Rajiv Gandhi University Of Knowledge Technologies-AP

NUZVID... RK VALLEY... SRIKAKULAM...ONGOLE

B. Tech Civil Engineering, Admitted Batch: 2020-21

RGUKT

BOARD OF STUDIES

IN

DEPARTMENT OF CIVIL ENGINEERING

RGUKT-AP

MODIFIED COURSE STRUCTURE AND SYLLABI OF B.TECH

PROGRAMME IN CIVIL ENGINEERING

Effective from the batches admitted in 2020-21 onwards

B. Tech Civil Engineering, Admitted Batch: 2020-21

CONTENTS

	(iv)	**Professional Core Courses**
		Engineering Geology
		Building Materials and Construction
		Mechanics of Materials-I
		Mechanics of Fluids
		Surveying-I
		Mechanics of Materials Lab
		Surveying Lab
		Concrete Technology
		Hydraulics Engineering
		Mechanics of Materials-II
		Structural Analysis
		Surveying-II
		Water Resources Engineering
		Hydraulics Engineering Lab
		Concrete Technology Lab
		Advanced Structural Analysis
		Design of Reinforced concrete Structures
		Environmental Engineering-I
		Environmental Engineering-II
		Estimation and Costing
		Transportation Engineering-I
		Transportation Engineering-II

		Soil Mechanics
		Soil Mechanics Lab
		Transportation Engineering Lab
		Design of Steel Structures
		Foundation Engineering
		Building Planning and Computer Aided Drawing Lab
		Environmental Engineering Lab
	(v)	**Professional Elective Courses**
		STRUCTURAL ENGINEERING
		Finite Element Method
		Stability of Structures
		Prestressed Concrete Structures
		Advanced Reinforced Concrete Structures
		Advanced Concrete Technology
		Structural Dynamics
		Bridge Engineering
		Repair and Rehabilitation of Structures
		Earthquake Resistant Design
		TRANSPORTATION ENGINEERING
		Pavement Analysis and Design
		Urban Transportation and Planning
		HYDRAULICS & WATER RESOURCES ENGINEERING
		Watershed Management

		Irrigation and Water Power Engineering
		Advanced Hydraulics
		ENVIRONMENTAL ENGINEERING
		Air Pollution and Control
		GEOTECHNICAL ENGINEERING
		Advanced Foundation Engineering
		Ground Improvement Techniques
		CONSTRUCTION ENGINEERING
		Construction Planning and Management
		Infrastructure Planning and Management
		Construction Economics and Finance
		GEOINFORMATICS
		Remote Sensing and GIS
		Environmental Geotechnics
		Sustainable Building Materials
		Functional Efficiency of Buildings
		Decision Making Methods in Civil Engineering
		Construction Safety Management
	(vi)	**Open Elective Courses**
		Electives offering from Civil Engineering
		Ground Water Hydrology
		Water Resources Systems
		Environmental Management & Impact Assessment

		Modern Construction Materials
		Green building and Landscape
		Solid and Hazardous Waste management
		Air Pollution and Control
		Civil Engineering Societal & Global Impact
	(vii)	**MOOC**
		MOOC-1
		MOOC-2
		MOOC-3
	(viii)	**Seminars/Mini Projects/Projects**
		Project-I
		Project-II
	(ix)	**Mandatory Courses**
		Aptitude and Reasoning
		Indian Constitution
		Environmental Science
		Indian Community Services
		Seminar

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Chapter-1

General, Course structure, Theme and semester-wise credit distribution

A. Definition of Credit:

1.5 Hour Lecture (L) per week	1 credit
1.5 Hour Tutorial (T) per week	1 credit
3 Hours Practical (Lab)/week	1.5 credits

B. Total number of credits: 160

C. Minimum number of contact hours/weeks per semester: 15 weeks of teaching

i. For 1 credit course: 15 contact hours per semester
ii. For 2 credit course: 30 contact hours per semester
iii. For 3 credit course: 45 contact hours per semester
iv. For 4 credit course: 60 contact hours per semester

D. Course code and definition, Abbreviations

Course Symbol	**Definitions**
PCC	Professional Core Course
PEC	Professional Elective Course
Project-1 & 2	Project
OEC	Open Electives Course
MOOC	Massive Open Online Course
MC	Mandatory Courses
SI	Summer Internship
BSC	Basic Science Course
ESC	Engineering Science Courses
HSC	Humanities and Social Sciences including Management Science
SEM	Seminar

E. Structure of Program

S.No	Category	Break up of credits
1	Basic Science Courses	17
2	Engineering Science Courses	15.5
3	Humanities and Social Sciences including Management courses	10.5
4	Professional core courses	81
5	Professional Elective courses	9
6	Open Elective courses	6
7	Massive Open Online Course	9
8	Project work, seminar and internship in industry or elsewhere	12
9	Mandatory courses [Aptitude and reasoning, Environmental Science, Indian Constitution]	(non-credit)
	Total	160

F. Semester-wise Credits Distribution

	TOTAL	E1-S1	E1-S2	E2-S1	E2-S2	E3-S1	E3-S2	E4-S1	E4-S2	SUM Intern	AICTE
BSC	**17**	8.5	8.5	0	0	0	0	0	0	0	25
ESC	**15.5**	7	8.5	0	0	0	0	0	0	0	24
HSC	**10.5**	2.5	0	3	0	1.5	1.5	0	2	0	12
PCC	**81**	0	3	18	23	20	17	0	0	0	48
PEC	**15**	0	0	0	0	0	3	9	3	0	18
OEC	**9**	0	0	0	0	0	0	3	6	0	18
MOOC	**9**	0	0	0	0	0	3	3	3	0	-
PROJECTS/ INTERNSHIP	**12**	0	0	0	0	0	0	4	5	3	15
RGUKT Proposed	**160**	**18**	**20**	**21**	**23**	**21.5**	**21.5**	**16**	**16**	**3**	
AICTE	160	17.5	20.5	21	23	21	22	15	16	**0**	

Notations:

E1-S1: First Year Engineering First Semester
E1-S2: First Year Engineering Second Semester
E2-S1: Second Year Engineering First Semester
E2-S2: Second Year Engineering Second Semester
E3-S1: Third Year Engineering First Semester
E3-S2: Third Year Engineering Second Semester
E4-S1: Fourth Year Engineering First Semester
E4-S2: Fourth Year Engineering Second Semester
SUM INTERN: Summer Internship Program

CODES:

NAME OF DEPARTMENT	**CODE**
CHEMICAL	CH
CIVIL	CE
CSE	CS
ECE	EC
MECHANICAL	ME
MME	MM
CHEMISTRY	CY
PHYSICS	PY
MATHEMATICS	MA
ENGLISH	EG
MANGEMENT	BM
BIOSCIENCE	BE

Subject	01-09(Each Semester we have max 7 subjects including MC)
Lab	81 – 89(each semester we have max 3 Lab)
Professional Elective Courses	21-50
Open Elective Courses	51-70
Massive Open Online Courses	81-90
Summer internships	91
Project-1	92
Project-2	93
Seminar (If any)	94
Mini projects (If any 3 year)	95

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CHAPTER – 2
SEMESTER-WISE STRUCTURE OF CURRICULUM

Mandatory Induction Program

3 Weeks Duration
• Physical activity • Creative Arts • Universal Human Values • Literary • Proficiency Modules • Lectures by Eminent people • Visit to local areas • Familiarization of Dept./Branch Innovations

I Year – SEMESTER – I

COURSE STRUCTURE

S. No	Category	Code	Subject Name	L-T-P	Credits
1	BSC	20CY 1102	Engineering Chemistry	**3-0-0**	**3**
2	BSC	20MA 1101	Differential Equations and Multivariable Calculus	**3-1-0**	**4**
3	ESC	20CS 1108	Programming and Data Structures	**3-0-0**	**3**
4	ESC	20CE 1114	Engineering Graphics and Computer Drafting	**1-0-3**	**2.5**
6	BSC	20CY 1182	Engineering Chemistry Lab	**0-0-3**	**1.5**
5	HSC	20EG 1181	English Language Communication Skills Lab-I	**1-0-3**	**2.5**
7	ESC	20CS 1188	Programming and Data Structures Lab	**0-0-3**	**1.5**
8	MC	20HS 1104	Aptitude and Reasoning	**2-0-0**	**0**
				Total Credits	**18**

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I Year – SEMESTER – II

COURSE STRUCTURE

S. No	Category	Code	Subject Name	L-T-P	Credits
1	BSC	20PY 1202	Engineering Physics	**3-0-0**	**3**
2	BSC	20MA 1201	Mathematical Methods	**3-1-0**	**4**
3	ESC	20EE 1209	Basic Electrical and Electronics Engineering	**3-0-0**	**3**
4	ESC	20CE 1201	Engineering Mechanics	**3-1-0**	**4**
5	PCC	20CE 1202	Engineering Geology	**3-0-0**	**3**
6	BSC	20PY 1282	Engineering Physics Lab	**0-0-3**	**1.5**
7	ESC	20ME 1285	Workshop	**0-0-3**	**1.5**
8	MC	20BE 1201	Environmental Science	**2-0-0**	**0**
				Total Credits	**20**

II Year – SEMESTER – I

COURSE STRUCTURE

S.No	Category	Code	Subject Name	L-T-P	Credits
1	HSC	20BM 2101	Management Economics and Financial Analysis	**3-0-0**	**3**
2	PCC	20CE 2101	Building Materials and Construction	**2-1-0**	**3**
3	PCC	20CE 2102	Concrete Technology	**3-0-0**	**3**
4	PCC	20CE 2103	Mechanics of Fluids	**2-1-0**	**3**
5	PCC	20CE 2104	Mechanics of Materials-I	**2-1-0**	**3**
6	PCC	20CE 2105	Surveying-I	**3-0-0**	**3**
7	PCC	20CE 2181	Mechanics of Materials Lab	**0-0-3**	**1.5**
8	PCC	20CE 2182	Surveying Lab	**0-0-3**	**1.5**
9	MC	20HS 2101	Indian Constitution	**2-0-0**	**0**
				Total Credits	**21**

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II Year – SEMESTER – II

COURSE STRUCTURE

S.No	Category	Code	Subject Name	L-T-P	Credits
1	PCC	20CE 2201	Hydraulics Engineering	**2-1-0**	**3**
2	PCC	20CE 2202	Mechanics of Materials-II	**2-1-0**	**3**
3	PCC	20CE 2203	Soil Mechanics	**3-1-0**	**4**
4	PCC	20CE 2204	Structural Analysis	**3-1-0**	**4**
5	PCC	20CE 2205	Surveying-II	**2-1-0**	**3**
6	PCC	20CE 2206	Water Resources Engineering	**2-1-0**	**3**
7	PCC	20CE 2282	Concrete Technology Lab	**0-0-3**	**1.5**
8	PCC	20CE 2281	Hydraulics Engineering Lab	**0-0-3**	**1.5**
				Total Credits	**23**

III Year – SEMESTER – I

COURSE STRUCTURE

S.No	Category	Code	Subject Name	L-T-P	Credits
1	PCC	20CE 3101	Advanced Structural Analysis	**3-1-0**	**4**
2	PCC	20CE 3102	Design of Reinforced concrete Structures	**3-1-0**	**4**
3	PCC	20CE 3103	Environmental Engineering-I	**2-1-0**	**3**
4	PCC	20CE 3104	Estimation and Costing	**2-1-0**	**3**
5	PCC	20CE 3105	Transportation Engineering-I	**2-1-0**	**3**
6	HSC	20EG 3182	English Language Communication Skills Lab-II	**0-0-3**	**1.5**
7	PCC	20CE 3181	Soil Mechanics Lab	**0-0-3**	**1.5**
8	PCC	20CE 3182	Transportation Engineering Lab	**0-0-3**	**1.5**
				Total Credits	**21.5**

III Year – SEMESTER – II

COURSE STRUCTURE

S.No	Category	Code	Subject Name	L-T-P	Credits
1	PCC	20CE 3201	Building Planning and Computer Aided Drawing Lab	**1-0-3**	**2.5**
2	PCC	20CE 3202	Design of Steel Structures	**3-1-0**	**4**
3	PCC	20CE 3203	Environmental Engineering-II	**3-0-0**	**3**
4	PCC	20CE 3204	Foundation Engineering	**2-1-0**	**3**
5	PCC	20CE 3205	Transportation Engineering-II	**2-1-0**	**3**
6	PEC	20CE 32XX	Professional Elective Course-1/ MOOC-1	**3-0-0**	**3**
7	HSC	20EG 3283	English Language Communication Skills Lab-1	**0-0-3**	**1.5**
8	PCC	20CE 3282	Environmental Engineering Lab	**0-0-3**	**1.5**
				Total Credits	**21.5**

(CE 3291-SUMMER INTERNSHIP PROJECT - 3 CREDITS

IV Year – SEMESTER – I

COURSE STRUCTURE

S.No	Category	Code	Subject Name	L-T-P	Credits
1	PEC	20CE 41 XX	Professional Elective Course-2 /MOOC-2	**3-0-0**	**3**
2	PEC	20CE 41 XX	Professional Elective Course-3	**3-0-0**	**3**
3	PEC	20CE 41 XX	Professional Elective Course-4	**3-0-0**	**3**
4	OEC	20XX 41 XX	Open Elective Course-1	**3-0-0**	**3**
5	PROJ	20CE 4191	**Project-1**	**0-0-4**	**4**
6	SEM	20CE 4194	Seminar	**0-0-4**	**0**
				Total Credits	**16**

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IV Year – SEMESTER – II

COURSE STRUCTURE

S.No	Category	Code	Subject Name	L-T-P	Credits
1	PEC	20CE 42 XX	Professional Elective Course-5	**3-0-0**	**3**
2	OEC	20CE 42 XX	Open Elective Course-2/ MOOC-3	**3-0-0**	**3**
3	OEC	20XX 42 XX	Open Elective Course-3	**3-0-0**	**3**
5	PROJ	20CE 4192	**Project-2**	**0-0-5**	**5**
6	MC	20HS 4299	Indian Community Services	**0-0-0**	**2**
				Total Credits	**16**

CREDIT DISTRIBUTION

	TOTAL	**E1-S1**	**E1-S2**	**E2-S1**	**E2-S2**	**E3-S1**	**E3-S2**	**E4-S1**	**E4-S2**	**SUM Intern**	**AICTE**
BSC	**17**	8.5	8.5	0	0	0	0	0	0	0	25
ESC	**15.5**	7	8.5	0	0	0	0	0	0	0	24
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PEC	**9**	0	0	0	0	0	0	6	3	0	18
OEC	**6**	0	0	0	0	0	0	3	3	0	18
MOOC	**9**	0	0	0	0	0	3	3	3	0	-
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RGUKT Proposed	**160**	**18**	**20**	**21**	**23**	**21.5**	**21.5**	**16**	**16**	**3**	
AICTE	160	17.5	20.5	21	23	21	22	15	16	**0**	

LIST OF PROFESSIONAL ELECTIVE COURSES

Code	Category	Course Name
		STRUCTURAL ENGINEERING
20CE XX21	PEC	Finite Element Method
20CE XX22	PEC	Stability of Structures
20CE XX23	PEC	Prestressed Concrete Structures
20CE XX24	PEC	Advanced Reinforced Concrete Structures
20CE XX25	PEC	Advanced Concrete Technology
20CE XX26	PEC	Structural Dynamics
20CE XX27	PEC	Bridge Engineering
20CE XX28	PEC	Repair and Rehabilitation of Structures
20CE XX29	PEC	Earthquake Resistant Design
		TRANSPORTATION ENGINEERING
20CE XX30	PEC	Pavement Analysis and Design
20CE XX31	PEC	Urban Transportation and Planning
		HYDRAULICS & WATER RESOURCES ENGINEERING, ENVIRONMENTAL
20CE XX32	PEC	Watershed Management
20CE XX33	PEC	Irrigation and Water Power Engineering
20CE XX34	PEC	Advanced Hydraulics
		GEOTECHNICAL ENGINEERING
20CE XX36	PEC	Advanced Foundation Engineering
20CE XX37	PEC	Ground Improvement Techniques
		CONSTRUCTION ENGINEERING
20CE XX38	PEC	Construction Planning and Management
20CE XX39	PEC	Infrastructure Planning and Management
20CE XX40	PEC	Construction Economics and Finance
		GEOINFORMATICS
20CE XX41	PEC	Remote Sensing and GIS
20CEXX42	PEC	Environmental Geotechnics
20CEXX43	PEC	Sustainable Building Materials
20CEXX44	PEC	Functional Efficiency of Buildings
20CEXX45	PEC	Decision Making Methods in Civil Engineering
20CEXX46	PEC	Construction Safety Management

LIST OF OPEN ELECTIVE COURSES		
20CE XX51	OEC	Ground Water Hydrology
20CE XX52	OEC	Water Resources Systems
20CE XX53	OEC	Environmental Management & Impact Assessment
20CE XX54	OEC	Modern Construction Materials
20CE XX55	OEC	Green building and Landscape
20CE XX56	OEC	Civil Engineering Societal & Global Impact
20CEXX57	OEC	Solid and Hazardous Waste management
20CEXX58	OEC	Air Pollution and Control
Courses offered by Civil Engineering to other Departments		
For ECE,EEE, MECH,MME & CHEM		
20CEXX14	ESC	Engineering Graphics and Computer Drafting

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**********SYLLABUS START**********

Rajiv Gandhi University Of Knowledge Technologies-AP

Constituted under the Act 18 of 2008

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Course Code	Course Name	Category	L-T-P	Credits
20CY 1102	**Engineering Chemistry**	**BSC**	**3-0-0**	**3**

Course Learning Objectives:

1. To introduce topics about distribution law phase rule, phase diagram
2. To gain the knowledge on fuels, its analysis and determining physical property of lubricants.
3. To understand potential generation from chemical reaction and corrosion methods
4. To characterize of chemical compounds by using analytical Techniques.
5. To gain knowledge on types of water and problems and solution associated with water.
6. To understand industrial preparation of commercial materials

Syllabus

UNIT-I: Distribution Law and Phase Rule (7 Hours)

Distribution Law – Nernst Distribution Law – Distribution Coefficient – Explanation and Limitations of Distribution Law - Modification of Distribution Law – Determination of Equilibrium Constant from Distribution Coefficient – Applications of Distribution Law

Phase Rule – Terms involved in Phase Rule – Types of Liquids – Derivation of Phase Rule – Phase Diagrams of One Component System (Water, CO_2 and Sulphur systems), Two Component System – Eutectic Point (Lead Silver System) and three component system. Applications of Phase Rule

UNIT- II: Fuels & Lubricants (7 Hours)

Fuels - Classification, examples, relative merits, types of coal, determination of calorific value of solid fuels, Bomb calorimeter, theoretical oxygen requirement for combustion, proximate & ultimate analysis of coal, manufacture of metallurgical coke, flue gas analysis, problems. Lubricants - Definition, theories of lubrication, characteristics of lubricants, viscosity, viscosity index, oiliness, pour point, cloud point, flash point, fire point, additives to lubricants, Solid lubricants.

UNIT- III: Electrochemistry and corrosion (7 Hours)

Overview of Fundamentals of Electrochemistry - Concentration Cells – Batteries: Dry Cell - Ni-Cd cells - Ni-Metal hydride cells- Li cells - Zinc – air cells.

Corrosion :- Definition – Theories of Corrosion (chemical & electrochemical) – Formation of galvanic cells by different metals, by concentration cells, by differential aeration and waterline corrosion – Passivity of metals – Pitting corrosion - Galvanic series – Factors which influence the rate of corrosion - Protection from corrosion – Design and material

selection – Cathodic protection - Protective coatings: – Surface preparation – Metallic (cathodic and anodic) coatings
Fuel cells: - Hydrogen Oxygen fuel cells – Methanol Oxygen fuel cells

UNIT-IV: Analytical Techniques (7 Hours)

Absorption Spectroscopy: Beer-Lambert's law and its limitations, transmittance, Absorbance, and molar absorptivity; Application of Beers-Lamberts law for simultaneous quantitative analysis of Cr in $K_2Cr_2O_7$, Mn in $KMnO_4$

Separation Techniques: Solvent extraction: Principle and process, Batch extraction, Continuous extraction and counter current extraction, Industrial Applications.

Chromatography: Classification of chromatography methods, Principles and Applications of – Paper Chromatography, Thin Layer Chromatography (TLC), Column Chromatography, Ion-exchange Chromatography, Gas Chromatography (GC), High Performance Liquid Chromatography (HPLC), Supercritical Fluid Chromatography.

UNIT- V: Water Technology (7 Hours)

Hard water:- Reasons for hardness – units of hardness - Boiler troubles – Priming and Foaming, Scale formation, Boiler corrosion, Caustic embrittlement - Internal treatments - Softening of Hard water : Lime – Soda process, Zeolite process and numerical problems based on these processes and Ion Exchange process - Water for drinking purposes- Purification – Sterilization and disinfection : Chlorination, Break point chlorination and other methods – Reverse Osmosis and Electro Dialysis.

UNIT- VI: Industrial Chemistry & Introduction to Nanotechnology (10 Hours)

Industrial Chemistry: Glass, Ceramics, Cement – Classification, ingredients and their role, Manufacture of cement and the setting process, quick setting cements
Alloys: Classification of alloys, Ferrous and Non-Ferrous alloys, Specific properties of elements in alloys.

Introduction to Nanotechnology: Introduction and classification of nanomaterials (0D, 1D, 2D, and 3D nanostructures) – Overview on synthesis of nanomaterials (Bottom-up and top-down methods) – chemical reduction, sol-gel, hydrothermal, solvothermal, ball-milling. Applications of nanotechnology in catalysis and surface coatings.

Learning resources

Text Books:

1. Physical Chemistry, Peter Atkins, Julia de Paula, 9th Edition, Oxford University Press, 2011.
2. Chemical Kinetics, Laidler, K. J., 2nd Edition, McGraw-Hill, 1965.

