desirable Courses: Engineering Mechanics, Solid mechanics, Design of steel structures

Textbooks:

1. Duggal S. K., "Limit state design of steel structures", Tata McGraw-Hill Publications, New Delhi, 2nd Edition, 2014.
2. Shiyekar, M. R., "Limit state design in structural steel", PHI learning Pvt. Ltd Publications 2nd Edition 2013.
3. Subramanian N., "Design of steel structures", Oxford University Press, 2010.

References:

1. Dayaratnam, P., "Design of steel structures", S. Chand Publication, New Delhi, 2008.
2. Gaylord, Edwin and Gaylord, Charles, "Design of steel structures", Tata McGraw Hill Publishing Company Ltd., New Delhi, 3rd Edition, 2010.
3. IS 800-2007 'Code of Practice for General Construction in steel', and IS 875-1987 part 1 to 5; Code of Practice for Design Loads (other than earthquake) for building structures, Bureau of Indian Standards, New Delhi.
4. SP: 6(1)- 1998, Hand Book for Structural Steel Sections.

Course Objectives :

1. To impart the knowledge of analysis and design of various steel members and their connections.
2. To demonstrate the design of practical steel structures such as industrial sheds, steel buildings etc.
3. To provide the knowledge of detailing of steel structural drawings.

Course Learning Outcomes:

CO	After the completion of the course the student should be able to	**Bloom's Cognitive**	
		Level	**Descriptor**
CO1	**Estimate** various types of loads such as Dl, LL, WL etc acting on steel structures.	IV	Analyzing
CO2	**Calculate** design forces in members of steel structures for various combinations of loads using modern tools.	V	Evaluating
CO3	**Design** various types of practical steel structures and develop detailed structural drawings.	VI	Creating

CO-PO Mapping : (Use 1, 2, 3 as Correlation Strengths)

PO	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**PSO1**	**PSO2**
CO1														**2**
CO2		**3**			**2**									**2**
CO3		**3**	**3**										**3**	**3**

Lab Assessment:

There are four components of lab assessment, LA1, LA2, LA3 and Lab ESE.

IMP: Lab ESE is a separate head of passing.

Assessment	Based on	Conducted by	Conduction and Marks Submission	Marks
LA1	Lab activities, attendance, journal	Lab Course Faculty	During Week 1 to Week 4 Submission at the end of Week 5	25
LA2	Lab activities, attendance, journal	Lab Course Faculty	During Week 5 to Week 8 Submission at the end of Week 9	25
LA3	Lab activities, attendance, journal	Lab Course Faculty	During Week 10 to Week 14 Submission at the end of Week 14	25
Lab ESE	Lab Performance and related documentation	Lab Course faculty	During Week 15 to Week 18 Submission at the end of Week 18	25

Critical depth of open cut in cohesive soil.	
Module 6: Compressibility and Consolidation of soils	**5 Hrs.**
a) **Compressibility:** Definition, compressibility of laterally confined soils. Compressibility of sand and clay. b) **Consolidation:** Terzaghi's theory of one dimensional consolidation, laboratory consolidation test, e-p and e-log p curves, determination of coefficient of volume compressibility, compression index, coefficient of consolidation, degree of consolidation, time factor, Computations of duration and magnitude for consolidation settlement.	
Module wise Outcomes At end of each module students will be able to: 1. Explain the nature and analyze the engineering behavior of soil mass. 2. Develop flow-net and analyze for quick condition, evaluate seepage quantity / seepage force / uplift pressure. 3. Explain the Soil compaction methods and apply the laboratory results to interpret field compaction. 4. Analyze and interpret the shear strength parameters for soil. 5. Analyse the earth pressure magnitudes and the depth of unsupported excavation in soils. 6. Analyse degree of consolidation.	
Tutorial One hour per week per batch tutorial is to be utilized for problem solving to ensure that students have properly learnt the topics covered in the lectures. This shall include assignment, tutorials, quiz, surprise test, declared test, seminar, final orals etc.	