3. Principles of Physical Chemistry, Puri, B. R., L. R. Sharma, M. S. Pathama, Vishal Publishing Company, 2008.
4. Jain & Jain, *Engineering Chemistry*, 16th Edition, 2015

Reference Books:

1. L. N. Ferguson, Text Book of Organic Chemistry, 2nd Edition, East-West Press, 2009.
2. Vairam, *Engineering Chemistry* of Wiley India Pvt. Ltd., edition (second) 2014
3. Shilkha Agarwal, *Engineering Chemistry*, 2nd Edition, 2019
4. Kapoor, K. L., *A Textbook of Physical Chemistry*, Macmillan2000.
5. John A. Dean, Van Nostrand Reinhold, *Chemical Separation Methods*, 1969.
6. Pragati *An Introduction to Chromatography*, Publishers, 2007.
7. Sastry, M. N., *Separation Methods*, Himalaya Publications, 3rd Edition, 2005.
8. Finar, I. L., *Organic Chemistry*, Vol 1, Pearsons, 2002

Web Resoureces:

NPTEL, *Chemistry*, http://www.nptelvideos.com/chemistry/

Course outcomes: At the end of the course, the student will be able to

CO 1	Identifying factors effecting solubility and extraction method from distribution law. Phase rule enable to classify equilibrium states in terms of phases, components and degrees of freedom.
CO 2	Analyze fuel property and determine efficiency of different fuels.
	Develop ability to construct electrochemical cell and evaluate methods to prevent corrosion
CO 4	Isolation and characterize of chemical compound by chromatographic techniques.
CO 5	To gain knowledge about water problems and solution associated with water.
CO 6	To analyze Glass, ceramics,cement properties and to categorize different types of alloys

Course Nature		Theory		
Assessment Method				
Assessment Tool	Weekly tests (In semester)	Monthly tests (In semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	Course Name	Category	L-T-P	Credits
20MA 1101	**Differential Equations and Multivariable Calculus**	**BSC**	**3-1-0**	**4**

Course Learning Objectives: The objective of this course is to

1. Discuss the Solutions of first order differential equations
2. Discuss the Solutions of higher order linear differential equations
3. Understand the converge of infinite series with different tests.
4. Learn power series representation of functions and its validity
5. Understand Continuity and differentiability of multi-variable functions and its applications to discuss maximum and minimum
6. Discuss the convergence Improper integrals and apply Leibnitz rule

Course Content:

Unit – I **(10 Contact hours)**

Differential equations of first order and first degree:

Basic concepts, Variable Separable method, homogeneous differential equations, Exact differential equations, Integrating factor, Differentiable equations Reducible to exact, Linear differential equations, Bernoulli differential equations.

Unit - II **(11 Contact hours)**

Linear differential equations of higher order:

Homogenous differentiable equations, Non-homogeneous linear equations of higher order with constant coefficients with RHS term of the type $e^{ax}, sinax, cosax,$ polynomials in $x, e^{ax}\,V(x), xV(x),$ Methods of Undetermined Coefficients, Method of variation of parameters, Euler Cauchy equation.

Unit - III **(12 Contact hours)**

Sequences and Series

Definition of Sequences and convergence, Convergence of series, Comparison test, Ratio test, Root test, Absolute and Conditional convergence, Alternating series, Power series, Taylor's and Maclaurin's series.

Unit - IV **(12 Contact hours)**

Functions of several variables:

Limit, Continuity and Differentiability of functions of several variables, Partial derivatives and their geometrical interpretation, Differentials, Derivatives of Composite and Implicit functions, Chain rule, Jacobians, Derivatives of higher order, Homogeneous functions, Euler's theorem, and Harmonic functions.

Unit - V

Applications of Functions of several Variable: (8 Contact hours)

Taylor's expansion of functions of several variables, Maxima and Minima of functions of several variables - Lagrange's method of multipliers.

Unit – VI (6 Contact hours)

Beta and Gamma Function:

Beta and Gamma functions - elementary properties, Relation between Beta and gamma functions, Evaluation of Definite integral using Beta and Gamma functions, differentiation under integral sign, and differentiation of integrals with variable limits - Leibnitz rule.

Learning resources

Text book:

1. ERWIN KREYSZIG**, '***Advanced Engineering Mathematics'*, Wiley-India, 9th Edition

Reference Books:

1. TOM M. APOSTAL**,'** *Calculus, Volume II'*, Wiley-India, Second Edition,
2. R. K. JAIN AND S. R. K. IYENGAR,' *Advanced Engineering Mathematics'*, Narosa Publishers, 3rd Edition.
3. B.S.GREWAL**, '***Higher Engineering Mathematics'*, Khanna Publishers, 42nd Edition.

Web resources:

1. NPTEL, IIT- Madras, 08-June-2017, Introduction to ordinary differential equations
URL: https://nptel.ac.in/courses/111106100/12
2. NPTEL, IIT- Kanpur, 15-March-2016, Differential Calculus of Several Variables
URL: https://nptel.ac.in/courses/111104092/11
3. NPTEL, IIT- Roorkee, 22-December-2017, Multivariable Calculus
URL:https://nptel.ac.in/courses/111107108/
4. MatheMagician, 24–April-2017, Calculus - sequences and series,
URL: https://www.youtube.com/playlist?list=PLJMXXdEk8kMAeBLj14HX0fhe_LypRc4aW
5.RGUKT Course Content

Course outcomes: At the end of the course, the student will be able to

CO 1	Solve first order differential equations.
CO 2	Solve higher order linear differential equations.
CO 3	Check the convergence of infinite series with different methods
CO 4	Discuss the power series representation of a function at various points.
CO 5	Explain limits and continuity, differentiability and partial derivatives of functions of multivariable and solve the extremum problems subjected to constraints.
CO 6	Apply Leibnitz rule and beta gamma functions to evaluate improper integrals.

For Theory courses only:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CS1109	Programming and Data Structures	ESC	3-0-0	3

Course Learning Objectives

1. To deduce adequate knowledge in programming language and problem-solving techniques.
2. To develop programming skills using the fundamentals of C Language.
3. To recognize the effective usage of arrays, structures, functions, pointers
4. To implement the memory management concepts.
5. To illustrate the usage of pointers and dynamic memory allocation.
6. Explore Data Structures and its applications.

Course Content:

Unit- I: Introduction (5 hours)

Computer Hardware, Bits and Bytes, History of Programming Languages, Character Set, Variables and Identifiers, Built-in Data Types. Operators and Expressions, Constants and Literals, Simple Assignment Statement, Basic Input/output Statement, Simple 'C' Program, Conditional Statements and Loops.

Unit – II: Arrays (6 hours)

One Dimensional Arrays, Array Manipulation, Searching, Insertion, Deletion of An Element from An Array; Finding the Largest/Smallest Element in An Array; Two Dimensional Arrays, Addition/Multiplication of Two Matrices, Transpose of square Matrix, Inverse of Matrix, Character Arrays, Multi-dimensional arrays.

Unit – III: Functions (8 hours)

Function Declaration, Function Definition, Function Call, Call by Value, Call by Reference, Recursion, String Fundamentals, String Handling Functions.

Unit – IV: Structure & Union (8 hours)

Structure Variables, Initialization, Structure Assignment, Nested Structure, Structures and Functions, Structures and Arrays: Arrays of Structures, Structures Containing Arrays, Unions.

Unit – V: Pointers (9 hours)

Pointer Type Declaration, Pointer Assignment, Pointer Initialization, Pointer Arithmetic, Functions and Pointers, Arrays and Pointers, Pointer to Pointers, Dangling Memory, Dynamic Memory Allocations, Storage Classes.

Unit – VI: Data Structures (**10hours)**

Linked List, Double Linked Lists, Stack, Stack Implementation Using Arrays, Stack Implementation Using Linked List, Queues, tree traversals

Learning Resources:

Text book:

1. ReemaThareja, *'Data Structures using C'*, Oxford Higher Education,2nd Edition.

Reference Books:

1. W. Kernighan, Dennis M. Ritchie, *'C Programming Language',* Prentice Hall India Learning Private Limited, 2nd Edition.
2. Balagurusamy, *'Programming in ANSI C',*McGraw Hill Education India Private Limited; 7th Edition.
3. YashavantKanetkar, *'Let us C',* BPB Publications,14th Edition

Web resources:

1. Prof SatyadevNandakumar, NPTEL-IIT Kanpur, *'Introduction to Programming in C'*, URL: https://nptel.ac.in/syllabus/106104128/
2. Dr P PChakraborty, NPTEL-IIT Kharagpur, *'Programming and Data Structures'* URL: https://nptel.ac.in/courses/106105085/4
3. URL: https://www.tutorialspoint.com/cprogramming/

Course outcomes: At the end of the course, the student will be able to

CO 1	Illustrate the flowchart and design an algorithm for a given problem and to develop one C program using Operators.
CO 2	Develop conditional and iterative statements to write C Programs.
CO 3	Describe C Programs that use the arrays and its usage.
CO 4	Exercise user defined functions to solve real time problems.
CO 5	Describe C Programs using pointers and to allocate memory using dynamic memory management functions.
CO 6	Explore different data structures and understand.

Assessment Method

Assessment Tool	Weekly tests/Assignments (in semester)	Monthly tests (in semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 1114	Engineering Graphics and Computer Drafting	ESC	1-0-3	2.5

Course Learning Objective

1. To know about emergence of Engineering Graphics as a refined communication tool and to be aware of International and national standards of practice for uniform presentation of drawings.
2. To describe the position of a point and position of the line with respect to all the planes of projection and obtain its views.
3. To learn orthographic projections of various simple plane surfaces in simple and inclined positions.
4. To know about orthographic projections of right and regular solids in simple positions, when their axes are perpendicular to one reference plane and parallel to the other.
5. To learn about types of cutting planes and to obtain views of simple solids.
6. To learn about computer aided drafting techniques and to be familiarize with one of the most powerful software 'AutoCAD'.

Course Content:

UNIT-I: Introduction to Engineering Drawing (**Contact Hours -7)**
Introduction to Engineering drawing – Tools and Standards, Geometric Constructions, Scales, Conics and Special Curves - ellipse, parabola, hyperbola, cycloids, involutes.

UNIT-II- Orthographic projections **(Contact Hours -6)**
Introduction to orthographic projections, Projections of Points, Projection of Lines.

UNIT-III- Projection of Solids **(Contact Hours -8)**
Projection of Planes, Projections of Solids cube, prism, pyramid, cylinder, cone and sphere.

UNIT-IV: Section of solids **(Contact Hours -8)**
Sections of Solids - cube, prism, pyramid, cylinder, cone and sphere. Development of Surfaces – Parallel line method and Radial line method.

UNIT-V: Introduction to AutoCAD **(Contact Hours - 8)**
Computer Aided Design – Introduction to AutoCAD, Co-ordinate System (UCS) and their Commands, Basic Commands of Drawing and Editing, Dimensioning and Text.

UNIT-VI: Computer Graphics **(Contact Hours -8)**
Drawing practice with AutoCAD – Creating 2D Drawings of Objects from Isometric

views, Creating Isometric views form Orthographic views and Introductions to 3D drawings.

Learning Resources:

Textbooks:

1. Bhatt N.D., Panchal V.M. & Ingle P.R., (2014), *'Engineering Drawing'*, 53rd Edition, 2014, Charotar Publishing House

Reference books:

1. Shah, M.B. &Rana B.C. (2008), *'Engineering Drawing and Computer Graphics'*, Pearson Education
2. Agrawal B. & Agrawal C. M. (2012), *'Engineering Graphics'*, TMH Publication

Web resources

1. Prof Anupam Saxena, NPTEL-IIT Kanpur, 'Engineering Drawing' URL: https://nptel.ac.in/courses/112104172/
2. Prof Anupam Saxena, NPTEL-IIT Kanpur, 'Computer Aided Engineering Design'. URL:https://nptel.ac.in/syllabus/112104031/

Course outcome: After the completion of this course, the student will be able to

CO 1	Student will be aware of International and national standards of practice.
CO 2	Student will be familiar with obtaining the views of the frontal and the top surfaces of an object.
CO 3	Student will be aware of orthographic projections of right and regular solids in simple positions, when their axes are perpendicular to one reference plane and parallel to the other.
CO 4	Student will know about computer aided drafting techniques and will be familiar with one of the most powerful software ‘AutoCAD’.

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly Charts	Monthly tests (3)	End Semester Test	Total
	Average (Min 8 charts)	Best of two (Max Marks-15)	Max Marks-40	
Weightage (%)	30%	30%	40%	100%

B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CY1182	**Engineering Chemistry Lab**	**BSC**	**0-0-3**	**1.5**

Course Learning Objectives:

At the end of this course, the student will be able to

1. To understand the water quality in terms of hardness
2. To know the concentration of acid/base concentration by using titrations methods
3. To study the physical property of chemical substances
4. Estimation metal concentration in alloys and cement
5. To gain the knowledge on fuels, its analysis and determining physical property of Lubricants.

Practical Syllabus

List of Experiments:

1. Determination of temporary and permanent hardness of water using standard EDTA solution.
2. Determination of percentage of Iron in Cement sample by colorimetry.
3. Determination of percentage of copper in brass
4. Estimation of Calcium in port land Cement
5. pH-metric titrations
    a. Strong acid and strong base.
    b. Strong acid and weak base.
6. Conductometric titrations
    a. Strong acid and strong base.
    b. Strong acid and weak base.
7. Potentiometric titrations
    a. Strong acid and strong base.
    b. $K_2Cr_2O_7$ and Mohr's salt.
8. Determination of density and surface tension of liquids against air
9. Determination of viscosities of pure liquids and solutions
10. Fuel Characterization:
    a. Flash point, Fire point
    b. Ash content
11. Adsorption of oxalic acid on charcoal

Reference Books:

1. *Chemistry Practical Manual*, Lorven Publications
2. K. Mukkanti (2009) *Practical Engineering Chemistry*, B.S. Publication
3. A Textbook of *Quantitative Analysis*, Arthur J. Vogel.
4. Dr. Jyotsna Cherukuris (2012) *Laboratory Manual of engineering chemistry-II*, VGS Techno Series

Course outcomes: At the end of the course, the student will be able to

CO 1	Ability to judge water quality of different places in terms of hardness.
CO 2	Estimate unknown concentration of acid/base by using pH-metric, potentiometric and conductometric titration methods.
CO 3	Derive the physical characterization like surface tension and viscosity of chemical substances
CO 4	Find out concentration in alloys & cement
CO 5	Analyze the physical properties of different fuels

Course Nature		Practical		
Assessment Method				
Assessment Tool (In semester)	Experiments related	Record	Viva-Voce/ Quiz/MCQ/Lab project	Total
Weightage (%)	20%	10%	10%	40%
Assessment Tool (End semester)	Procedure/Description of the experiment with relevant information and Discussion on Results	Results	Viva-Voce	
Weightage (%)	30%	10%	20%	60%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20EG1181	English Language Communication Skills Lab-1	HSC	1-0-3	2.5

Course objectives:

1. To facilitate computer-aided multi-media instruction enabling individualized and independent language learning
2. To sensitize the students to the nuances of English speech sounds, word accent, intonation and rhythm
3. To provide opportunities for practice in using English in day to day situations
4. To improve the fluency in spoken English and neutralize mother tongue influence
5. To train students to use language appropriately for debate, group discussion and public speaking

COURSE CONTENT

UNIT-I: **(06 Contact Hours)**

Theory: An Ideal Family by Katherine Mansfield

Spoken Skills: Situational Dialogues – Role-play – Expressions in various situations – Self Introduction – Introducing others – Greetings – Apologies – Requests – Giving directions

UNIT-II: **(06 Contact Hours)**

Theory: Energy -Alternative sources of Energy

Panel Debate on "On-grid & off-grid support to public participation in the production of solar energy in India", Reading the Wikipedia content on "The Green New Deal". Reflective session on the prospects of "The Green New Deal in India"

Writing Skills: Letter Writing (Formal & Informal) and Hands on Session on Letter Writing

UNIT-III: **(06 Contact Hours)**

Theory: Transport - Problems & solutions

Group Discussion on "The Future of Bullet Trains in India"

PPT on "The Dedicated Freight Corridors & the Future of Indian Economy" – Introduction to Speech

Spoken Skills: Sounds – Vowels, Consonants and Diphthongs – Pronunciation Exercises (Basic Level)

UNIT-IV: **(06 Contact Hours)**

Theory: Technology - Evaluating technology

PPT on "3R: Reduce, Recycle, Reuse" - Solo Debate on "Can Block Chain Technology Mitigate the Issue of Cyber Crimes and Hacking?"

Presentation Skills: JAM –Description of Pictures, Photographs, Process, Talking about wishes, Information Transfer

UNIT-V: **(06 Contact Hours)**

Theory: Environment - Ecology versus Development

Listening Skills: Listening Activity on YouTube video on "Greening the Deserts" - Students' seminar on "Waste to Wealth: Examples from around the Globe".

UNIT-VI: **(06 Contact Hours)**

Theory: Industry - Selling products

Reading Skills: Reading the material on "4Ps: Product, Price, Place, and Promotion" Role play on "How to sell your product and services"

References:

1. Non – Detailed Text Book: Panorama – A Course on Reading published by Oxford University Press, India
2. English for engineers and technologists by Orient Black Swan
3. A Textbook of English Phonetics for Indian Students 2nd Ed T. Balasubramanian. (Macmillan), 2012.
4. Speaking English Effectively, 2nd Edition Krishna Mohan & NP Singh, 2011. (Macmillan).
5. A Hand book for English Laboratories, E.Suresh Kumar, P.Sreehari, Foundation Books,2011
6. English Pronunciation in Use. Intermediate & Advanced, Hancock, M. 2009. CUP
7. Basics of Communication in English, Soundararaj, Francis. 2012.. *New Delhi: Macmillan*
8. English Pronouncing Dictionary, Daniel Jones Current Edition with CD.Cambridge, 17th edition, 2011.

Course outcomes: At the end of the course, the student will be able to

CO 1	Understand the issues affecting the economy and environment in India and across the globe
CO 2	Develop the instinct for problem solution
CO 3	Develop the ability to collect materials on various socio-economic-technological issues and prepare PPT for presentation
CO 4	Improving listening skills
CO 5	Inculcate speaking as a behaviour by repeated practice and exposure

Assessment Method:

Course Nature: THEORY + LABORATORY

Internal Assessment (40 Marks)		**External Assessment (**60 Marks)	
Record Writing	– 10 Marks	Reading Comprehension	– 15 Marks
Attendance	– 10 Marks	Writing	– 30 Marks
Continuous Assessment (Listening – 10 Marks + Oral Presentations – 10 Marks)		Speaking (Viva-Voce)	– 15 Marks

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CS 1189	**Programming and Data Structures Lab**	**ESC**	**0-0-3**	**1.5**

Course Learning Objective:

1. Understand the basic concept of C Programming and Data Structures, its different modules that include conditional and looping expressions, Arrays, Strings, Functions, Structures, Files, Stacks and Queues
2. Acquire knowledge about the basic concept of writing a program
3. Purpose of programming language and its application in problem solving

List of Experiments

Exercise-1: Introduction to C, Conditional Statements and Loops

1. C Program to calculate the sum of Natural numbers.
2. C Program to generate multiplication table of a given number.
3. C Program to display Fibonacci sequence (Up to given number)
4. C Program to Check whether a given number is prime or not
5. C Program to make a simple Calculator using switch case
6. C Program to check whether a number is palindrome or not
7. C Program to display factors of a given number
8. C Program to print Pyramids, Triangles and various patters using loops

Exercise-2: Arrays and Sortings

1. C Program to find second largest Element of an Array
2. C Program to add two matrix using multi-dimensional arrays.
3. C Program to multiply two matrix using multi-dimensional arrays.
4. C Program to find transpose of a matrix.
5. C Program to Sort Elements of an Array using Bubble sort.
6. Using Insertion Sort, Selection Sort
7. Using Counting Sort, Bucket Sort 8. Check whether two strings are anagram of each other or not.

Exercise 3: Functions and Recursion

1. C Program to check whether given number is prime or not using user-defined function.

2. C Program to swap two integer values using call by value and call by reference.
3. C Program to find the factorial of a given number using recursion.
4. C Program to calculate length of string without using strlen() function.
5. C Program to print all permutations of a string (abc, acb, bac, bca, cab, cba)
6. C Program to sort elements in Lexicographical order (Dictionary order) using in built string functions.
7. Sorting using Merge Sort
8. Sorting using Quick Sort

Exercise-4: Structues and Unions

1. C Program using structures to read and display the information about a student.
2. C Program to read, display, add and subtract two complex numbers.
3. C Program to read and display the information of a student using nested structure
4. C Program, using an array of pointers to a structure, to read and display the data of students.
5. C Program to demonstrate arrays of Union variables.
6. C Program using structures to maintain a book library (Book is a structure) which has following operations print various types of books along with their count, author details, search a book by author name or book name or publisher.

Exercise-5: Pointers and File Handling

1. C Program to demonstrate, handling of pointers in C.
2. C Program to access array elements using pointers.
3. C Program to find the sum of n numbers with arrays and pointers.
4. C Program to swap two numbers using pointers and function
5. C Program to find sum of n elements entered by user. To perform this allocate memory dynamically using malloc() function.
6. C Program to read and write a file.
7. C Program to count number of lines and words.
8. Write a c program to copy a data of file to other file.

Exercise-6: Introduction to Data Structures

1. Write a program to create a linked list and perform insertions and deletions of all cases. Write functions to sort and finally delete the entire list at once.
2. Write a program to create a doubly linked list and perform insertions and deletions in all cases.
3. Write a program to perform push, pop and peek operations on a stack.
4. Write a program to implement a linked stack.

5. Write a program to implement a linked queue.
6. Write a program to implement binary search tree insertion.
7. Write a program to implement binary search tree traversals (pre-order, post-order, in-order).

Course outcome: After the completion of this Laboratory course, the student will be able to

CO 1	Apply and practice logical ability to solve the problems
CO 2	Understand C programming development environment, compiling, debugging, executing a program using the development environment
CO 3	Analyzing the complexity of problems, modularize the problems into small modules and then convert them into programs
CO 4	Understand and apply the in-built functions and customized functions for solving the problems
CO 5	Understand and apply the pointers, memory allocation techniques and use of files for dealing with variety of problems
CO 6	Understand and apply the structures and unions concept and solving problems on the same
CO 7	Understand the basic concepts of stacks, queues and applying the same for basic problems

Course Nature		**Practical**		
Assessment Method				
Assessment Tool (In semester)	Experiments related	Record	Viva-Voce/ Quiz/MCQ/Lab project	Total
Weightage (%)	20%	10%	10%	40%
Assessment Tool (End semester)	Procedure/Description of the experiment with relevant information and Discussion on Results	Results	Viva-Voce	
Weightage (%)	30%	10%	20%	60

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20HS 1104	Aptitude and Reasoning	MC	2-0-0	0

Course Learning Objectives:

1. To enable the students for their competitive exams
2. To enhance their capability in aptitude and reasoning.
3. To develop their reasoning skill.
4. To prepare them for all type of competitive exams

Course Contents:

Unit I: **(1.5 hours)**

Number system: Base System, Exponents, Factorials, LCM & HCF, Properties of Numbers, Remainders, Successive Divisions

Sequence & Series: Arithmetic Progression, Harmonic Progression, Geometric Progression

Unit II: **(8 hours)**

Arithmetic: Averages, Clocks& Calendars, Simple Interest & Compound Interest, Mixture & Alligations, Percentages, Profit, Loss & Discounts, Ratio & Proportion, Speed, Time & Distance, Time & Work

Algebra: Binomial Theorem, Complex Numbers, Functions, Higher Degree Equations, Inequalities, Linear Equations, Logarithm, Quadratic Equations

Unit III: **(6 hours)**

Geometry: Mensuration, Lines& Angles, Circles, Polygons, Triangles, Co-ordinate Geometry, Trigonometry

Probability & Statistics: Mean, Median & Mode, Permutation& Combination, Probability Set Theory & Venn Diagram

Unit IV: **(7 hours)**

Logical Reasoning: Logical Sequence, Premise, Assumption & Conclusion, Binary Logic, Blood Relations, Linear & Matrix Arrangement, Seating Arrangement, Coding & Decoding, Statements & Assumptions Puzzles

Analytical Reasoning: Course of Action Fact, Inference &Judgement, Logical Deduction, Statement & Assumption, Strong & Weak Arguments, Syllogism

Unit V: **(4.5 hours)**

Data Interpretation: Charts (Column, Pie & Bar), Tables Graphs (Line & Area), Venn Diagram, Data Sufficiency. Reading Comprehension

Unit VI: **(3 hours)**

Verbal Ability: Cloze Test Error Spotting, Fill in the blanks, Sentence Correction, Word Usage, Para jumbles, Paragraph Completion, Paragraph Summary

Learning resources

Text book:

1. Sarvesh K Verma, *'Quantitative Aptitude Quantum CAT'*, arihant publications
2. Arun Sharma, MeenakshiUpadhyay, *'Verbal Ability and Reading Comprehension'*, McGraw Hill publications
3. Arun Sharma, *'Data Interpretation'*, McGraw Hill publications
4. Arun Sharma, *'Logical Reasoning'*, McGraw Hill publications

Reference books:

1. Nishit K Sinha, 'Logical Reasoning and Data Interpretation', Pearson publications
2. Arun Sharma, *'Quantitative Aptitude'*, McGraw Hill publications

Web resources:

1. https://unacademy.com/

Course outcomes: At the end of the course, the student will be able to

CO 1	Improve aptitude, problem solving skills and reasoning abilities
CO 2	Improve Verbal ability skills, Data interpretation skills
CO 3	Understand the basic techniques required for solving Reading Comprehension

CO 4	Familiarize with the written tests of competitive exams, campus placements and PSUs
CO 5	Collectively solve problems in teams and group
CO 6	Adopt and acquire new techniques in solving problem

Assessment Method

Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	Nil	Nil	100	100

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20PY 1202	Engineering Physics	BSC	3-0-0	3

Course Learning Objectives:

1. To pursue the in-depth knowledge on waves and oscillations as well ultrasonic waves, its production and applications.
2. To know properties of matter and their utilization in civil engineering.
3. To know the concept of acoustic and its effect on civil constructions.
4. To get adequate knowledge on the use of functional materials
5. To get adequate knowledge on different techniques used in processing of ceramic materials.
6. To learn about effect of natural calamity on structure

Unit I: Oscillations and Waves (7 Hours)

Oscillations**:** Simple Harmonic Oscillator (SHO), Damped Oscillations, Forced Oscillations, Amplitude Resonance, Quality Factor, production of Ultrasonic waves: magnetostriction and piezoelectric methods, detection of ultrasound: acoustic grating and ultrasonic interferometer, industrial applications.

UNIT II: Properties of Matter (8 Hours)

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment – bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT III: Acoustics (8 Hours)

Classification of sound- decibel- Weber–Fechner law – Sabine's formula- derivation using growth and decay method – Absorption Coefficient and its determination –factors affecting acoustics of buildings and their remedies. Methods of sound absorptions - absorbing materials - noise and its measurements, sound insulation and its measurements.

UNIT IV: New Engineering Materials (6 Hours)

Composites - definition and classification - Fiber reinforced plastics (FRP) and fiber reinforced metals (FRM) - Metallic glasses - Shape memory alloys.

UNIT V: New Engineering Materials (Ceramics) (8 Hours)

Ceramics - Classification - Crystalline -Non Crystalline - Bonded ceramics, Manufacturing methods - Slip casting - Isostatic pressing -Gas pressure bonding - Properties - thermal, mechanical, electrical and chemical ceramic fiber -ferroelectric and ferromagnetic ceramics - High aluminium ceramics.

UNIT VI: Hazards **(8 hours)**

Seismology and Seismic waves - Earth quake ground motion - Basic concepts and estimation techniques - site effects - Cyclone and flood hazards - Fire hazards and fire protection, fire-proofing of materials.

OUTCOMES:

Upon completion of this course,

1. The student will gain knowledge on oscillation and it importance in building design.
2. the students will have knowledge on the thermal performance of buildings,
3. the students will acquire knowledge on the acoustic properties of buildings,
4. the students will gain knowledge on the properties and performance of engineeringmaterials
5. the students will gain knowledge on the ceramics materials preparation techniques use in civil engineering
6. the students will understand the hazards of buildings.

TEXT BOOKS:

1. Md. N. Khan, S. Panigrahi, '*Principles of Engineering Physics 1*' Cambridge University press 2016
2. Alexander, D. "Natural disaster", Springer (1993).
3. Budinski, K.G. & Budinski, M.K. "Engineering Materials Properties and Selection", Prentice Hall, 2009.
4. Severns, W.H. & Fellows, J.R. "Air conditioning and Refrigeration", John Wiley and Sons, London, 1988.
5. Stevens, W.R., "Building Physics: Lighting: Seeing in the Artificial Environment, Pergaman Press, 2013.

REFERENCES:

1. Gaur R.K. and Gupta S.L., Engineering Physics. Dhanpat Rai publishers, 2012.

2. Reiter, L. "Earthquake hazard analysis - Issues and insights", Columbia University Press,1991.
3. Shearer, P.M. "Introduction to Seismology", Cambridge University Press, 1999.

Course Nature	**Theory**			
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (Marks)	10	30	60	100

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20MA 1201	Mathematical Methods	BSC	3-1-0	4

Course Learning Objectives: The objective of this course is to

1. Introduce vector spaces and linear transformation.
2. Discuss Eigen values and Eigen vectors of a matrix and various properties.
3. Setup double and triple integrals to find volume and surface area.
4. Discuss directional derivatives and application of Green's, Stokes and Gauss theorems.
5. Discuss numerical methods to find the roots of transcendental equations and Interpolation.
6. Evaluate integrals by using numerical methods and solving IVP.

Course Content:

Unit – I: Linear Algebra: (12 hours)

Vector Spaces, Linear Combinations of Vectors, Linear dependence and Independence, Basis and Dimension, Linear Transformations, Matrix Representations of Linear transformation.

Unit – II: Eigen values and Eigen vectors: (8 hours)

Solving system of Homogeneous and Non-Homogeneous equations by using Gauss elimination method. Characteristic roots and Characteristic Vectors of a matrix - Cayley-Hamilton Theorem (without proof); Finding inverse and power of a matrix by Cayley-Hamilton Theorem.

Unit-III: Multiple integrals: (10 hours)

Double and triple integrals, computations of surface and volumes, Jacobeans of transformations, change of variables in double integrals, Change of Order of double integrals, integrals dependant on parameters - applications.

Unit–IV: Vector calculus: (12 hours)

Scalar and vector fields, level surfaces, directional derivative, Gradient, Curl, Divergence, Laplacian, line, surface integrals and Volume integrals, Green, Gauss and Stokes theorems (without Proof) and problems.

Unit – V: Root finding Methods and Interpolation: (10 hours)

Roots of polynomial and transcendental equations – bisection method, Regula-falsi method and Newton-Raphson method, Finite differences, Newton's forward and backward interpolation formulae.

Unit – VI: Numerical integration and numerical solution of IVP: (8 hours)

Trapezoidal rule, Simpson's 1/3rd rule and 3/8th rule for numerical integration, Solution of IVP by Euler and Runga-Kutta method.

Learning resources

Text book:

1. ERWIN KREYSZIG**, '***Advanced Engineering Mathematics'*, Wiley-India, 9th Edition.

Reference Books:

1. R. K. Jain and S. R. K. Iyengar**,** '*Advanced Engineering Mathematics',* Narosa Publishing House, New Delhi, 3rd Edition.

2**.** B.S.Grewal, '*A Text Book of Higher Engineering Mathematics'*, Khanna Publishers, 43rd Edition.

3. Gilbert Strang , 'Linear Algebra and its Applications*',* CENGAGE Learning 4th Edition.

Web resources:

1. https://onlinecourses.nptel.ac.in/noc20_ma54/preview
2. https://onlinecourses.nptel.ac.in/noc21_ma11/preview
3. RGUKT content

Course outcomes: At the end of the course, the student will be able to

CO 1	Write Matrix representation for transformations.
CO 2	Find Eigen values and Eigen vector for a Matrix.
CO 3	Setup and evaluating double and triple integrals.
CO 4	Apply Green's Stokes and Gauss Divergence Theorems.
CO 5	Approximate the roots of polynomial and transcendental equations.
CO 6	Approximate the Integral value by numerical methods and solve IVP using numerical methods.

For Theory courses only:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20EE 1209	**Basic Electrical and Electronics Engineering**	**ESC**	**3-0-0**	**3**

Course Learning Objectives

1. Impart a basic knowledge of electrical quantities such as current, voltage, power, energy and frequency to understand the impact of technology.
2. Provide knowledge for the analysis of basic DC and AC circuits used in electrical and electronic devices.
3. To explain the working principle, construction, applications of DC machines, AC machines.
4. Realize the importance of electronic devices in the present technology.
5. To understand the semi conducter devices
6. To understand the concept of transistors

Course content

Unit-I: DC Circuits: **(Contact hours: 13)**
Introduction, Basic definitions, Types of elements, Ohm's Law, Kirchhoff's Laws, Series, Parallel circuits, Star-delta and delta-star transformations, equivalent resistance calculation, Mesh and Nodal analysis, superposition theorem, thevenin's theorem and maximum power transfer theorem.

Unit-II: AC Circuits (**Contact Hours: 07)**
Single-phase: Inductive circuits, capacitive circuits, series RL, RC and RLC circuits, resonance
Three-phase: star connection and delta connection.

Unit-III: DC machines **(Contact Hours: 09)**
Generator: Principle of operation of DC Generator, EMF equation, types, applications
Motor: DC motor types, torque equation, applications, three point starter.

UNIT-IV: AC machines: **(Contact Hours: 09)**
Transformers: Principle of operation of single phase transformers, EMF equation, losses, efficiency and regulation.
Induction machine: Principle of operation of induction motor, slip-torque characteristics, applications.

UNIT-V: Semiconductor Devices **(Contact Hours: 09)**
Diode: types of semiconductors, P-N junction diode, V-I Characteristics, zener diode, Diode Applications. **Rectifiers:** Half wave, Full wave and Bridge rectifiers.

UNIT-VI: Transistors: **(Contact Hours: 07)**

PNP and NPN Junction transistor, Transistor configurations, Transistor as an amplifier

Learning Resources

Textbook

1. Kothari and Nagarath *Basic Electrical and Electronics Engineering*, TMH Publications, 2nd Edition.

Reference books

1. V.K.Mehta, S.Chand& Co Principles of *Electrical and Electronics Engineering*
2. Kothari and Nagarath*Basic Electrical Engineering*, TMH Publications, 2nd Edition.

Web Resources

1. Prof T S Natarajan, NPTEL-IIT Madras, *'Basic Electronics'*
URL: https://nptel.ac.in/courses/122106025/
2. Prof U Umanand, IISC Bangalore, *'Basic Electrical Technology'*.
URL: http://nptel.ac.in/courses/108108076/
2. Prof S Aniruddhan, IIT Madras, *'Basic Electrical Circuits'*.
URL: https://onlinecourses.nptel.ac.in/noc16_ee03

Course Outcomes

At the end of the course, the student will be able to

CO 1	Predict the behaviour of any electrical and magnetic circuits.
CO 2	Formulate and solve complex AC, DC circuits
CO 3	Identify the type of electrical machine used for that particular application
CO 4	Realize the requirement of transformers in transmission and distribution of electric power and other applications
CO 5	Utilize the semiconductor devices like diodes and transistors
CO 6	Internlink Knowledge of electrical and electronic circuits to general problems

Assessment Method

Assessment Tool	Weekly tests/Assignments (In semester)	Monthly tests (In semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 1201	ENGINEERING MECHANICS	ESC	3-1-0	4

Course Learning Objectives: The student will be able to

1. Capacity to cognize Newton laws by applying mathematics, science, and engineering
2. Ability to identify, formulate, and solve engineering problems using classical mechanics
3. Skill to apply modern engineering techniques and resources to solve complex mechanical/civil engineering activities with an understanding of the limitations.
4. Capacity to propose and conduct experiments, as well as to analyze and interpret data
5. Ability to analyze plane trusses
6. Ability to realize the Dynamic forces and their corresponding processes that influence the behavior and response of structural components

Course Content:

UNIT I: Forces &Friction (contact hours -8)

Introduction to Engineering Mechanics- basic concepts, equilibrium of forces, Triangle law of forces, polygon law of forces, Lami's theorem, forces in space. Friction-, Sliding friction and Ladder friction and applications of friction.

UNIT II: Centroid and Centre of Gravity: (contact hours-8)

Introduction-Centroid of plane figures and compound areas; centre of gravity of simple and composite objects; pappu's theorem-I and theorem –II

UNIT III: Moment of Inertia (contact hours - 12)

Introduction-Second moment of an area; polar moment of inertia; radius of gyration; transfer formula; moment of inertia of simple and composite areas; product of inertia of simple and compound objects- transfer formula for product of inertia; Mass moment of inertia of simple and compound objects - transfer formula for mass moment of inertia

UNIT IV: Analysis of Trusses (contact hours - 12)

Definition of static determinacy and indeterminacy; Analysis of statically determinate plane trusses- method of joints and sections; analysis of statically determinate space

trusses- tension coefficient method

UNITV: Kinematics **(contact hours - 10)**

Rectilinear motion; curvilinear motion-fixed axis rotation- constant and variable acceleration, equation of motion in both fixed-translation, projectiles-horizontal and inclined projection at same level and different levels, Relative-motion of two particles

UNIT VI: Kinetics **(contact hours - 10)**

Newton's second law; Translation and Fixed axis rotation; Alembert's principle; concept of work energy equation, power and efficiency, virtual work and impulse momentum equation. Introduction to type springs, introduction to vibrations.

Text Books:

1. A.K.Tayal, *Engineering Mechanics Statics and Dynamics*, 14th Edition, 2011,Umesh Publications.
2. S.Timoshenko& D.H Young *Engineering Mechanics*, 5th Edition,2013, McGraw Hill publications.

Reference Books:.

1. J. L. Meriam*Engineering Mechanics, statics,* , 6th Edn , 2006, Wiley India Pvt Ltd.
2. J. L. *Meriam Engineering Mechanics, dynamics,* 7th Edn, 2013 Wiley India Pvt Ltd.
3. I. H. Shames *Engineering Mechanics, statics and dynamics*, 4th Edition, 2005, Pearson Publications
4. F. P. Beer & E. R. *Johnston Mechanics For Engineers,* statics – 10 th Edn, 2012, McGraw Hill Publ.
5. P. Beer & E. R. Johnston *Mechanics For Engineers*, dynamics - F– 5th Edn, 2007, McGraw Hill Publ.
6. E. W. Nelson, C. L. Best & W.G. McLean,*Theory& Problems of engineering mechanics, statics & dynamics* –5th Edn, 1998 – Schaum's outline series - McGraw Hill Publ.
7. Ferdinand. L. Singer, Harper – *Collins Engineering Mechanics,* 3rd Edition, 1994, Indus Publications.
8. A Nelson *Engineering Mechanics statics and dynamics*, 1st Edition, 2009, McGraw Hill Publ.
9. S. S. Bhavikatti, K. G. Rajashekarappa*Engineering Mechanics*, 1st Edition, 2016, New age International Publishers.

Web Resources:

1. Lecture series on *Engineering Mechanics* by Prof. Manoj Harbola, Department of Physics, IIT Kanpur.NPTEL,

URL:https://www.youtube.com/watch?v=LG0YzGeAFxk&list=PL63F5D8638872CC3E

Course Outcomes: On completion of the course the student will be able to

CO1	Student can able to categorize how the Newton laws work's in Nature
CO2	One can formulate and solve the problems after understanding the classical mechanics
CO3	Capacity to understand the reasonable constrains while tackling the problems in real life
CO4	Students can capable decrypt information from charts by utilizing numerical procedures
CO5	One can comprehend the response of structure because of dynamic impact
CO6	Student can able to analyze the trusses

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 1202	ENGINEERING GEOLOGY	PCC	3-0-0	3

Course Objectives:

The student will be able to

1. Explain the failures of some civil engineering constructions.
2. Relate the types of minerals and their physical properties.
3. Demonstrate the classification of rocks and their texture.
4. Summarize the crystal systems
5. Show the concept of geological maps
6. Interpret the concept of structural geology

Course content:

UNIT- I: Introduction: **(Contact hours - 8)**

Importance of geology from Civil Engineering point of view. Brief study of case histories of failure of some Civil Engineering constructions due to geological drawbacks. Importance of Physical geology, Petrology and Structural geology.

Weathering of Rocks:

Its effect over the properties of rocks importance of weathering with reference to dams, reservoirs and tunnels weathering of common rocklike "Granite".

UNIT- II: Mineralogy **(Contact hours - 8)**

Definition of mineral, Importance of study of minerals, Different methods of study of mineral and rock, The study of physical properties of minerals and rocks for megascopic study for the following minerals and rocks. Study of physical properties of following common rock forming minerals Feldspar, Quartz, Flint, Jasper, Olivine, Augite, Hornblende, Muscovite, Biotite, Asbestos, Chlorite ,Kyanite, Garnet, Talc, Calcite. Study of other common economics minerals such as Pyrite, Hematite, Magnetite, Chrorite ,Galena ,Pyrolusite Graphite, Magnesite and Bauxite.

UNIT III: Petrology: **(Contact hours - 7)**

Definition of rock: Geological classification of rocks into igneous, Sedimentary and metamorphic rocks. Dyke sand sills, common structures and textures of igneous, Sedimentary and metamorphic rocks. Their distinguishing features, Mega scopic study of

Granite, Dolerite, Basalt, Pegmatite, Laurite, Conglomerate, Sand Stone, Shale ,Limestone, Gneiss, Schist, Quartzite, Marble and Slate.

UNIT-IV: Structural geology: **(Contact hours-7)**

Out crop, strike and dip study of common geological structures associating with the rocks such as folds, fault sun conformities, and joints - their important types. Their important CE In-situ and drift soils, common types of soils, their origin and occurrence in India, Stabilization of soils.

UNIT- V: Groundwater and Geophysics **(Contact hours-7)**

Groundwater, Importance of study of ground water, earth quake sand landslides. Geophysical studies Principles of geophysicalstudybyGravitymethods.Magnetic methods, Electrical methods, Seismic methods, Radio metric method sand geothermal method, Special importance of Electrical resistivity methods and seismic refraction methods.

UNIT V: Geology for Engineering Projects **(Contact hours-8)**

Geological Investigations - Geophysical Investigations - Remote Sensing Techniques Geological Considerations for Dam Reservoirs, Tunnels and RoadCuts - Practice in Geology - Demonstration for Clinometer, Electrical ResistivityMeter, Geological Maps - Identification of Crystals, Minerals and Rocks.

Learning resources:

Text Books:

1) K.V.G.K. Gokhale , Principals of *Engineering Geology* , 1st Edition, 2010, B.S publications.
2) N.Chennkesavulu, *Engineering Geology* ,2nd Edition, 2009,Macmilan India Pvt Ltd.,

References:

1. F.G.Bell, *Fundamental of Engineering Geology* , 2016, Butterworths Publications, New Delhi.
2. Krynine& Judd, Principles of *EngineeringGeology&Geotechnics*, 1st Edition, 2005, CBS Publishers& Distribution,

Web Resources:

1. NPTEL HRD, December 31, 2009, “http://nptel.ac.in/courses/105105106/”

Course outcomes:

After successful completion of the course, the learners would be able to…

1	Site characterization and how to collect, analyze, and report geologic data using standards in engineering practice
2	The fundamentals of the engineering properties of Earth materials.
3	Identify of rocks and their texture.
4	Estimate the crystal systems
5	Analyse the concept of geological maps
6	Understand the concept of structural geology

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course code	Course Name	Category	L-T-P	Credits
20PY1282	Engineering Physics Lab	BSC	0-0-3	1.5

Course Learning Objectives:

1. The goal of this experiment is to determine the acceleration due to gravity (g) and radius of gyration about an axis through the center of gravity by means of a compound pendulum.
2. The goal of this experiment is to determine momentum of inertia of given Flywheel.
3. The goal of this experiment is to determine dielectric constant of given material by capacitance method.
4. The goal of this experiment is to determine the radius of curvature of a Plano convex lens by Newton's Ring experiment.
5. The goal of this experiment is to determine the wavelength of laser light using Diffraction Grating
6. The goal of this experiment is to determine the Magnetic Hysteresis Loop (B-H loop) of given magnetic materials
7. The goal of this experiment is to determine the acceptance angle and Numerical Aperture of given fiber optic cable
8. The goal of this experiment is to determine the magnetic susceptibility of given paramagnetic sample
9. The goal of this experiment is to study the Hall Effect and to calculate:-(i) The Hall Coefficient (RH) (ii) The concentration of charge carriers
10. The goal of this experiment is to determine the electrical resistivity of a given Semiconductor using Four Probe method
11. The goal of this experiment is to determine the Energy Band Gap of a given Semiconductor using Four Probe method
12. The goal of this experiment is to understand the concept of the normal mode frequency and beat frequency using coupled pendulum

List of the experiments

1. Determination of 'g' by compound pendulum
2. Moment of inertia by Flywheel
3. Dielectric constant and dipole moment of molecules
4. Determination of the radius of curvature of a Plano convex lens by Newton's Ring experiment
5. Determination of the wavelength of laser light using Diffraction Grating

6. B-H Curve tracer
7. To determine the numerical aperture of a given optical fiber and hence to find its acceptance angle
8. Measurement of magnetic susceptibility by Gouy's method
9. Hall effect
10. To determine the resistivity of semiconductor by Four probe method
11. To determine the energy gap of a semiconductor
12. To determine the degree of coupling by using normal modes of coupled oscillations

Course outcomes: At the end of the course, the student will be able to

CO 1	How to determine the acceleration due to gravity (g) and radius of gyration about an axis through the center of gravity using compound pendulum.
CO 2	Learn the concept of momentum of inertial and he will able to calculate momentum of inertia of given Flywheel
CO 3	learn how to determine the dielectric constant of given material by capacitance method
CO 4	Calculate the radius of curvature of a Plano convex lens by Newton's Ring experiment
CO 5	Calculate the wavelength of laser light using Diffraction Grating and get knowledge over the phenomena of diffraction.
CO 6	Learn the concept of magnetism and student will able to determine the Magnetic Hysteresis Loop (B-H loop) of given magnetic materials
CO 7	Calculate the acceptance angle and Numerical Aperture of given fiber optic cable
CO 8	Learn how to calculate the magnetic susceptibility of given sample
CO 9	understand the concept of Hall effect and he/she will able to calculate the hall coefficient, carrier density and carrier mobility of a given semiconductor
CO 10	Learn the four probe method and its applications in determination of electrical resistivity of given semiconductor.
CO11	Determine the Energy Band Gap of a given Semiconductor
CO12	Learn how to determine normal mode frequency and beat frequency using coupled pendulum. Student will also understand the concept of coupling and energy transform from one system to other through oscillation.

B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Nature		**Practical**		
Assessment Method				
Assessment Tool	Experiments	Record	Viva-Voce/ Quiz/MCQ/Lab project	Total
Weightage (%)	25%	5%	10%	40%
End Semester Examination weightage (%)				60%

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Course code	**Course Name**	**Category**	**L-T-P**	**Credits**
20ME 1285	**Workshop**	**ESC**	**0-0-3**	**1.5**

Course Learning Objectives:

1. To understand different machining operations on different machines
2. To understand the process of preparing the mould cavity for sand casting
3. To understand the preparation and joining of metal work pieces using welding
4. To understand the preparation and assembly of work pieces using fitting
5. To make different products using sheet metal by Tin smithy operation
6. To understand the joining of wood pieces by Carpentry operation
7. To understand wiring connections in different applications

List of Experiments: (Working Hours: 3hours per experiment)

1. Plain Turning, Step Turning and Taper Turning on Lathe Machine
2. Surface Machining and Drilling operations on Milling Machine
3. Preparation of Mould Cavity using Single Piece Solid Pattern
4. Preparation of Mould Cavity using Split Piece Pattern
5. Preparation of Butt Joint using Shielded Metal Arc Welding
6. Preparation of Lap Joint using Shielded Metal Arc Welding
7. Filling the holes in a given metal work piece using Oxy-Acetylene Gas Welding
8. Preparation of ‘V’ shape joint using Fitting Operation
9. Preparation of ‘L’ shape joint using Fitting Operation
10. Preparation of Tray and Cone by Tin smithy Operation
11. Preparation of Dove tail joint by Carpentry Operation
12. Preparation of ‘T’ joint by Carpentry Operation

13. House wiring for one lamp and two lamps with single switch
14. Staircase wiring connection
15. Go Down wiring connection

Learning resources

Text books:

1. Balasubramaniam, R., "*Callister's Materials Science and Enginsseering*", Wiley India Ltd, 2014. 2nd Edition

Reference books:

1. Groover, M. P., "*Fundamentals of modern Manufacturing*", Wiley, 2011.4th Edition.
2. Rao, P. N., "*Manufacturing Technology: Foundry, Forming and Welding*", McGraw Hill, 2013. 4th Edition

Course outcomes: At the end of the course, the student will be able to

CO 1	Understand different machining operations on different machines
CO 2	Understand the process of preparing the mould cavity for sand casting
CO 3	Understand the preparation and joining of metal work pieces using welding
CO 4	Understand the preparation and assembly of work pieces using fitting
CO 5	Make different products using sheet metal by Tin smithy operation
CO 6	Understand the joining of wood pieces by Carpentry operation
CO 7	Understand wiring connections in different applications

Course Nature		**Practical**		
Assessment Method				
Assessment Tool	Experiments	Record	Viva-Voce/ Quiz/MCQ/Lab project	Total
Weightage (%)	25%	5%	10%	40%
End Semester Examination weightage (%)				60%

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Course Code	Course Name	Category	L-T-P	Credits
20BE 1201	Environmental Science	MC	2-0-0	0

Course Learning Objectives:

1. To provide knowledge about multidisciplinary nature of environment, various sources of natural energy.
2. Understanding of ecosystem structure and function etc.
3. Knowledge of biodiversity and conservation
4. Understanding of problems caused by pollution and its impact
5. Understanding about the various social issues related to environment.
6. Awareness for the Environment and human health

Course Content:

UNIT-I: The Multidisciplinary Nature of Environmental Studies and Natural Resources (9 hours)

The Multidisciplinary Nature of Environmental Studies: Definition, scope and importance; Need for public awareness.

Natural Resources: Renewable and Non-Renewable Resources

Natural resources and associated problems.

a) Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people. b) Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. c) Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies. d) Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies. e) Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. Case studies. f) Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification. Role of an individual in conservation of natural resources. Equitable use of resources for sustainable lifestyles.

UNIT-II: Ecosystems (4 hours)

Concept of an ecosystem, Structure and function of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Ecological succession, Food chains, food webs and ecological pyramids, Introduction, types, characteristic features, structure and function of the following ecosystem:-a. Forest ecosystem, b. Grassland ecosystem, c. Desert ecosystem, d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries).

UNIT-III: Biodiversity and It's Conservation (4 hours)

Introduction – Definition: genetic, species and ecosystem diversity, Biogeographical classification of India, Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values, Biodiversity at global, National and local levels, India as a mega-diversity nation, Hot-sports of biodiversity, Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

UNIT-IV: Environmental Pollution (6 hours)

Cause, effects and control measures of:-a. Air pollution, b. Water pollution, c. Soil pollution, d. Marine pollution, e. Noise pollution, f. Thermal pollution, g. Nuclear hazards, Solid waste Management: Causes, effects and control measures of urban and industrial wastes, Role of an individual in prevention of pollution, Pollution case studies, Disaster management: floods, earthquake, cyclone and landslides.

UNIT- V: Social Issues and the Environment (4 hours)

From Unsustainable to Sustainable development urban problems related to energy, Water conservation, rain water harvesting, watershed management, Resettlement and rehabilitation of people; its problems and concerns. Case Studies, Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case Studies. Wasteland reclamation, Consumerism and waste products, Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation, Public awareness.

UNIT-VI: Human Population and the Environment (3 hours)

Population growth, variation among nations, Population explosion – Family Welfare Programme, Environment and human health, Human Rights, Value Education, HIV/AIDS, Women and Child Welfare, Role of Information Technology in Environment and human health, Case Studies.

Learning Resources

Text Book:

1. Erach Bharucha, '*Textbook of Environmental studies'*, UGC

Reference Books:

1. Clark RS, '*Marine Pollution'*, Clanderson Press, Oxofrd (TB).

2. De AK, '*Environmental Chemistry'*, Wiley Eastern Ltd.

Course Outcomes: At the end of the course, the student will be able to

CO1	Well understanding about their surrounding natural resources and their conservation
CO 2	Able to understand the ecosystem food chain and habitat.
CO 3	Develop the practices for conservation of biodiversity
CO 4	To well understand the pollution courses, impact and prevention from pollution
CO 5	Able to bring about an awareness of a variety of environmental concerns.
CO 6	It attempts to create a pro-environmental attitude and a behavioral pattern in society that is based on creating sustainable lifestyles.

For Theory Courses Only:

Course Nature	**Theory**			
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20BM 2101	Managerial Economics and Financial Analysis	HSMC	3-0-0	3

Course Learning Objectives:

1. To strengthen students managerial skill.
2. To enhance the conceptual clarity in economic concepts.
3. To develop to forecasting capability.
4. It will help to produce multi-disciplinary thought.
5. It will enhance their conceptual and practical/hand on practice in accounting.
6. It will help to implement and understand the uses of ratios.

Course Contents:

Unit I: **(7 hours)**

Introduction to managerial economics, consumer behavior, demand, demand analysis, demand forecasting, supply, supply analysis.

Unit II: **(7 hours)**

Theory of production, production functions, concept of cost, cost analysis, break even analysis.

Unit III: **(7 hours)**

Market structure-monopoly, oligopoly, monopolistic, prefect market; Types of business Organizations-sole proprietorship, partnership, private ltd. Companies and public ltd. Companies, formation of company.

Unit IV: **(8 hours)**

Introduction to capital, capital sources, capital budgeting- NPV, IRR, Payback period, profitability index.

Unit V: **(8 hours)**

Introduction to financial accounting, rules of debit-credit, Double-Entry Book Keeping, Journal, Ledger, Trial Balance- Final Accounts (Trading Account, Profit and Loss Account and Balance Sheet with simple adjustments, Preparation of final account and other related accounting statements.

Unit VI: **(8 hours)**

Financial statements, comparative statement analysis, common- size statement analysis, ratio analysis, time series (only theories).

Learning resources

Text book:

1. 1. Aryasri, A. R., *Managerial Economics & Financial Analysis*, McGraw Hill, 2014.

Reference Books:

1. Siddiqui., *Managerial Economics & Financial Analysis*, 2e, New Age International Private Limited, 2017.

2. Pandey, I.M., "*Financial Management*", 11e, Vikas Publishing House, 2015.

3. Prasanna Chandra., "*Financial Management: Theory and Practice*", 9e, Mc Graw Hill Education, 2015.

Web resources:

1. Managerial Economics and Financial Analysis, Dr. Trupti , IIT Bombay
http://nptel.ac.in/courses/110101005/

Course outcomes: At the end of the course, the student will be able to

CO 1	A student will be able to understand basic economics as well as management concepts.
CO 2	This subject will provide implication facilities of concepts.
CO 3	Students can be able to do primary data collection and classification.
CO 4	Students can also be able to forecast as well as generate trend series by utilizing the available secondary data.
CO 5	They have basic knowledge about accounting and its terminologies.
CO 6	They will be able to prepare and understand accounting tables.

For Theory courses only:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 2101	BUILDING MATERIALS AND CONSTRUCTION	PCC	3-0-0	3

COURSE OBJECTIVES:

The student can be able to

1. Identify and Understand the basic building materials and their functional and mechanical properties
2. Classify different type of building materials and their practical applications.
3. Understand the details of masonry construction and flat roofs and information about various types of structural elements - foundation, columns, beams, walls, sloped and flat roofs.
4. Realize various types of finishing works plastering, painting, varnishes and importance.
5. To perceive the elements of buildings structural & functional.
6. Understand the super structure and sub structure of a building.

Course Content:

UNIT -I: Introduction To Building Materials (Contact Hours: 06)

Functions of buildings – Types of building materials – Sustainable materials in construction - Regulations & Standards – Fundamental properties and selection of materials.

UNIT –II: Masonry Products & Concrete (Contact Hours: 10)

Building stones – classification, processing, characteristics, durability aspects, tests, application and selection, preservation etc.

Bricks – classification, manufacturing, characteristics, durability aspects, tests, application and selection, sustainability aspects, laying etc.

Limes – Cementing action, manufacturing, slaking, storage, properties, classification, tests, applications etc.

Mortars – Classification, preparation, strength, tests, applications etc.

Concrete – Constituent materials, properties, characteristics, tests, production, properties, masonry units etc.

UNIT –III: Other Building Materials (Contact Hours: 06)

Timber, Glass, Ceramics, Plastics & Metals Introduction – characteristics - manufacturing – classification, applications.

UNIT –IV: Elements of Building Construction –I (Contact Hours: 10)

Foundations, Masonry walls, Framed Buildings Vs. Load bearing wall construction, Lintels & Arches- Definition, function and classification of lintels, Balconies, chejja and canopy. Arches; Elements and Stability of an Arch. Flooring & Roofing – Floors; Requirement of good floor, Components of ground floor, Selection of flooring material, Laying of Concrete, Mosaic, Marble, Granite, Tile flooring, Cladding of tiles. Roof;- Requirement of good roof, Types of roof, Elements of a pitched roof, Trussed roof, King post Truss, Queen Post Truss, Steel Truss, Different roofing materials, R.C.C. Roof.

UNIT –V: Elements of Building Construction -II (Contact Hours: 08)

Doors, Windows & Ventilators: Location of doors and windows, technical terms, Materials for doors and windows, Paneled door, Flush door, Collapsible door, Rolling shutter, PVC Door, Paneled and glazed Window, Bay Window, French window. Ventilators. Sizes as per IS recommendations

Stairs: Definitions, technical terms and types of stairs, Requirements of good stairs. Geometrical design of RCC doglegged and open-well stairs.

UNIT –VI: Finishing Works and special materials (Contact Hours: 06), Plastering & Pointing, Damp Proof Course, Water proofing, Paints, Distempers, Varnishes, Asphalt, Bitumen & Tar, Thermal & Sound insulating materials. Scaffolding, Centering and Form work for concrete structures.

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1	Perceive various elements of building Construction and their significance
CO2	Understand the tests of basic building materials and interpretation of the results
CO3	Analyze suitability of all the building materials – selection criterion
CO4	Understand the finishing works of buildings

CO5	Getting knowledge of special materials and their applications
CO6	Selection of materials based on functional requirement

Learning Resources:

Text books:

1. M.L. Gambhir. – Tata Mc. "*Building Materials*" GrawHillPublishers, New Delhi.
2. Dr. B.C.Punmia ,*Building Construction* , Laxmi Publications (P) Ltd., New Delhi, 11th Edition 2016.

Reference books:

1. S.C.Rangwala, *Building Construction*, Charotar Publishing House Pvt.Ltd., 2009, Gujarat

2. P C Varghese, "Building Material", PHI Learning Pvt. Ltd, Eighth Printing, 2012.

Web Resources:

1. IIT Delhi, December 31 2009, "*Building Materials and Construction*" URL: http://nptel.ac.in/courses/105102088/

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests/Assignments (In Semester)	Monthly tests (In Semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 2102	CONCRETE TECHNOLOGY	PCC	3-0-0	3

Course Learning Objectives: The student will able

1. Define the concepts of Concrete production and its behavior in various environments.
2. Distinguish about different types of concrete
3. Identify the production and quality control of concrete
4. Analyze the test procedures for the determination of properties of concrete.
5. Demonstrate durability properties of concrete in various environments.
6. Evaluate the mix design of concrete

Course Content:

UNIT I: Concrete-Significance –Constituents (Contact Hours:8)

History and significance of concrete as a sustainable construction material, Concrete Constituent Materials: Cement- Manufacturing –Basic Cement Chemistry – Hydration – Classification – Tests Aggregate – Classification – Characteristics & Properties of aggregates – Tests on aggregates and their significance – Grading – Fineness Modulus Water – Mixing water, Curing Water – Tests of water

UNIT II: Admixtures & Fresh Concrete (Contact Hours:8)

Admixtures – Classifications – Mineral Admixtures, Chemical Admixtures - Functions – Applications Fresh Concrete: Workability – definition, tests and interpretation, Rheology of fresh concrete, Effect of constituent materials on workability

UNIT III: F Hardened Concrete (Contact Hours:6)

Strength criterion, behavior under compressive strength. Factors affecting strength of hardened concrete*:* porosity, gel-space ratio, total voids in concrete, w/c ratio, degree of compaction, age etc. Elasticity, Shrinkage and creep of concrete Introduction to durability issues in concrete

UNIT IV: Production of concrete and quality control (Contact Hours:8)

Batching of materials, Mixing of concrete materials, transpiration, RMC, placing, compaction, finishing and curing, form work. Factors causing variations in concrete quality, field control, advantages of quality control, statistical quality control.

UNIT V: Proportioning of concrete mixes (Contact Hours:8)

Basic considerations, factors influencing choice of mix design proportions, methods of concrete mix designing – IS method (as per IS 10262: 2019), ACI method, British DoE method

UNIT VI: Special Concretes **(Contact Hours:7)**

Lightweight Concrete – Vacuum Concrete - Mass Concrete – Roller Compacted Concrete – Self Compacting Concrete - Fibre Reinforced Concrete – High Performance Concrete – Pre-Cast Concrete – 3D Printing of Concrete -Functions & Applications

Learning Resources:

Text Books:

1. M.L. Gambhir "*Concrete Technology Theory and Practice*" 5th Edition, 2017, McGrah Hill Education (India) Private Limited, 5th Edition.

Reference Books:

1. M.S SHETTY " *Concrete Technology Theory and Practice*" 8th Edition, 2018,S Chand Publications
2. A.M. Niveli& JJ Brooks "*Concrete Technology*" Pearson Education, 2nd Edition, 2010.

Web Resources:

1. NPTEL course on "*Concrete technology*"
   URL; **http://nptel.ac.in/courses/105/102/105102012/**
2. NPTEL course on "*Concrete Engineering technology*"
   URL; **http://nptel.ac.in/courses/105/104/105104030/**

Course Outcomes: Upon successful completion of the course, the student will be able to

CO1	Understand the basic concepts of concrete and realize the importance of quality of concrete.
CO2	Familiarize the basic ingredients of concrete and their role in the production of Concrete.
CO3	Test the fresh concrete properties and the hardened concrete properties and evaluate the ingredients of concrete through lab test results.
CO4	Familiarize the basic concepts of special concrete and their production.
CO5	Understand the behavior of concrete in various environments
CO6	Design the concrete mix by IS method

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests/Assignments (In Semester)	Monthly tests (In Semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 2103	MECHANICS OF FLUIDS	PCC	2-1-0	3

Course Learning Objectives: On completion of the course the student will be able to

1. To learn the importance, application and inter-relationship of various properties of fluid like mass density, viscosity and surface tension
2. To determine the forces on plane and curved surfaces in a fluid at rest and the concepts of buoyancy and metacentre.
3. To study the properties of a moving fluid like velocity and acceleration and the forces on fluid through the continuity equation, Euler's and Bernoulli's equations
4. To study the laminar and turbulent flow in pipes, major and minor losses in pipes.
5. To develop the principles and equations for pressure flow and momentum analysis
6. To study boundary layer along thin plate and its transition

Course Content:

UNIT-I: Introduction **(Contact hours: 7)**

Dimensions and units – Physical properties of fluids specific gravity, viscosity, surface tension, vapor pressure and their influences on fluid motion.

UNIT-II: Hydro Statics **(Contact hours: 8)**

Pressure at a point, Pascal‟s law, Hydrostatic law - atmospheric, gauge and vacuum pressure- measurement of pressure. Pressure gauges, Manometers: differential and Micro Manometers. Hydrostatic forces on submerged plane, Horizontal, Vertical, inclined and curved surfaces – Center of pressure. Derivations and problems. Buoyancy- Meta centric height, conditions of Equilibrium of submerged Bodies.

UNIT-III: Fluid Kinematics **(Contact hours: 8)**

Description of fluid flow, Stream line, path line and streak lines and stream tube. Classification of flows : Steady, unsteady, uniform, non-uniform, laminar, turbulent, rotational and irrotational flows – Equation of continuity for one, two , three dimensional flows – stream and velocity potential functions, flow net analysis.

UNIT-IV: Fluid Dynamics **(Contact hours: 8)**

Surface and body forces – Euler's and Bernoull's equations for flow along a stream line for 3-D flow, (Navier – stokes equations, Momentum equation and its application – forces on pipe bend. **Measurement of Flow:** Pitot tube, Venturi meter and orifice meter –

classification of orifices, flow over rectangular, triangular and trapezoidal and Stepped notches - –Broad crested weirs.

UNIT-V: Closed Conduit Flow **(Contact hours: 7)**

Laws of Fluid friction – Darcy's equation, Minor losses – pipes in series – pipes in parallel – Total energy line and hydraulic gradient line.Pipe network problems, variation of friction factor with Reynold's number – Moody"sChart.Characteristics of Laminar & Turbulent flows. Flow between parallel plates, Flow through long tubes, flow through inclined tubes.

UNIT-VI: Boundary Layer Theory **(Contact hours: 7)**

Boundary layer – concepts, Prandtl contribution, characteristics of boundary layer along a thin flat plate, Von-karman momentum integral equation, laminar and turbulent Boundary layers no deviations BL in transition, separation of BL, control of BL, Flow around submerged objects-Drag and Lift- Magnus effect.

COURSE OUTCOMES: At the end of the course, student will be able to

CO1	Identify how properties of fluids change with temperature and their affect on pressure and fluid flow
CO2	Describe fluid pressure and its measurement
CO3	Define the relationship between pressure and elevation as it relates to manometers, barometers and other pressure measuring devices.
CO4	Calculate forces on a plane submerged in a static fluid
CO5	Use the general energy equation to calculate changes in fluid flow for circular and non-circular pipes for in-compressible fluids.
CO6	Derive energy, momentum and displacement thickness for any type of fluid

Learning Resources:

Text Book:

1. P.N.Modi and S.M.Seth., *Hydrualics and Fluid Mechanics*, 21st Edition, 2017, Standard Book House,1995.

Reference Books:

1. C.S.P Ojha, R. Berndtsson, P.N Chandrmouli "*Fluid Mechanics and machinery*", 1st Edition, 2010, Oxford University Press Publishers.
2. K.L Kumar, *Engineering Fluid Mechanics*, Eurasia Publishing House PVT Ltd, NewDelhi,2009.

3. *Fluid Mechanics and Hydraulic Machines*, Dr. R. K. Bansal, 10th Edition, 2018, Lakshmi Publications.
4. K Srinivasa Raju and D. Nagesh Kumar, "Fluid Mechanics- Problem Solving using MATLAB", 2020, PHI Learning Pvt. Ltd.

Web Resources:

1. IIT Bombay, December 31 2009, '*Fluid Mechanics*', URL: https://nptel.ac.in/courses/105101082/1
2. IIT Guwahati, December 31 2009, '*Fluid Mechanics*', URL: https://nptel.ac.in/courses/105103095/3

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests/Assignments (In Semester)	Monthly tests (In Semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 2104	MECHANICS OF MATERIALS-1	PCC	2-1-0	3

Course Objectives: The student will be able to

1. Determine the stress, strain, and deflection in structural elements when subjected to different loads.
2. Evaluate the principal stress and principal plane in material subjected to load
3. Give preliminary concepts of assessment of bending moment and shear force in Propped cantilevers, fixed beams and continuous beams due to various loading conditions.
4. Impart concepts of Bending Moment and Shear force for beams with different boundary and loading conditions
5. Evaluate flexural and shear stresses in elements when subjected to transverse loads
6. Demonstrate concept of torsion in circular shafts.

Course Content:

UNIT-I: Simple Stresses and Strains: (Contact Hours - 6)

Normal stress, shear stress, state of stress at a point, ultimate strength, allowable stress, factor of safety, normal strain, shear strain, Poisson's ratio, Hooke's law, stress-strain characteristics for mild steel.

UNIT-II: Axial Stress-Strain and Strain Energy: (Contact Hours - 6)

Elastic moduli and the relationship between them, Bars of varying section, temperature stresses, composite bars, Strain energy, Resilience, Gradual, sudden, impact and shock loadings.

UNIT-III: Principal Stresses and Strains (Contact Hours - 8)

Normal and tangential stresses on an inclined plane for biaxial stresses, Two perpendicular normal stresses accompanied by a state of simple shear, Mohr's circle of stresses, Principal stresses and strains, Analytical and graphical solutions.

UNIT-IV: Shear Force and Bending Moment: (Contact Hours - 10)

Definition of beam, Types of beams, Concept of shear force and bending moment, S.F and B.M diagrams for cantilever, simply supported and overhanging beams subjected to point loads, uniformly distributed load uniformly varying loads and combination of these loads, Point of contra flexure, Relation between S.F., B.M and rate of loading at a section of a beam.

UNIT-V: Flexural Stresses & Shear Stresses (Contact Hours - 8)

Theory of simple bending, Assumptions, Derivation of bending equation: M/I =f/y = E/R, Neutral axis, Determination of bending stresses, Section modulus of rectangular and circular sections (Solid and Hollow), I,T, Angle and Channel sections. Derivation of formula, Shear stress distribution across various beam sections like rectangular, circular, triangular, I, T angle sections.

UNIT-VI: Torsion of Circular Shafts: (Contact Hours - 7)

Theory of pure torsion, Torsion equation, Assumptions made in the theory, Theory of pure torsion, Torsional moment of resistance, Polar section modulus, Power transmitted by shafts, Combined bending and torsion and end thrust.

Learning Resources:

Text Books:

1. Beer, F.P., and Johnston, JR, E.R., "*Mechanics of Materials*", 7th Edition, 2014, McGraw Hill, 1992.
2. S. Ramamrutham&B.Narayanan, "*Strength of Materials*", 18th Edition, 2014, DhanpatRai Publishing Company Pvt Ltd.,

Reference Books:

1. Popov, E.P., *Mechanics of Materials*, 2nd Edition, 2015, Prentice Hall of India Private Limited, 1976.
2. Punmia B C, *Mechanics of Materials*, Revised Edition, 2017, Laxmi Publications Ltd, New Delhi
3. Hibbeler, R.C., "*Mechanics of Materials*", 10th Edition, 2016, Pearson Education, Low Price Edition, 2007
4.Bansal, R.K., "*Strength of Materials*", 6th Edition, 2018, Laxmi Publications (P) Ltd., 2007

Web Resources:

1. NPTEL, December 31 2009, "*strength of materials"*URL:http://nptel.ac.in/courses/105105108/

Course Outcomes: On completion of the course the student will be able to

CO1	Define the fundamental concepts of stress and strain and the relationship between both through the strain-stress equations in order to solve problems for simple tridimensional elastic solids.
CO2	Demonstrate the concept of strain energy
CO3	Evaluate principal stresses and strains in a loaded structure
CO4	Analyze and represent the stress diagrams in bars and simple structures
CO5	Examine the problems relating to pure and non-uniform bending of beams and other simple structures
CO6	Determine the torsional deformation of bars and other simple tri-dimensional structures

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests/Assignments (In Semester)	Monthly tests (In Semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course code	Course name	Course Category	L-T-P	Credits
20CE 2105	**SURVEYING – I**	**PCC**	**3-0-0**	**3**

COURSE OBJECTIVES:

The student can able to,

1. Explain the basic principles of surveying.
2. Distinguish the various methods of linear and angles measuring instruments and enable the students to use surveying equipments.
3. Identify the different methods of Plane table Surveying
4. Demonstrate the Levelling and different methods of levelling.
5. Examine the Contouring and methods of contouring.
6. Demonstrate the Tacheometry and various tacheometry methods

Course Content:

UNIT–I: Introduction to Surveying (Contact Hours: 10)

Classification of surveying-Principles of Surveying-Linear measurements, direct measurement. Problems on Base line measurement- -Offsets-Basic problems in chaining-obstacles in chaining-Problems. Errors and corrections to linear measurements. Introduction to compass survey Definitions of Bearing. True bearing, True meridian, Magnetic Meridian, Magnetic bearing. F.B. & B.B of lines – Designation of bearings – W.C.B. & R.B. – related problems. Theory of Magnetic compass (i.e. Prismatic compass) – Magnetic dip-Description of Prismatic Temporary adjustments of compass-Magnetic Declination – Local attraction-Related Problems-Errors in compass survey.

UNIT- II: Plane table surveying (Contact Hours:6)

Introduction-Advantages accessories-Temporary adjustment. Methods of plane tabling-Plane table traversing-Three point problem – Mechanical method – Two point problem-Errors in plane tabling.

UNIT- III: Levelling (Contact Hours: 7)

Definitions of terms-Methods of levelling-Uses and adjustments of dumpy level-Temporary and permanent adjustments of dumpy level leveling, Differential leveling, profile leveling, Reciprocal leveling, H.I. method-Rise and fall method-Checks-Related problems- Reciprocal levelling-Related problems-L.S & C.S Levelling-Problems in levelling-Errors in levelling.

UNIT-IV: Contouring (Contact Hours: 7)

Definitions-Interval, Characteristics of contours- methods of locating contours-Direct and indirect methods-Interpolation of contours-Contour gradient- Uses of contour maps. Introduction to Auto Level.

UNIT-V: Theodolite **(Contact Hours: 8)**

Types of Theodolites – Temporary Adjustments, Measurement of horizontal angle – Method of repetition, Method of reiteration – Uses of Theodolites, Introduction to Total Station. Parts of a total Station – Accessories –Advantages and Applications. Open and closed traverse – Closing errors, balancing the error – Bowditch method – Transit method, omitted measurements – Gales traverse table.

UNIT-VI: Tacheometry **(Contact Hours: 7)**

Principle of tachometry – Stadia methods – Fixed hair method – Movable hair method – Tangential method – Reduction diagrams

Line Ranger, Optical Square, Abney level and Clinometer, Ceylon Ghat tracer, Pantagraph, Sextant and Planimeter.

COURSE OUTCOMES:

Upon successful completion of the course, the student will be able to

1	Demonstrate the basic surveying skills
2	Use various surveying instruments.
3	Perform different methods of surveying
4	Compute various data required for various methods of surveying.
5	Integrate the knowledge of contouring and methods of contouring
6	Carryout trigonometric levelling

Learning Resources:

Text Books:

1. Dr. K.R. Arora, *Surveying Vo.I*, 16th edition, 2018, Standard Book House.
2. B.C. Punmia, *Surveying Vol.I*, 17th Edition, 2016, Lakshmi Publications.
3. S.K.Duggal, *Surveying Vol.I*, 4th Edition, 2017,TataMcgraw Hill Education.

Web Resources:

1. IIT Kanpur, December 31 2009, "*Surveying*" URL: http://www.nptelvideos.in/2012/11/surveying.html.

Course Nature	**Theory**			
Assessment Method				
Assessment Tool	Weekly tests/Assignments (In Semester)	Monthly tests (In Semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course code	Course Name	Category	L-T-P	Credits
20CE 2181	**MECHANICS OF MATERIALS LAB**	**PCC**	**0-0-3**	**1.5**

Course Objectives/ Outcomes:

On completion of the course the student will be able to

1. understand the behaviour of stress vs. strain characteristics of mild steel
2. Evaluate impact strength of material
3. Understand basic concepts of stress, strain and their relations based on linear elasticity.
4. Evaluate elastic, rigidity modulus of materials.
5. Understand how to determine hardness of different materials
6. Understand the shear strength of material

LIST OF EXPERIMENTS:

1. Stress-Strain characteristics of mild steel bar in tension
2. Stress-Strain characteristics TMT bar in tension
3. Torsion test on mild steel
4. Brinell hardness test
5. Rockwell hardness test
6. Spring test
7. Izod Impact test
8. Charpy Impact test
9. Shear test- Single shear & Double Shear
10. Flexural Testing Machine on Steel I Section

Course Nature		**Practical**		
Assessment Method				
Assessment Tool (In semester)	Experiments related	Record	Viva-Voce/ Quiz/MCQ/Lab project	Total
Weightage (%)	20%	10%	10%	40%
Assessment Tool (End semester)	Procedure/Description of the experiment with relevant information and Discussion on Results	Results	Viva-Voce	
Weightage (%)	30%	10%	20%	60%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course code	Course name	Category	L-T-P	Credits
20CE 2182	SURVEYING LAB	PCC	0-0-3	1.5

Course Objectives /Course Outcomes:

On completion of the course the student will be able to

1. Explain the Survey of an area by chain survey (closed traverse) & plotting, Chaining across obstacles.
2. Determine of distance between two inaccessible points with compass
3. Survey of an area by prismatic compass & Surveyor compass (closed traverse) and plotting after adjustment.
4. Estimate plane table survey by Radiation method, intersection methods
5. Estimate plane table survey by traversing
6. Determine the Levelling by Height of instrument and Rise and Fall method.
7. Evaluate the horizontal and vertical angle using theodolite.
8. Estimate Area, angles using Total Station

List of Experiments:

1. Introduction of instruments used for chain survey, Measurement of distance by ranging and chaining
2. Distance between two inaccessible points using compass
3. Compass traversing, Closing error correction – Closed traverse (Local Attraction)
4. Plane Table Traversing- Radiation Method &Intersection Method
5. Plane Table Traversing- two point and three Point problem
6. Fly leveling – Height of Instrument method and Rise and Fall method
7. Longitudinal and Cross sectional leveling
8. Contour plan of a given area – Direct method and Grid method
9. Measurement of Horizontal and vertical angles by Theodolite
10. Trigonometric levelling – Height and Distance problem
11. Curve Setting- different methods
12. Determination Area, Contouring, Traversing using Total station
13. Determination of remote height using total station
14. Distance, Gradient, diff, height between two inaccessible points using total station.

Course Nature		**Practical**		
Assessment Method				
Assessment Tool (In semester)	Experiments related	Record	Viva-Voce/ Quiz/MCQ/Lab project	Total
Weightage (%)	20%	10%	10%	40%

Assessment Tool (End semester)	Procedure/Description of the experiment with relevant information and Discussion on Results	Results	Viva-Voce	
Weightage (%)	30%	10%	20%	60%

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Course code	Course Name	Category	L-T-P	Credits
20HS 2201	**INDIAN CONSTITUTION**	**MC**	**2-0-0**	**0**

Course Learning Objectives:

1. The basic objective of the course is to provide knowledge about institutions

2. It help to understand the processes to governing the society in a systematic way.

3. It helps to establish social Justice, Liberty, Equity and Fraternity.

4. The course will introduce the idea of political system in general

5. It provides idea about working process of constitutional institutions.

6. To create awareness about the functioning of the judicial system in India.

Course Contents:

UNIT I: **(5 hours)**

Introduction-Constitution' meaning of the term, Indian constitution sources and constitutional history, Features: Citizenship, Preamble, Fundamental Rights and duties, Directive Principles of State Policy.

UNIT II: **(5 hours)**

Union Government and its Administration-Structure of the Indian Union: Federalism, centre-state relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Loksabha, Rajyasabha.

UNIT III: **(5 hours)**

Election commission-Election commission: Role and functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

UNIT IV: **(3 hours)**

State Government and its Administration- Governor: Role and position, CM and Council of ministers, state secretariat: Organization, structure and functions.

UNIT V: **(7 hours)**

Local Administration-District's Administration head: Role and importance, Municipalities: Introduction, Mayor and role of Elected Representatives, CEO of Municipal Corporation, Panchayati raj: Introduction, PRI: Zilla Panchayat, Elected officials and their roles, CEO Zilla Panchayat: Position and role, Block level: Organizational Hierarchy (different departments), Village level: Role of elected and appointed officials, Importance of grass root democracy.

UNIT VI: **(5 hours)**

Union Judiciary-Establishment and constitution of Supreme court, Appointment of Judges, Establishment of State High court, Establishment of common High court for 2 or more states, WRITS, PIL(Public Interest Litigation).

Learning resources

Text book:

1. Durga Das Basu,*Constitutions of India*, 23rded, LexisNexis Publication.

Reference Books:

1.'Indian Polity' by Laxmikanth

2.'Indian Administration' by SubhashKashyap

4.'Indian Administration' by Avasti and Avasti

5.'Government and Politics of India' by W.H.Mrrison Jones

6.'Constitution of India' by J.C.Johari

Course outcomes: At the end of the course, the student will be able to

CO 1	The students will understand their fundamental rules and duties.
CO 2	The students will learn the political system and the system of elections in India.

CO 3	It is to provide the students the institutions and processes to govern themselves in the manner they prefer.
CO 4	Students can also be able to utilize the laws and facilities provided by constution
CO 5	It will provide over all idea about our legal system.
CO 6	It will enable students more strong in terms of law and practice in day to day life.

For Theory courses only:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	0	0	0	0

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 2201	HYDRAULICS ENGINEERING	PCC	2-1-0	3

Course Learning Objectives:

1. To discuss the physical processes of fluid flow analytically and empirically
2. To classify the types of flows in open channel and to design open channel sections in a most economical way with minimum wetted perimeter.
3. To develop gradually varied flow profiles for different slopes
4. To study about non-uniform flows in open channels and to learn about the characteristics of hydraulic jump.
5. To understand the waves and surges in unsteady flow situation
6. To impart the knowledge about various hydraulic turbines and pumps

Course Content:

UNIT-I: Free Surface Flows (Contact hours: 7)

Introduction, Channels and their Geometric properties, Pipe flow and free surface flow, continuity equation, energy in free surface flow. Velocity measurement and distribution, discharge measurement by velocity-area method. Continuity and Momentum equation

UNIT-II: Uniform Flow (Contact hours: 8)

Resistance flow formula, Velocity distribution, Equivalent roughness coefficient, Velocity coefficients, Uniform flow in rigid boundary channel, Uniform flow in mobile boundary channel, normal and critical slopes

Energy and Momentum Principle - Concept of Specific Energy, Critical Depth, Alternate depth, Specific Force, Sequent depth.

UNIT-III: Non-Uniform Flow (Contact hours: 9)

Gradually Varied Flow – basic assumptions – dynamic equation for Gradually Varied Flow, characteristics of flow profiles in prismatic channels. Computation of length of back water curve - standard step method, direct step method Computation of back water profile using spread sheet.

UNIT-IV: Rapidly Varied flow (Contact hours: 7)

Characteristics of the flow – hydraulic jump – initial and sequent depths; Non-dimensional equation, practical applications of hydraulic jump; types of jump in horizontal floor, basic

characteristics of the jump – energy loss, efficiency and jump as energy dissipater, stilling basins

UNIT-V: Unsteady Flow **(Contact hours: 6)**

Rapidly Varied Unsteady flow and Gradually Varied Unsteady flow – Introduction to surges and types of shallow water waves. Introduction to transient flow.

UNIT-VI: Hydraulic Machines **(Contact hours: 8)**

Fundamentals of hydraulic turbine theory; Turbine performance characteristics and selection of turbines; Design of radial flow and axial flow turbines and Pelton turbines; Draft tube theory, specific speed; Fundamentals of Rotodynamic pumps – types, advantages, working, volute and whirl pool chambers, velocity triangles for pumps, NPSH and specific speed

COURSE OUTCOMES: At the end of the course, student will be able to	
1	Understand and be able to use the energy and momentum equations.
2	Become familiar with open channel cross sections, hydro-static pressure distribution and Manning's law
3	Determine water surface profiles for gradually varied flow in open channels
4	Estimate the energy dissipation and sequent depth for a hydraulic jump
5	Flood waves/surges magnitude travelling towards upstream/downstream direction
6	To be familiar with different types of turbines and their efficiencies.

Learning Resources:

Texts Book:

1. K.Subramanya, *Flow in Open Channels*, 3rd Edition, 2008, Tata McGraw Hill Publication co. Ltd. New Delhi, 1992

Reference Books:

1. P.N. Modi and S.M. Seth, *Hydraulics and Fluid Mechanics*, 21st Edition, 2017, Standard Book House, 1998
2. V.T. Chow, *Open Channel Hydraulics*, McGraw Hill, 1975
3. K.G. Rangaraju, *flow in Open Channels*, 1st Edition, 2001,Tata McGraw Hill Publication Co. Ltd., New Delhi, 1993
4. R.H. French, *Open Channel Hydraulics*, 1st Edition, 2007, McGraw Hill Book Co., New York 1986

Web Resources:

1. IIT Guwahati, December 31 2009, '*Hydraulics Engineering*', URL: https://nptel.ac.in/courses/105103096/

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests/Assignments (In Semester)	Monthly tests (In Semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 2202	MECHANICS OF MATERIALS-II	PCC	2-1-0	3

Course Objectives: The student will be able toe

1. Evaluate the stresses and strains in thick and thin cylinders
2. Evaluate the allowable loads and associated allowable stresses before mechanical failure using theories of failures
3. Discuss various types of springs and their deflections
4. Differentiate column and strut and analyze their failure
5. Evaluate the stresses in structure when direct and bending stresses are acted
6. calculate the deflections of beam

Course Content:

UNIT – I: Thin Cylinders & Thick Cylinders: (Contact Hours-6)

Thin seamless cylindrical shells, Derivation of formula for longitudinal and circumferential stresses - hoop, longitudinal and Volumetric strains, Changes in diameter, and volume of thin cylinders, Thin spherical shells. Introduction Lame‘s theory for thick cylinders , Derivation of lame‘s formulae – distribution of hoop and radial stresses across thickness, design of thick cylinders, compound cylinders, Necessary difference of radii for shrinkage – Thick spherical shells.

UNIT-II: Theories Of Failures: (Contact Hours-6)

Introduction, Various Theories of failures-Maximum Principal stress theory, Maximum Principal Strain theory, Maximum shear stress theory, Maximum strain energy theory, Maximum shear strain energy theory.

UNIT – III: Springs: (Contact Hours-6)

Introduction, Types of springs, deflection of close and open coiled helical springs under axial pull and axial couple, springs in series and parallel, Carriage or leaf springs.

UNIT – IV: Columns And Struts: (Contact Hours-8)

Introduction, Types of columns, Axially loaded compression members, Crushing load, Euler‘s theorem for long columns, assumptions, derivation of Euler’s critical load formulae for various end conditions, Equivalent length of a column, slenderness ratio, Euler’s critical stress, Limitations of Euler’s theory, Long columns subjected to eccentric loading

UNIT-V: **Direct and Bending Stresses:** **(Contact Hours-9)**

Stresses under the combined action of direct loading and B.M, determination of stresses in the case of chimneys, retaining walls and dams, conditions for stability, stresses due to direct loading and B.M. about both axis

UNIT VI: Deflection Of Beams: **(Contact Hours-10)**

Bending into a circular arc-slope, deflection and radius of curvature, Differential equation for the elastic line of a beam - Double integration and Macaulay's methods, Determination of slope and deflection for cantilever and simply supported beams subjected to various types of loads, Mohr's theorems, and Moment area method.

Learning Resources:

Text Books:

1. Beer, F.P., and Johnston, JR, E.R., "*Mechanics of Materials*", 7th Edition, 2014, McGraw Hill, 1992.
2. S. Ramamrutham&B.Narayanan, "*Strength of Materials*", 18th Edition, 2014, DhanpatRai Publishing Company Pvt Ltd.,

Reference Books:

1. Popov, E.P., *Mechanics of Materials*, 2nd Edition, 2015, Prentice Hall of India Private Limited, 1976.
2. Punmia B C, *Mechanics of Materials*, Revised Edition, 2017, Laxmi Publications Ltd, New Delhi
3. Hibbeler, R.C., "*Mechanics of Materials*", 10th Edition, 2016, Pearson Education, Low Price Edition, 2007
4.Bansal, R.K., "*Strength of Materials*", 6th Edition, 2018, Laxmi Publications (P) Ltd., 2007

Web Resources:

1. NPTEL, December 31 2009, "*strength of materials*" URL;http://nptel.ac.in/courses/105105108/

Course Outcomes: On completion of the course the student will be able to

CO1	Understand behavioral difference between thick and thin cylinders and calculate the failure stresses

CO2	Calculate the allowable stresses before mechanical failure using theories of failures
CO3	Understand the behavior of various types of springs
CO4	Calculate the crushing load for columns and strut
CO5	the behavior of structure when direct and bending stresses are acted
CO6	One can calculate the deflections of beams for different type of loadings

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests/Assignments (In Semester)	Monthly tests (In Semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Course Category	L-T-P	Credits
CE 2203	SOIL MECHANICS	PCC	2-1-0	3

Course Learning Objectives:

The student will be able to

1. Demonstrate the concepts of origin of soil, identification and classification of the soils
2. Illustrate the concept of permeability.
3. Distinguish the stresses and seepage through soils.
4. Explain about the compaction of soils.
5. Tell the compressibility and consolidation of the soils
6. Define the shear strength of soils.

Course Content:

UNIT-I: Introduction: **(Contact hours: 8)**

Soil formation and structure – moisture content – Mass- volume relationship – Relative density. Unified and Indian standard soil classification system. Index Properties of Soils: Grain size analysis. Clay soil Structure and Clay Mineralogy.

UNIT-II: Permeability: **(Contact hours: 8)**

Soil water – capillary rise – flow of water through soils – Darcy's law permeability – Factors affecting permeability – laboratory determination of coefficient of permeability – Permeability of layered soils.

Stress-analysis:

Effective Stress & Seepage Through Soils: Total, neutral and effective stress – principle of effective stress – quick sand condition.

UNIT-III: Seepage through Soils: **(Contact hours: 8)**

Seepage, Flow nets, Seepage calculations for geotechnical structures, Boussinesq's and Westergaard's theories for point load, uniformly loaded circular and rectangular areas, pressure bulb, variation of vertical stress under point load along the vertical and horizontal plane, and Newmark's influence chart for irregular areas.

UNIT-IV: Compaction of Soils: **(Contact hours: 5)**

Mechanism of compaction – factors affecting compaction effects of compaction on soil properties – Field compaction Equipment – compaction quality control. Estimation of optimum moisture content and maximum dry density.

UNIT-V: Compressibility& Consolidation of Soil: **(Contact hours: 8)**

Types of compressibility – Immediate Settlement, primary consolidation and secondary consolidation – stress history of clay; e-p and e-log(p) curves – normally consolidated soil, over consolidated soil and under consolidated soil – pre-consolidation pressure and its determination – Terzaghi's 1-D consolidation theory – coefficient of consolidation: square root time and logarithm of time fitting methods – computation of total settlement and time rate of settlement.

UNIT-VI: Shear Strength of Soils: **(Contact hours: 8)**

Importance of shear strength – Mohr's– Coulomb Failure theories – Types of laboratory tests for strength parameters – strength tests based on drainage conditions – strength envelops – Shear strength of sands – dilatancy – critical void ratio. Stress-Strain characteristics of clays and sand; Stress paths.

Learning Resources

Text Book:

1. Gopal Ranjan, A.S.R. Rao, '*Basicand Applied Soil Mechanics'*, 3rd Edition, 2016 New Age International (P) Limited publishers, India.

Reference Books:

1. Braja M. Das, '*Principles of Geotechnical Engineering*', Thomson learning Inc, 5th Edition 2001.
2. K. Terzaghi, R. B. Peck and G. Mesri,'*Soil Mechanics in Engineering Practice*', 3rd edition 1996 , John Wiley & Sons.

Web resources:

1. IIT Kharagpur, December 21 2017, '*Soil Mechanics/Geotechnical Engineering I'*. URL: https://nptel.ac.in/courses/105105168/

Course outcomes: At the end of the course, the student will be able to

CO 1	Elaborate concepts of origin of soil, identification and classification of the soils
CO 2	Illustrate the concept of permeability.

CO 3	Analyze the stresses and seepage through soils.
CO 4	Understand concept of compaction of soils.
CO 5	Analyze the compressibility and consolidation of the soils
CO 6	Define shear strength of soils.

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 2204	STRUCTURAL ANALYSIS	PCC	3-1-0	4

Course Objectives: The student will be able to

1. Illustrate the basic concepts of structural stability, static and kinematic indeterminacy
2. Define strain energy, determine deflections using strain energy
3. Evaluate forces and deflections in beams,frames and trusses by force methods
4. Demonstrate the development of slope deflection equations and to solve application to continuous beams with and without settlement of supports.
5. Illustrate the concepts of moving loads and influence lines are imparted for assessment of maximum SF and BM at a given section when loads of varying spans rolling loads of Pratt and Warren trusses
6. Interpretation of Plastic analysis of structural elements

Course Content:

UNIT –I: Indeterminate Structural Analysis (contact hours - 8)

Indeterminate Structural Analysis –Determination of static and kinematic indeterminacies –Solution of trusses with up to two degrees of internal and external indeterminacies –Strain energy in linear elastic system, expression of strain energy due to axial load, bending moment and shear forces - Castigliano's first theorem-Deflections of simple beams and pin jointed trusses.

UNIT –II:

Propped Cantilevers, Fixed Beams and Continuous beams (contact hours - 12)

Analysis of propped cantilevers-shear force and bending moment diagrams-Deflection of propped cantilevers, Deflection of fixed beams, effect of sinking of support, effect of rotation of a support. Clapeyron's theorem of three moments- Analysis of continuous beams with constant moment of inertia with one or both ends fixed-continuous beams with overhang, continuous beams with different moment of inertia for different spans, Effects of sinking of supports-shear force and bending moment diagrams.

UNIT III: Arches (contact hours - 8)

Three hinged arches, Elastic theory of arches – Eddy's theorem – Determination of horizontal thrust, bending moment, normal thrust and radial shear – effect of temperature. Two Hinged Arches, Determination of horizontal thrust bending moment, normal thrust and radial shear.

UNIT – IV: Slope Deflection and Moment Distribution Method (contact hours - 12)
Derivation of slope deflection equation of supports application to continuous beams including settlement of supports single bay, single sway, portal frame including side sway. Stiffness and carryover factors –Distribution factors– Analysis of continuous beams with and without sinking of supports–storey portal frames –including Sway-Substitute frame analysis by two cycle.

UNIT – V: Influence Lines: (contact hours - 12)
Definition of influence line for SF, Influence line for BM- load position for maximum SF at a section, Load position for maximum BM at a section for single point load, U.D.load longer than the span, U.D.load shorter than the span, Influence lines for forces in members of Pratt and Warren trusses.

UNIT-VI: Plastic Analysis (contact hours - 08)
Plastic Analysis: Introduction– Idealized stress– Strain diagram –shape factors for various sections– Moment curvature relationship–ultimate moment –Plastic hinge –lower and upper bound theorems –ultimate strength of fixed and continuous beams.

Learning Resources:

Text Books:

1. R C Hibbler," *Structural Analysis*" 10th edition, 2017, Person India Publication

References:

1. C. K. Wang, *Intermediate Structural Analysis*, *1st Edition, 2017*, McGraw-Hill India.
2. S P Gupta and G S Pandit , *Theory of Structures - Volumes 1 and 2*, 1st Edition, 2017, Tata McGraw Hill.
4. Norris, Wilbur and Utku, *Elementary Structural Analysis*, 4th Revised Edition, 1991, McGraHill.
5. C.S. Reddy, *Basic Structural Analysis*, 7th Edition, 1981, Tata McGraw Hill.

Web Resources:

NPTEL, December 31 2009, "*structural analysis"* URL:http://nptel.ac.in/courses/105101085/

Course Outcomes: On completion of the course the student will be able to

CO1	Distinguish between the determinate and indeterminate structures.
CO2	Identify the behavior of structures due to the expected loads, including the moving loads, acting on the structure.

CO3	Estimate the bending moment and shear forces in beams for different fixity conditions.
CO4	Analyze the continuous beams using various methods- slope deflection method, Moment distribution method and Kani's method.
CO5	Draw the influence line diagrams for various types of moving loads on beams/bridges.
CO6	Analyze the strength of structural elements using plastic analysis

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests/Assignments (In Semester)	Monthly tests (In Semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course name	Category	L-T-P	Credits
20CE 2205	SURVEYING- II	PCC	2-1-0	3

COURSE OBJECTIVES:

The student will be able to

1. Explain the triangulation
2. Distinguish the different types of curves and methods of setting curves
3. Determine the Earth work computation
4. Train on utilization of surveying instruments like EDM, Total station and GPS.
5. Demonstrate basics of photogrammetry and mapping process.
6 Throw light on remote sensing elements.

Course Content:

UNIT-I: Triangulation (Contact Hours: 6)

Classification- indivisibility of station – Signals and towers-base line measurements – Corrections – Satellite station and Reduction to center – Basinet. Trigonometric levelling – Elevation of top of the tower same plane, Different planes.

UNIT II: Curves (Contact Hours: 6)

Simple curves – Elements of simple curves – Methods of setting simple curves – Rankin's method – Two theodolite method – Compound curves – Elements of compound curves.

UNIT III: Earthwork Computations (Contact Hours: 7)

Embankments and cutting for a level section with and without transverse slopes, Simpson's method, Trapezoidal method, determination of the capacity of reservoir.

UNIT IV: Modern Field Survey Systems (Contact Hours: 10)

Principle of Electronic Distance Measurement, Modulation, Types of EDM instruments, Distomat, Total Station – Parts of a Total Station – Accessories –Advantages and Applications, Field Procedure for total station survey, Errors in Total Station Survey; Global Positioning Systems- Segments, GPS measurements, errors and biases, Surveying with GPS, Co-ordinate transformation, accuracy considerations, Differential GPS, comparison between GPS and DGPS.

UNIT V: Photogrammetry Surveying (Contact Hours: 10)

Introduction, Basic concepts, perspective geometry of aerial photograph, relief and tilt displacements, terrestrial photogrammetry, flight planning; Stereoscopy, ground control

extension for photographic mapping- aerial triangulation, radial triangulation, methods; photographic mapping- mapping using paper prints, mapping using stereo plotting instruments, mosaics, map substitutes.

UNIT VI: Remote Sensing **(Contact Hours: 6)**

Introduction –Electromagnetic Spectrum, interaction of electromagnetic radiation with the atmosphere and earth surface, remote sensing data acquisition: platforms and sensors; visual image interpretation; digital image processing.

COURSE OUTCOMES : Upon successful completion of the course, the student will be able to	
CO1	Illustrate Earthwork computation by various methods.
CO2	Determine the distances by using EDM
CO3	Discuss the total station and it's practical applications
CO4	Carryout surveying using Total station
CO5	Mapping area using triangulation
CO6	Carryout data acquisition and interpretation

Learning Resources:

Text Books:

1. Dr. K.R. Arora, *Surveying, Vol. II*, 13th Edition, 2016,Standard Book House, Fifth edition, 2001.
2. Dr.B.C. Punmia, *Surveying, Vol. II*, 16th Edition, 2016, Laxmi Publications Pvt. Ltd,
3. Dr. A.M.Chandra, *Higher Surveying*, 2nd Edition, 2006, New Age International Publishers.

Web Resources:

1. IIT Kanpur, December 31 2009, "*Surveying*" URL: http://www.nptelvideos.in/2012/11/surveying.html

Course Nature	**Theory**			
Assessment Method				
Assessment Tool	Weekly tests/Assignments (In Semester)	Monthly tests (In Semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course name	Category	L-T-P	Credits
20CE 2206	WATER RESOURCES ENGINEERING	PCC	2-1-0	3

Course Learning Objectives:

1. To provide knowledge in the hydrologic cycle, precipitation, evapotranspiration, infiltration and its measures.
2. To be familiarized with the construction of hydrograph for different durations of rainfall
3. To develop the skills in modeling of flood flows and flood routing
4. To develop skills in the ground water flow, type of aquifers and yield from the well.
5. To impart the knowledge of various irrigation techniques, crop requirements and different land management practices.
6. To familiarize with water logging and antiwater logging measures.

Course Content:

UNIT – I: Precipitation **(Contact hours: 8)**

Hydrological cycle, precipitation and its measurement, error in estimation, missing rainfall data, consistency of rainfall records, intensity-duration-frequency curves, and Probable Maximum Precipitation (PMP). Evaporation Consumptive Use and Infiltration: process affecting factors, estimation and measurement techniques. Infiltration indices.

UNIT – II: Runoff **(Contact hours: 10)**

Runoff, components of runoff, hydrograph analysis, components, peaks flows, unit hydrograph and its derivation from isolated and complex storms, S-curve hydrograph, synthetic unit hydrograph, Instantaneous Unit Hydrograph, Runoff analysis.

UNIT – III: Floods **(Contact hours: 7)**

Types of floods and their estimation by different methods, probability and frequency analysis, flood routing through reservoirs and channels, flood control measures, economics of flood control.

UNIT – IV: Ground Water **(Contact hours: 8)**

Confined and unconfined aquifers, aquifer properties, hydraulics of wells under steady flow conditions. Groundwater quality, Ground water recharge-necessity and methods of improving ground water storage. Darcy's law and its limitations. Formulation of governing equations for groundwater movement. Hydraulics of flow towards wells.

UNIT – V: Irrigation **(Contact hours: 7)**

Irrigation, crop requirements and yields, irrigation scheduling. Estimation of crop water requirements, methods of irrigation, Micro irrigation and Sprinkler irrigation, Weirs on permeable foundations. Canals layout, stable channels, and silt control, canal losses.

UNIT – VI: Water Logging & drainage **(Contact hours: 5)**

Theory of subsurface drainage. Seawater intrusion and its control, approximate solution. Water logging-causes, effects and its prevention. Salt efflorescence causes and effects

COURSE OUTCOMES: At the end of the course, student will be able to

CO1	Estimate the hydrological parameters.
CO2	Compute the missing rainfall, consistency and average rainfall of a region.
CO3	Interpret hydrograph, S-Hydrograph, unit hydrograph and IUH
CO4	Carryout statistical and probability analysis of hydrological data
CO5	Visualize and understand the occurrence and movement of ground water.
CO6	Identify the appropriate irrigation technique to increase the crop efficiency.

Learning Resources:

Text Book:

1. K. Subramanyan, "*Engineering Hydrology*", Fourth Edition., Tata McGraw Hill, New Delhi, 2013

Reference Books:

1. Dr. P.N. Modi, "*Irrigation, Water Resources & Water Power Engineering*", 9th ed., Standard Book House, New Delhi, 2014.
2. Dr. B.C. Punmia& Dr. Pande B.B. Lal, " *Irrigation and water power Engineering* ", 16th ed., Laxmi Publications Pvt. Ltd., New Delhi, 2009
3. K.N Duggal, "*Elements of Water Resources Engineering*", New age international Publishers, 2003
4. R.K. Linsley and J.L.H. Paulhus: *Water Resources Engineering*, McGraw Hill Book Co., 1992

Web Resources:

1. IIT Kanpur, December 31 2009, '*Water Resources Engineering*', URL: https://nptel.ac.in/courses/105104103/
2. IIT Kharagpur, December 31 2009, '*Water Resources Engineering*', URL: https://nptel.ac.in/courses/105105110/

Course Nature	**Theory**
Assessment Method	

Assessment Tool	Weekly tests/Assignments (In Semester)	Monthly tests (In Semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	Course Name	Category	L-T-P	Credits
20CE 2282	**CONCRETE TECHNOLOGY LAB**	**PCC**	**0-0-3**	**1.5**

Course objectives/Outcomes:

On the completion of the course student will be able to

1. Determine the consistency and fineness of cement.
2. Determine the setting times of cement.
3. Determine the specific gravity and soundness of cement.
4. Determine the compressive strength of cement.
5. Determine the workability of cement concrete by compaction factor, slump and Vee – Beetests
6. Determine the specific gravity of coarse aggregate and fine aggregate by Sieve analysis.
7. Determine the flakiness and elongation index of aggregates.
8. Determine the various strengths like compressive strength, split tensile strength and flexural strength of the concrete.

Cement Testing:

1. Normal Consistency
2. Initial and Final Setting Time
3. Soundness
4. Fineness of Cement
5. Compressive Strength of Cement

Aggregate Properties:

6. Grade analysis of Fine and Coarse aggregates
7. Loose and Bulk density of Coarse and Fine aggregates
8. Water absorption of coarse aggregates and Angularity number
9. Specific gravity of Fine and coarse aggregate

Tests on Fresh concrete:

10. Workability (Slump Test)
11. Workability (Compaction factor Test)
12. Workability on self-compacting concrete(V-box, L-box, J- ring test)

Tests on Hardened Concrete:

12. Compressive strength of Concrete
14. Split tensile strength of concrete
15. Flexural strength of concrete
16. Bond strength of concrete

Course Nature		**Practical**		
Assessment Method				
Assessment Tool (In semester)	Experiments related	Record	Viva-Voce/ Quiz/MCQ/Lab project	Total
Weightage (%)	20%	10%	10%	40%
Assessment Tool (End semester)	Procedure/Description of the experiment with relevant information and Discussion on Results	Results	Viva-Voce	
Weightage (%)	30%	10%	20%	60%

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Course Code	**Course Name**	**Category**	**L-T-P**	**Credits**
20CE 2281	**HYDRAULICS ENGINEERING LABORATORY**	**PCC**	**0-0-3**	**1.5**

Course Objectives /Course Outcomes:

On completion of the course the student will be able to

1. To provide students with a solid foundation in fluid flow principles
2. Estimate the friction and measure the frictional losses in fluid flow
3. Experiment with flow measurement devices like venturimeter and orifice meter.
4. Predict the coefficient of discharge for flow through pipes

5. Conduct experiments (in teams) in pipe flows and open channel flows and interpreting date from model studies to prototype cases, as well as documenting them in reports.
6. The ability to analyze experimental data and develop empirical equations
7. The ability to communicate in written reports

LIST OF EXPERIMENTS

1) Venturi meter and Orifice meter
2) Pitot tube
3) Rota meter
4) Bernoulli's Experiment
5) Notches and Weirs
6) Orifices and Mouth Pieces
7) Free and Forced Vortices
8) Friction Losses
9) Fransis Turbine
10) Impact of jets

Course Nature		**Practical**		
Assessment Method				
Assessment Tool (In semester)	Experiments related	Record	Viva-Voce/ Quiz/MCQ/Lab project	Total
Weightage (%)	20%	10%	10%	40%
Assessment Tool (End semester)	Procedure/Description of the experiment with relevant information and Discussion on Results	Results	Viva-Voce	
Weightage (%)	30%	10%	20%	60%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 3101	Advanced Structural Analysis	PEC	2-1-0	3

Course Learning Objectives: The student will be able to

1. Familiarize Students with Different types of Structures
2. Understand Concepts of lateral Load analysis
3. Familiarize Cables and Suspension Bridges
4. Analyse the problems using Kani's method
5. Understand Analysis of Matrix methods
6. Understand concepts of moving loads and influence lines

Course Content:

UNIT-I **(Contact hours: 6)**

Suspension Bridges: Stresses in suspended loaded cables, length of cable, simple suspension bridge with 3-hinged stiffening girders for static load, Influence lines for horizontal and vertical components of tension in the cable, tension in the cable, bending moment and shear force

UNIT-II **(Contact hours: 8)**

Moving loads on trusses/girders: Influence line for forces in members of statically determinate plane framed structures under moving loads for Warren girder, Pratt truss, and Curved flange truss.

Unit - III: **(Contact hours: 5)**

Approximate methods of structural analysis, application to building frames. (i) Portal method (ii) Cantilever method.

UNIT – IV: Kani's Method: **(Contact hours: 8)**

Analysis of continuous beams, including settlement of supports and single bay portal frames with side sway by Kani's method.

UNIT-V **(Contact hours: 9)**

Flexibility Matrix Method: Determination of static and kinematic indeterminacy – Equilibrium and compatibility conditions-Principles of superposition, Application of Flexibility Matrix Method to continuous beams, plane-trusses, plane-frames and Ortho grid

structures (Static indeterminacy not exceeding three)-Effect of temperature, Lack of fit and Pre-stressing forces

UNIT-VI **(Contact hours: 9)**

Stiffness Matrix Method: Application of Stiffness Matrix Method to continuous beams, plane trusses, plane frames and ortho grid structures (Degree of freedom not exceeding three) Construction of stiffness Matrix for frames-Direct Method.

Learning Resources:

Text Books:

1. Devdas Menon, "*Advanced Structural Analysis*", Narosa Publishing House, 2009.

Reference Books:

1. Amin Ghali, Adam M Neville and Tom G Brown, "*Structural Analysis: A Unified Classical and Matrix Approach*", Sixth Edition, 2009, Chapman & Hall.
2. Devdas Menon, "*Structural Analysis*", Narosa Publishing House, 2nd edition 2018.
3. AsslamKassimali, "*Matrix Analysis of Structures*",2nd edition , 2011.
4. R C Hibbler *'Structural Analysis'*, 9th edition,2017, Person India Publication

Web Resources:

1 IIT Madras, 2012, '*Advanced Structural Analysis'* by Prof. Devdas Menon, Department of Civil Engineering, **URL**: http://www.nptelvideos.in/2012/11/advanced-structural-analysis.html

Course Outcomes: At the end of this course; the student will be able to

CO1	Differentiate Determinate and Indeterminate Structures
CO2	Carryout lateral Load analysis of structures
CO3	Analyse Cable and Suspension Bridge structures
CO4	Analyse structures using Kani's method
CO5	Analyse structures using Matrix methods
CO6	Analyse the loads in Pratt and Warren trusses when loads of different types and spans

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 3102	Design of Reinforced Concrete Structures	PCC	3-1-0	4

Course Learning Objectives:

The student will be able to

1. Understand the general mechanical behavior of reinforced concrete, design philosophies, design requirements get introduced to IS:456 code
2. Understand the basic principles of limit state design, assumptions made in design of flexure
3. Know the procedure for analysis and design of different types of slabs
4. Grasp the fundamentals of analysis and design of beams for shear and torsion, checking for bond
5. Learn the design and detailing of columns
6. Learn the design and detailing of footings

Course Content:

UNIT-I: Design Philosophies (contact hours - 8)

Working stress method- design constants, singly reinforced beam, Introduction to ultimate load method. Introduction, Concepts of limit state design, Basic statistical principles, Characteristic loads, Characteristic strength, Partial load and safety factors, representative stress-strain curves for cold worked deformed bars and mild steel bars. Assumptions in limit state design, stress block parameters, limiting moment of Resistance.

UNIT-II- Design of Beams: (contact hours - 12)

Analysis at service and ultimate loads, Limit state design of singly and doubly reinforced rectangular and flanged sections- T and L.

UNIT-III-Design of Slabs: (contact hours - 12)

One-way and two way slabs for flexure at ultimate limit state as per IS 456; deflection control. Introduction of flat and ribbed slabs

Design of stair cases (Limit state method): Types of stairs, Effective span, Distribution of Loading on stairs, Design and detailing of dog – legged stair cases.

UNIT-IV Design for Shear, Torsion and Bond: (contact hours - 8)

Analysis and design with and without shear reinforcement at ultimate load limit state as per IS 456, development length, splicing, curtailment, code specifications.

UNIT-V Design of Compression Members: (contact hours - 10)

Short and slender columns – under axial loads, uniaxial bending and biaxial bending, Braced and un-braced columns, I S Code provisions, introduction to slender columns.

UNIT-VI: Design of Footings (contact hours - 10)

Types of footings, Design of isolated- square, rectangular and circular footings and combined footing, Type of stair cases, Design of stair case.

Learning resources:

Text Books:

1. .UnnikrishnaPillai&DevdasMenon, ,"*Reinforced concrete design*" 3rd Edition,2017, Tata Mc.Graw Hill ,New Delhi.

Reference Books:

1. N Subramanian ,"*Design Reinforced concrete structures*" , first edition 2013 Oxford Publications, New Delhi.
2. B.C.Punmia, Ashok Kumar Jain and Arun Kumar Jain,"*Limit State Design*" , first edition 2007 , Laxmi, publications Pvt. Ltd., New Delhi
3. P.C.Varghese ,"*Limit state designed of reinforced concrete*" 2nd edition 2008 Printice Hall of India, New Delhi.
4. IS: 456-2000. "*Guidelines for Reinforced concrete design"* Bureau of Indian Standards, New Delhi

Web resources:

1. IIT KHARAGPUR, December 31 2009, "*Design of reinforced concrete structures"* URL:http://nptel.ac.in/courses/105105105/

Course Outcomes: On completion of the course the student will be able to

CO1	Identify and compute the main mechanical properties of concrete and steel.
CO2	Identify and calculate the design loads and distribution.
CO3	Analyze and design R.C. slabs, Footings and stair cases
CO4	Analyze and design reinforced concrete flexural members.
CO5	Analyze and design for vertical and horizontal shear in reinforced concrete.
CO6	Analyze and design short and slender R.C. columns.

Course Nature	**Theory**			
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 3103	ENVIRONMENTAL ENGINEERING-I	PCC	2-1-0	3

Course Learning Objectives:

On completion of the course the student will be able to

1. To identify the role of environmental engineer
2. To explain the necessity of protected water supply
3. To define and describe water characteristics and water quality standards
4. To explain the process of surface water and ground water treatment.
5. To apply the knowledge of water quality parameters and treatment principles for designing of water treatment plant
6. To differentiate different types of water distribution networks

Course Content

Unit - I: Water Quality/ Characteristics (Contact hours: 08)

Introduction to Environmental Engineering, role of environmental engineer. Importance and necessity of protected water supply systems, objectives of protected water supply system, wholesomeness and palatability, physical, chemical and biological characteristics of water, their sources, and drinking water standards. Water quality monitoring: Estimation of physical, chemical and biological characteristics, different types of tests and equipments used for examinations.

Unit - II:Water Quantity Estimation (Contact hours: 06)

Water demand for various purposes, Population forecast, Different forecasting methods: Arithmetic, Geometric, Incremental increase, logistic etc.

Unit – III: General Requirements for water supply (Contact hours: 07)

Flow chart of public water supply system Sources, intake, pumping and conveyance, Different types of intakes, pumps, Design of conveyance pipe, Distribution reservoirs, mass curve method.

Unit – IV:Surface Water Treatment for Potable Water Supply (Contact hours: 10)

Basic unit processes and operations for surface water treatment- flow-sheets.
Sedimentation: factors affecting efficiency, design values of various parameters, tube settlers. Coagulation and flocculation: mechanisms, common coagulants, rapid mixing and flocculating devices, G and GT values, Jar test, coagulant aids - polyelectrolyte etc.

Filtration: classification, slow and rapid sand filters, dual media filters, sand, gravel and under-drainage system, mode of action, cleaning, limitations, operational difficulties, performance, basic design consideration, Disinfection: chlorination, chemistry of chlorination, kinetics of disinfection, chlorine demand, free and combined chlorine, break point chlorination, super chlorination, de chlorination, chlorine residual, use of iodine, ozone, ultraviolet rays and chlorine dioxide as disinfectants.

Unit – V: Ground Water treatment for potable water supply (Contact hours: 8)

Basic unit processes and operations for ground water treatment- flow-sheets.
Aeration: Types of aeration.Water softening: lime soda and Base Exchange methods, principle reactions, design considerations, sludge disposal.Miscellaneous treatments: removal of iron and manganese, taste, odour and colour, principles and methods; de-fluoridation, reverse osmosis.

Unit – VI Water distribution systems and networks (Contact hours: 6)

Requirements of water distribution, methods of distribution, Types of distribution layouts: Dead end, Grid iron, radial, ring system, design values of various parameters, Hydraulic analysis: Hardy cross method.

Learning resources

Text book:

1. Santhosh Kumar Garg, "*Environmental Engineering Vo.I*", Khanna publishers, 21st edition, 2012

Reference Books:

1. Howard S.Peavy," *Environmental Engineering*", 1st edition 1985 McGraw-Hill International editions
2. Gerard Kiely, "*Environmental Engineering*", Tata McGraw-Hill Indian edition, 2007.
3. G.S. Birdi ,"*Water supply and Sanitary Engineering*", DhanpatRai& Sons Publishers

Web resources:

1. NPTEL HRD, December 20, 2007,"*Water and Waste water Engineering*" URL:http://nptel.ac.in/courses/105106119/#

Course outcomes: At the end of the course, the student will be able to

CO 1	understand the role of environmental engineer
CO 2	explain the objectives of protected water supply
CO 3	define and describe water characteristics and water quality standards
CO 4	differentiate the process of surface water and ground water treatment.

CO 5	apply the knowledge of water quality parameters and treatment principles for designing of conventional water treatment plant units.
CO 6	compare different types of water distribution networks

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	**Course Name**	**Category**	**L-T-P**	**Credits**
20CE 3104	**Estimation and Costing**	**PEC**	**3-0-0**	**3**

Course Learning Objectives:

1. To make the learners to have comprehensive understanding of work book estimation
2. To make the learners appreciate the costing procedures for various construction works
3. To make the learners realize the actual construction process from drawings and vice versa
4. To study and do valuation by different methods.
5. To understand the specifications and rate analysis.
6. To quantitative estimations for the buildings, roads & CD works.

Course Content:

UNIT-I: Introduction: **(Contact hours: 5)**

Introduction to Estimation & Costing – Types of estimates Principles in selecting units of measurement for items, various units and modes of measurement for different trades. Basic Principles of measurement – Degree of accuracy in measurements, I.S. 1200.Lump sum and Contingency provisions in Estimates – Classification

UNIT-II: Specifications - Rate analysis: (Contact hours: 8)

Specifications – purpose and basic principles of general and detailed specifications detailed specifications for various items of work Taking out quantity, Measurement and abstract sheets and recording Categories of Labourers- Material requirements for different items of works- Labour requirement for different items of works Standard Data Book- Task or Out turn of labourers -Cost of materials and wages of labour Schedule of Rates- Revision of rates- Market Rates Cost of conveyance- Handling charges, Preparation of bills of quantities – MS Excel as Estimation Tool

UNIT-III: Estimation of buildings: (Contact hours: 8)

Method of Building Estimation: Quantification of various items of construction – Method of building estimates -Illustrative examples Approximate estimates, purpose, various methods used for buildings Detailed estimate – Load bearing masonry building Detailed estimate – Framed structure, Bar bending schedule – Slab, Beam, Column& Footing – Joinery – Building Services

UNIT-IV: Estimation of roads and CD works: (Contact hours: 10)

Detailed Road Estimation - Earthwork Methods, Metalled Road, CC Roads, Bitumen Top Roads, Culverts – Pipe, Slab and Simple Bridge, Retaining walls. Microsoft Excel as a tool for estimation.

UNIT V: (Contact hours: 6)

Sanctioning of Estimates – Works – PWD Procedure: Organization of Engineering Department – Works & Contracts Classification – Administrative &Expenditure Sanction – Technical Sanction - Method of Carrying out works – Measurement Book- Rules & Methods of Measurement - Public Works Accounting – Power of Sanction – Duties & Oversee.

UNIT VI: Fundamentals and Methods of Valuation: (Contact hours: 8)

Principles & Purpose of valuation – Types, Mortgage &Lease Problems on valuation, Valuer and his duties, Form of rent, different types of rent Years' Purchase – Capital cost, Method of valuation Reversion value of land, annuity perpetual, whole life Deferred Depreciation – Obsolescence – Sinking fund.

Learning Resources:

Text Books:

1. B.N. Dutta, '*Estimating & Costing in Civil Engineering Theory and Practice'*, UBS Publishers & Distributors Limited, New Delhi, 28th Revised Edition, 2016.

Reference Books:

1.Rangawala,'*Estimating, Costing and Valuation", Charotar Publishing House Pvt Ltd, 17th Edition, 2017.*

2. R C Kohli, "A Textbook of Estimating , Costing & Accounts (Civil)", S Chand &CompNY Pvt. Ltd., New Delhi, 13th Edition. 2013.

Web Resources:

1.April 22 2018"Estimation and costing"

URL:https://www.youtube.com/watch?v=0veqwkJ_o6o

Course outcomes: At the end of the course, the student will be able to

CO 1	Understand work book estimation
CO 2	Realize costing procedures for various construction works
CO 3	Execute the actual construction process from drawings and do estimation
CO 4	Preparation of DPRs
CO 5	Apply MS Excel as a tool for estimation
CO 6	Engage in typical PWD practices of works execution

Assessment Method:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	**Course Name**	**Category**	**L-T-P**	**Credits**
20CE 3105	**Transportation Engineering-I**	**PCC**	**2-1-0**	**3**

Course Learning Objectives:

The student will be able to

1. To understand the highway development in India.
2. To understand concepts of various road cross sectional elements and geometric design of highways.
3. To be familiarized with various tests on road materials and its suitability for road construction.
4. To design the flexible pavements.
5. To design the rigid pavements.

6. To understand the construction and maintenance procedures of various types of roads.

Course Content:

UNIT-I: Highway Development and Planning (Contact hours: 5)

Highway development in India, Necessity for Highway Planning, Different Road Development Plans, Classification of Roads, Road Network Patterns, Planning Surveys, Highway Alignment and factors affecting Alignment, Engineering Surveys.

UNIT-II: Highway Geometric Design (Contact hours:8)

Importance of Geometric Design**,** Design controls and Criteria**,** Highway Cross Section Elements**,** Sight Distance Elements-SSD, OSD &ISD, Design of Horizontal Alignment: Super elevation, Extra widening, Transition Curves, Design of Vertical alignment, Gradients, Vertical curves.

UNIT-III: Highway Materials (Contact hours: 8)

Sub-grade soil: classification by group index method (HRB), Subgrade soil strength: California bearing ratio, modulus of subgrade reaction. Bituminous materials: types & desirable properties, Tests on bitumen, Tests on Aggregates, Bituminous paving mixes: Marshall Method of mix design.

UNIT-IV: Design of Flexible & Rigid Pavements (Contact hours: 8)

Objectives & Requirements of pavements, Types of Pavements**,** Functions of pavement components, Design factors, Flexible Pavement Design Methods: CBR method, IRC 37:2012, Burmistermethod.Design of rigid pavements by IRC:58:2011, Design Considerations: wheel load stresses, temperature stresses, frictional stresses, combination of stresses, Design of slabs, Design of joints.

UNIT-V: Highway Construction &Drainage (Contact hours: 8)

Types of highway construction, Earthwork, Preparation of subgrade, Construction of earth roads, Construction of gravel roads, and Construction of water bound macadam roads, Construction of bituminous pavements, Construction of cement concrete pavements. Highway Drainage, surface and sub-surface drainage.

UNIT VI: Traffic Engineering (Contact hours: 8)

Introduction, Traffic Characteristics, Traffic Operations, Design Intersections, Design of Parking Facility, Highway Lighting, Traffic Planning and Administration, Peak hour factor, accident study, statistical analysis of traffic data; Microscopic and macroscopic parameters of traffic flow, fundamental relationships; Traffic signs; Signal design by Webster's method; Types of intersections; Highway capacity.

Learning Resources:

Text Books:

1. Khanna& Justo, '*Highway Engineering*', Nem Chand & Bros, Roorkee, revised 10th edition.

Reference Books:

1. Dr. L.R. Kadiyali& Dr. N.B.Lal, '*Principles and Practice of Highway Engineering*', Khanna Publication.2016 edition.
2. ParthaChakraborthy&Animesh Das, '*Principles of Transportation Engineering*', Prentice Hall of India Publications.2nd edition.
3. L.R.Kadiyali, '*TrafficEngineering'*, Khanna Publishers, 7th edition.

Web Resources:

1. IITKharagpur, '*Introduction to Transportation Engineering*'

URL: http://www.nptelvideos.in/2012/11/introduction-to-transportation.html

Course outcomes: At the end of the course, the student will be able to

CO 1	Explain the highway development in India.
CO 2	Determine various road cross sectional elements and geometric design of highways.
CO 3	Determine various tests on road materials and its suitability for road construction.
CO 4	Design the flexible pavements.
CO 5	Design the rigid pavements.
CO 6	Improve the construction and maintenance procedures of various types of roads.

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20EG3183	English Language Communication Skills Lab-II	HSC	0: 0: 3	1.5

Course objectives:

1. To improve group discussion skills of the students
2. To help the students to write their CV and Internship application
3. To improve the telephonic etiquettes of the students
4. To help the students to take decision on their career

COURSE CONTENT

UNIT-I: **(06 Contact Hours)**

Group Discussion - How to think and analyze - How to initiate a topic - How to continue a topic - How to support or reject a point-of-view - How to defend your position - Managing distractions and mediating between contenders - How to summarize & conclude

UNIT-II: **(06 Contact Hours)**

Telephonic conversation & Etiquettes - How to introduce oneself - How to introduce the main issue - How to keep the other person engaged - How to convince the other person - How to complain without irritating. - Giving assurance and asking for clarification - How to end a formal telephonic conversation

UNIT-III: **(06 Contact Hours)**

Career Planning & Job-Skill Analysis - ASK: Talking about one's Attitudes, Knowledge, & Skills - SMART goals - Reading & Analysis of Job Advertisements

UNIT-IV: **(06 Contact Hours)**

CV & Resume Writing - Difference between CV & Resume - Writing CV - Writing Resume - Writing Cover Letter

UNIT-V: **(06 Contact Hours)**

Application for Internship - Application for internship in Academic Labs - Application for internship in Industries - Follow up the Application with reminders and requests

UNIT-VI: **(06 Contact Hours)**

Interview Skills - Preparation for the Interview - Frequently asked questions - Dress Codes, Appearance, and Etiquettes. 6.4 Facing the Interview

References:

1. *Business Communication Today*, 12th Edition, Courtland L Bovee & John Thill, Pearson
2. British Council Material on Career Planning & Interviews
3. *Master the Group Discussion & Personal Interview - Complete Discussion on the topics asked by reputed B-schools & IIMs* by Sheetal Desarda, Notion Press
4. *Group Discussion and Interview Skills* by Priyadarshi Patnaik , Cambridge University Press India
5. *The Ultimate Guide to Internships: 100 Steps to Get a Great Internship and Thrive in It* by Eric Woodard
6. Telephone Etiquette by Robert DeGroot

Course outcomes: At the end of the course, the student will be able to

CO 1	Get used to a variety of GDs to understand the principles, finer nuances, and intricacies of the art
CO 2	Get exhaustive information on how to prepare for internship and interview
CO 3	Write his/her CV to remain well-prepared for the interviews
CO 4	Take decision on his/her career goals and plans
CO 5	Attain professional speaking skills to enhance his/her employability skills.

Assessment Method:

Course Nature: LABORATORY

Internal Assessment (40 Marks)		**External Assessment (**60 Marks)	
Record Writing	– 10 Marks	Reading Comprehension	– 15 Marks
Attendance	– 10 Marks	Writing	– 30 Marks
Continuous Assessment (Listening – 10 Marks + Oral Presentations – 10 Marks)		Speaking (Viva-Voce)	– 15 Marks

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 3181	Soil Mechanics Lab	**PCC**	**0-0-3**	**1.5**

Course Objectives / Course Outcomes:

On completion of the course the student will be able to

1. To identify the engineering properties of given soil
2. To determine the permeability of the given soil
3. To estimate the optimum moisture content and maximum dry density of given soil
4. To determine the compaction and consolidation of given soil
5. To predict the shear strength parameters of given soil
6. To determine the engineering properties of given soil

List of Experiments:

1. Soil Moisture Content
2. Soil Specific Gravity
3. Grain size Analysis – Mechanical Method
4. Hydrometer Analysis
5. Atterberg Limits (Liquid limit, Plastic limit and Shrinkage limit)
6. Vane shear test
7. Compaction test (Standard Proctor test & Modified proctor test)
8. Consolidation Test
9. Sand replacement method
10. Core cutter Method
11. Direct Shear Test
12. Tri-axial test apparatus
13. Falling head permeability test
14. Constant head permeability test

Course Nature		**Practical**		
Assessment Method				
Assessment Tool (In semester)	Experiments related	Record	Viva-Voce/ Quiz/MCQ/Lab project	Total
Weightage (%)	25%	5%	10%	40%
Assessment Tool (End semester)	Procedure/Description of the experiment with relevant information and Discussion on Results	Results	Viva-Voce	Total
Weightage (%)	30%	10%	20%	60

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 3182	**Transportation Engineering Lab**	**PCC**	**0-0-3**	**1.5**

Course Objectives / Course Outcomes:

On completion of the course the student will be able to

1. To determine the properties aggregates
2. To determine the properties of bitumen
3. To determine the California Bearing Ratio percentage of given soil

List of Experiments:

1. TESTS ON AGGREGATE:
   a. Specific gravity
   b. Sieve analysis
   c. Flakiness index
   d. Elongation index
   e. Crushing value
   f. Impact value
   g. Abrasion value.
2. TESTS ON BITUMEN:
   a. Specific gravity
   b. Penetration value
   c. Softening point
   d. Ductility
   e. Flash and Fire point.
3. TESTS ON SOILS:
   a. California Bearing Ratio

Course Nature		**Practical**		
Assessment Method				
Assessment Tool (In semester)	Experiments related	Record	Viva-Voce/ Quiz/MCQ/ Lab project	Total
Weightage (%)	25%	5%	10%	40%
Assessment Tool (End semester)	Procedure/Description of the experiment with relevant information and Discussion on Results	Results	Viva-Voce	Total
Weightage (%)	30%	10%	20%	60

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 3201	Building planning and Computer Aided Drawing Lab	PCC	1-0-3	2.5

Course Learning Objectives:

1. Demonstrate building bye-laws and regulations.
2. Imparting the planning aspects of residential buildings.
3. Implementation of plan, section and elevation of building in AutoCAD
4. Make use of drawing doors and windows in AutoCAD
5. Improve in drawing and detailing of reinforcement in slabs,beams and columns etc., in AutoCAD

Course Content:

UNIT I: (Contact hours:7)

Building Byelaws, Regulations and Residential Buildings

Introduction- terminology- objectives of building byelaws- floor area ratio- floor space index- principles under laying building bye laws- classification of buildings- open space requirements – built up area limitations- height of buildings- wall thickness – lightening and ventilation requirements, Minimum standards for various parts of buildings requirements of different rooms and their grouping- characteristics of various types of residential buildings and relationship between plan, elevation and forms and functions.

UNIT II: (Contact hours: 8)

Doors, Windows, Ventilators, Planning And Designing Of Buildings

Sign conventions of all materials brick,stoneetc., DrawPanelled door, panelled and glazed door, glazed windows, paneled windows, swing ventilators, fixed ventilators. Draw the Plan, Elevation and Sections of a Residential and Public buildings from the given line diagram

Lab content:

LIST OF EXPERIMENTS:

1. Introduction to computer aided drafting
2. Software for Auto CAD – Introduction to different software
3. Practice exercises on AutoCAD software and commands with different shapes

(a) Exercise-1
(b) Exercise-2
(c) Assignment-1

4. Drawing of plans of buildings using software a) Single storeyed buildings 2 BHK building b) multi storeyed buildings
   (a) Exercise- 1: Plan of the building
   (b) Exercise-2: Section and Elevation of the building plan by representing building components
   (c) Exercise -3: Site plan and building plan
5. Detailing of building components like Doors and Windows etc., using CAD software
6. Drawing and detailing of reinforcement in Building Components
   (a) Exercise-1- Beams
   (b) Exercise-2 – Columns and Footings
   (c) Exercise-3 – Slabs
   (d) Beam Column junction and non-structural components

Learning resources:

Text Books:

1. Gurucharan Singh and JagadishSingh,"*Planning, designing and Scheduling*"2009, Standard Publishers Distributors

2. M. Chakravarthi ,"*Building planning and drawing*".Charotar Publishing House Pvt. Ltd. – Anand , 7th Revised edition (2013)

References:

1. M G Shah, C M Kale and S Y Patki ,"*Building drawing*" , 1985, Tata McGraw Hill, New
Delhi.

2. M G Shah and C M Kale," *Principles of Building Drawing*", Trinity Publications, New Delhi.

3. B. P. Verma, "*Civil Engineering drawing and House planning*", Khanna publishers, New Delhi.

4. SurajSingh,"*Civil Engineering Building practice*", : CBS Publications New Delhi, and Chennai.

5. G. C Saha and Joy Gopal Jana, "*Building Materials and Construction",*Mcgraw Hill Education (P) India Ltd. New Delhi.

Web resources:

1. August-23, 2017, "*Auto Cad Tutorials-plan section and elevation*", URL:https://www.youtube.com/watch?v=nib02vEKT2M.

Course outcomes:

After successful completion of the course, the learners would be able to…

CO 1	Adapt the skills of drawing building elements and plan the buildings as per requirements as per the building by-laws.
CO 2	able to aware of commands in Auto CAD
CO 3	Develop building plan,section and elevation in AutoCAD.
CO 4	Draw different building components like doors and windows.
CO 5	Evaluate reinforcement detailing in slabs, beams and columns etc. in AutoCAD.

For Theory + Lab course:

Course Nature		**Theory + Lab**		
Assessment Method				
Assessment Tool	Weekly Assignments /Charts/Drawings	Monthly tests (Theory -3)	End Semester Test (Lab +Theory question)	Total
	Average (Min 8 charts)	Best of two (Max Marks-15)	Max Marks-40	
Weightage (%)	30%	30%	40%	100%

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Course Code	**Course Name**	**Category**	**L-T-P**	**Credits**
20CE 3201	**DESIGN OF STEEL STRUCTURES**	**PCC**	**3-1-0**	**4**

Course Objectives:

The student will be able to

1. Learn the behavior and design of structural steel components.
2. Familiarize Students with different types of Connections and relevant IS codes

3. Equip student with concepts of design of flexural members
4. Understand Design Concepts of tension and compression members in trusses
5. Familiarize students with different types of Columns and column bases and their Design
6. Familiarize students with Plate girder and Gantry Girder and their Design

Course Content:

UNIT – I: Bolted and Welded connections: (contact hours - 14)
Introduction, Advantages and disadvantages of welding- Strength of welds-Butt and fillet welds: Permissible stresses – IS Code requirements. Design of welds fillet weld subjected to moment acting in the plane and at right angles to the plane of the joints, beam to beam and beam to Column connections.

UNIT –II: Tension Members and Compression Members: (contact hours - 10)
General Design of members subjected to direct tension and bending – effective length of columns. Slenderness ratio – permissible stresses. Design of compression members, struts etc.

UNIT – III: Beams: (contact hours - 8)
Allowable stresses, design requirements as per IS Code-Design of simple and built-up beams-Curtailment of flange plates, Beam to beam connection, check for deflection, shear, buckling, check for bearing, laterally unsupported beams.

UNIT – IV: Design of Built Up Compression Members (contact hours - 8)
Design of lacings and batten. Design Principles of Eccentrically loaded columns splicing of columns. Design of Column Foundations: Design of slab base and gusseted bases. Column bases subjected moment.

UNIT - V: Roof Trusses: (contact hours - 10)
Different types of trusses – Design loads – Load combinations IS Code recommendations, structural details – Design of simple roof trusses involving the design of purlins, members and joints – tubular trusses.

UNIT – VI: Plate Girder & Gantry Girder: (contact hours - 10)
Design consideration – I S Code recommendations Design of plate girder Welded – Curtailment of flange plates stiffeners – splicing and connections. Gantry girder impact factors - longitudinal forces, Design of Gantry girders.

Learning resources:

Text Books:

1. N Subramanian ,"*Design of Steel Structures- Limit State Method*" , 2nd edition 2016 , Oxford Press, New Delhi
2. K. S. Sairam, "Design of Steel Structures", 2nd edition 2015, Pearson Education India, New Delhi.
3. S.K. Duggal, Tata Mcgraw Hill ,"*Design of steel structures*", 2009 ,New Delhi

References:

1. P Dayaraththam," *Design of steel structures*" , S Chand Publication, New Delhi
2. B.C. Punmia "*Comprehensive Design of Steel structures*", , Ashok Kumar Jain and Arun Kumar Jain,2nd edition 2015 , Laxmi Publications, New Delhi.
3. M.Raghupathi, "*Design of Steel Structures*", 1995 , Tata Mc. Graw-Hill

Web Resources :

1. IIT MADRAS, December 31 2009, "*Design of steel structures"* URL:http://nptel.ac.in/courses/105106112/

Course Outcomes: On completion of the course the student will be able to

CO1	Design bolted and welded connections for tension and compression members and beams.
CO2	Identify and compute the design loads on a typical steel building.
CO3	Identify the different failure modes of steel tension and compression members and beams, and compute their design strengths.
CO4	Select the most suitable section shape and size for tension and compression members and beams according to specific design criteria.
CO5	Identify the different failure modes of bolted and welded connections, and determine their design strengths.
CO6	Design Plate Girder and Gantry Girder with connection detailing.

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 3203	ENVIRONMENTAL ENGINEERING-II	PEC	2-1-0	3

Course Learning Objectives:

On completion of the course the student will be able to

1. To define and describe waste water characteristics
2. To list the effluent standards for safe disposal, IS:10500
3. To explain the process of waste water treatment.
4. To apply the knowledge of waste water parameters in design of conventional waste water treatment plant
5. To design and analyze waste water collection system
6. To impart the knowledge of advanced waste water treatment systems.

Course Content:

UNIT- I: Sewage Characteristics (Contact hours:08)

Characteristics of sewage: composition and chemistry of sanitary sewage, B.O.D, C.O.D, etc, their sources and examinations, physical, chemical, bacteriological standards for disposal of effluent.

UNIT –II: Introduction To Sewage Treatment (Contact hours:09)

Sewage treatment: aims, methods of treatment, flow-sheets for preliminary, primary, Secondary and tertiary treatment. Preliminary treatment: Screening, Skimming, grit chambers; process and design, disposal of screenings and grit. Primary treatment: Sedimentation: Process and design

UNIT –III: Sewage Treatment-Biological (Contact hours:10)

Introduction to Microbiology: Microbial ecology and Growth kinetics; Types of microorganisms; aerobic vs. anaerobic processes Secondary/ Biological treatment methods; principles, trickling filter operation, re-circulation, activated sludge process and its modifications, hydraulic design of trickling filter and activated sludge process, sludge volume index, operational problems in activated sludge process and trickling filters, stabilization ponds.

UNIT –IV: Sludge Digestion and Disposal (Contact hours:06)

Sludge digestion: principles of anaerobic digestion, quantity and characterizations of sludge, design of sludge digestion tanks, disposal of digested sludge, drying beds.

UNIT- V: Advanced Sewage Treatment (Contact hours:06)

Low cost sanitation: septic tanks and Anaerobic Filter - principles, operation and suitability, design values, disposal of treated effluent. Tertiary Treatment methods, general description.

UNIT –VI: Design of Sewers **(Contacthours:06)**

Various design parameters, Hydraulic formulae for design velocities, design of sewers.

Learning resources

Text Books:

1. Santhosh Kumar Garg," *Environmental Engineering Vol.II*", Khanna publishers,24tth edition, 2012

References:

1. Howard S. Peavy, "*Environmental Engineering*",1st Edition,1985, McGraw-Hill International editions.
2. G.S. Birdi, "*Water supply and sanitary Engineering*" ,DhanpatRai& Sons Publishers
3. "*Waste water Engineering: Treatment, Disposal and reuse* ",Metcalf&Eddy, 4th Edition, 2002, McGraw-Hill Indian editions.

WED RESOURSES:

1. NPTEL HRD, December 20, 2007,"*Water and Waste Water Engineering*" URL: http://nptel.ac.in/courses/105106119/#

COURSE OUTCOMES: At the end of the course, the student will be able to

CO 1	explain physical ,chemical and biological characteristics of waste water
CO 2	list different effluent standards for safe disposal, IS:10500
CO 3	Acquire knowledge to explain the process of waste water treatment.
CO 4	cope up with the basic operation of unit processes for conventional sewage treatment plant
CO 5	design different units of waste water treatment plant
CO 6	Analyze sewage network system.

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 3204	FOUNDATION ENGINEERING	PCC	2-1-0	3

Course Learning Objectives:

The student will be able to

1. Classify the characterization of soils.
2. Explain the bearing capacity of soils.
3. Design the shallow foundations.
4. Design the deep foundations.
5. Understand the concepts of earth pressure theory and stability of slopes.
6. Demonstrate the stability of slopes.

Course Content:

UNIT-I: **(Contact hours: 5)**

Methods of soil exploration – Boring and Sampling methods – Penetration Tests – Plate load test – Pressure meter – preparation of soil investigation report.

UNIT-II: Earth pressures : **(Contact hours: 8)**

Rankine's theory of earth pressure – earth pressures different soils and layered soils – Coulomb's earth pressure theory – Culmann's graphical method. Retaining Walls: Types of retaining walls – stability of retaining walls against overturning, sliding, bearing capacity and drainage from backfill.

UNIT-III: Stability of Slopes: **(Contact hours: 8)**

Infinite and finite earth slopes – types of failures – factor of safety of infinite slopes – stability analysis by Swedish arc method, standard method of slices, Bishop's Simplified method – Taylor's Stability Number Stability of slopes of earth dams under different conditions.

UNIT-IV: Stresses distribution in soils: **(Contact hours: 8)**

Boussinesq's theory-Computation of increment in vertical stress due to application of a point load (its distribution on horizontal, vertical planes), uniformly distributed circular and rectangular areas -Pressure bulb -Significant depth-Construction and use of Newmark's chart -Westergaard's theory -Validity of elastic theories -Contact pressure distribution.

UNIT-V: Bearing capacity **(Contact hours: 8)**

Bearing capacity of Foundations using general bearing capacity equation – Terzaghi's-Meyerhof's, Brinch Hansen's, IS Method, Skemptom's and Vesic'smethods.

Shallow foundations

Functional requirements- Types- -suitability -Types of shear failures, Effect of type of shear failure/shape of the footing /water table, ultimate and allowable bearing capacity,- correction factors, Settlements of foundations, immediate, consolidation and creep settlements. Contact pressure and settlement distribution

UNIT-VI: Deep Foundations: **(Contact hours: 8)**

Types of piles – Load carrying capacity of piles based on static pile formulae in different soils- Dynamic pile formulae – Pile load tests - Load carrying capacity of pile groups in sands and clays – Settlement of pile groups. pile under lateral loading, Negative Skin friction.

Learning Resources

Text Book:

1. Joseph E. Bowles, '*Foundation Analysis and Design*',The McGraw Hill Companies,Fifth Edition.

Reference Books:

1. Gopal Ranjan, A.S.R. Rao, '*Basic and Applied Soil Mechanics'*, 3rdedition , 2016 , New Age International (P) Limited publishers, India.
2. Braja M. Das, '*Principles of Foundation Engineering*', Cengage learning Inc, 7th Edition 2010.

Web Resources:

1. IIT Kharagpur, July 17 2013, '*Advanced Foundation Engineering'*.
   URL: https://nptel.ac.in/courses/105105039/

Course outcomes: At the end of the course, the student will be able to

CO 1	Understand the characterization of soils.
CO 2	Understand the bearing capacity of soils.
CO 3	Design the shallow foundations.
CO 4	Design the deep foundations.
CO 5	Elaborate the concepts of earth pressure theory and stability of slopes.
CO 6	Discuss of stability of slopes.

Assessment Method:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 3205	**Transportation Engineering-II**	**PEC**	**2-1-0**	**3**

Course Learning Objectives:
The student will be able to

1. Illustrate the development of railways in India
2. Design the track and horizontal and vertical curves of railways.
3. Explain track drainage and signalizations.
4. Categorize the concepts of dock and harbor engineering.
5. Demonstrate the concepts of airport engineering.
6. Explain the concepts of tunnels.

Course Content:

UNIT-I: Railway Engineering-I **(Contact hours: 5)**
Historical Development of Railways in India, Advantages of Railways, Classification of Railways, Permanent Way & its components, functions. Track volume and Track capacity.

UNIT-II: Railway Engineering-II **(Contact hours: 8)**
Rail Joints, Welding of rails and Creep of rails. Track Geometric Design, Gradients, Horizontal and Vertical curves, super elevation, Negative Super elevation, Coning of Wheels.

UNIT-III: Railway Engineering-III **(Contact hours: 8)**
Turnouts: Left Hand Turnout, Track Junctions, Points and crossings, Tracks Drainage, Railway Stations and Yards, Signaling.

UNIT-IV: Dock and Harbor Engineering **(Contact hours: 8)**
Layout of Port, Components and Functions, Classification of Ports, Harbor and its classification, Site selection of ports &harbors, Natural phenomenon - Tides, Wind, Waves & Currents, Navigational aids.

UNIT-V: Airport Engineering **(Contact hours: 8)**
Layout of Airports, Aircraft components and functions, Aircraft characteristics, Airport site selection, Airport obstructions, Wind rose Diagram, Runway design, Taxiway.

UNIT-VI:Tunnels **(Contact hours: 8)**

Alignment of tunnels – Cross-section of tunnels – Construction methods of Tunnels – Tunnel lining – Ventilation – Drainage

Learning Resources:

Text Books:

1. B.L. Gupta and Amit Gupta, '*Roads, Railways. Bridge, Tunnels & Harbor dock Engineering*', Standard Publishers Distributors.3rd edition 2011.

Reference Books:

1. S.C. Saxena& S Arora, '*Railway Engineering*', Dhanpatrai Publications, 6th Edition 2010.
2. Srinivasan, '*Docks &Harbor Engineering*', Charotar Publishing House, 7th Edition 2012.
3. S.K. Khanna& M.G. Arora& S.S. Jain, '*Airport Planning & Design*', Nem Chand & Brothers, 5th Edition 1999.

Web Resources:

1. IIT Roorkee, '*Transportation Engineering – II*'
   URL: http://www.nptelvideos.in/2012/11/transportation-engineering-ii.html

Course outcomes: At the end of the course, the student will be able to

CO 1	Understand the development of railways in India
CO 2	Design the track and horizontal and vertical curves of railways
CO 3	Demonstrate the concepts of track drainage and signalizations
CO 4	Analyze the concepts of dock and harbor engineering
CO 5	Discuss about the concepts of airport engineering
CO 6	Predict about the tunnels

Assessment Method:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20EG3283	**English Language Communication Skills Lab-III**	**HSC**	**0-0-3**	**1.5**

Course objectives:

1. To improve interpersonal skills of the students
2. To help the students to write professional letters and reports
3. To practice the etiquettes to be used at workplace
4. To reward hands on experience on managing meetings
5. To imbibe leadership qualities in the students

COURSE CONTENT

UNIT-I: **(06 Contact Hours)**

Professional Presentation - Collecting & Reading the materials to be presented - Analyzing the main points - Summarizing & concluding - Developing PPT - Delivery of the Presentation

UNIT-II: **(06 Contact Hours)**

Report Writing & Writing Professional Emails & Applications – Routine Reports – Investigative Reports - Professional Emails - Formal Letters and Applications

UNIT-III: **(06 Contact Hours)**

Agenda, Meetings, & Minutes - Setting the agenda for a meeting - Managing a meeting - Keynote address & vote of thanks - Publishing the minutes

UNIT-IV: **(06 Contact Hours)**

People skills and small talks (2 minutes) - Talking to professional executives - Talking to colleagues - Talking to the boss - Talking to your team - Talking to the media delegates

UNIT-V: **(06 Contact Hours)**

Corporate Etiquettes - How to introduce & greet - How to raise a question - How to clarify a doubt - How to say “yes” or “no” - Rapport building - Dining & winning - Counseling somebody - How to influence & motivate

UNIT-VI: **(06 Contact Hours)**

Life Skills - Leadership communication - Interpersonal communication - Stress management - Time Management

References:

1. *Business Communication Today*, 12th Edition, Courtland L Bovee & John Thill, Pearson
2. British Council Material on communication
3. Training in Interpersonal Skills: Tips f: Tips for Managing People at Work by Robbins and Hunsaker
4. Soft Skills for Everyone, with CD Paperback –by Jeff Butterfield
5. Communication for business by Shirley Taylor, Pearson

Course outcomes: At the end of the course, the student will be able to

CO 1	The art of professional presentation
CO 2	Write professional reports and letters
CO 3	Conduct a formal meeting
CO 4	Develop people skills and corporate etiquettes
CO 5	Gain the basic knowledge about leadership communication, stress management and time management

Assessment Method:

Course Nature: LABORATORY

Internal Assessment (40 Marks)		**External Assessment (**60 Marks)	
Record Writing	– 10 Marks	Reading Comprehension	– 15 Marks
Attendance	– 10 Marks	Writing	– 30 Marks
Continuous Assessment (Listening – 10 Marks + Oral Presentations – 10 Marks)		Speaking (Viva-Voce)	– 15 Marks

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE 3282	**ENVIRONMENTAL ENGINEERING Lab**	**PCC**	**0-0-3**	**1.5**

Course Learning Objectives/Outcomes:

1. To provide students with a solid foundation in water quality principles
2. To estimate the physical characteristics of water and sewage
3. To measure the chemical characteristics of water and sewage
4. To predict the optimum chemical dosage for various water treatment processes
5. To analyze water quality by comparing experimental data with IS values
6. To interpret experimental results in reports and graphical forms

List of Experiments:

1. Estimation of pH and Electrical Conductivity
2. Determination of turbidity
3. Estimation of Odour
4. Determination of Total solids
5. Determination of Total volatile solids and Total fixed solids
6. Determination of Suspended solids and Dissolved solids
7. Determination of Chloride by Argentometric Method
8. Estimation of hardness
9. Estimation of alkalinity
10. Estimation of Dissolved Oxygen
11. Estimation of Biochemical Oxygen Demand
12. Estimation of Chemical Oxygen Demand
13. Determination of Optimum Coagulant Dosage

Course Nature		**Practical**		
Assessment Method				
Assessment Tool (In semester)	Experiments related	Record	Viva-Voce/ Quiz/MCQ/Lab project	Total
Weightage (%)	20%	10%	10%	40%
Assessment Tool (End semester)	Procedure/Description of the experiment with relevant information and Discussion on Results	Results	Viva-Voce	
Weightage (%)	30%	10%	20%	60

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**********ELECTIVES SYLLABUS**********

B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX21	FINITE ELEMENT METHOD	PEC	3-0-0	3

Course Learning Objectives:

The objective of this course is:

1. Equip the students with the fundamentals of Finite Element Analysis.

2. Enable the students to formulate the design problems into FEA.

3. Enable the students to solve Boundary value problems using FEM.

4. To learn the theory and characteristics of finite elements that represent engineering structures.

5. To understand the concepts of trusses, beams and frames by finite element method.

6. To understand the basic concepts of finite element formulation techniques.

Course Content:

UNIT I: INTRODUCTION FINITE ELEMENTAL ANALYSIS (Contact hours: 7)
Approximate solution of boundary value problems--Methods of weighted residuals, approximate solution using variation method, Modified Galerkin method, Boundary conditions and general comments.

UNIT II: FINITE ELEMENT FORMULATION TECHNIQUES (Contact hours: 6)
Basic finite element concepts-Basic ideas in a finite element solution, General finite element solution procedure, Finite element equations using modified Galerkin method, Application: Axial deformation of bars, axial spring element.

UNIT III: ANALYSIS OF TRUSSES (Contact hours: 10)
Analysis of trusses-Two dimensional truss element, three dimensional space truss element, Stresses due to lack of fit and temperature changes.

UNIT IV: BEAM ANALYSIS (Contact hours: 8)
Beam bending-Governing differential equation for beam bending, two node beam element, and exact solution for uniform beams subjected to distributed loads using superposition, Calculation of stresses in beams, Thermal stresses in beams.

UNIT V: ISOPARAMETRIC FORMULATION & SOLUTION (Contact hours: 8)

Higher order elements for one dimensional problems-Shape functions for second order problems, Isoperimetric mapping concept, Quadratic Iso-parametric element for general one dimensional boundary value problem, One dimensional numerical integration, Application: Heat conduction through a thin film.

UNIT-VI: BOUNDARY VALUE PROBLEM (Contact hours: 6)

Two dimensional boundary value problems using triangular elements, Equivalent functional for general 2D BVP, A triangular element for general 2D BVP, Numerical examples.

Learning Resources:

Text Books:

1. Robert D. Cook, Michael E Plesha '*Concepts and applications of Finite Element Analysis'*,2001 ,4th Edition, John Wiley & sons Publications.

Reference Books:

1. Tirupati R. Chandrupatla, Ashok D. Belgunda '*Introduction to Finite Elements in Engineering*', 4thedition ,2011, PHI publications.
2. Bhatti, M.A., '*Fundamental Finite Element Analysis and Applications: with Mathematica and Matlab Computations'*, Wiley, 1st edition , 2005.
3. David V. Hutton '*Fundamentals of Finite Element Analysis*', Tata McGraw-Hill , 1st edition , 2003 .
4. C.S. Krishna Murthy *'Finite element Analysis- Theory and programming*', 2013 ,TataMcGra Hill.

Web Resources:

IIT Madras, July 02, 2012, '*Finite element analysis'* (NPTEL)

1.http://nptel.ac.in/courses/105106051/

COURSE OUTCOMES: At the end of the course, the student will be able to

CO 1	Solve simple boundary value problems using Numerical technique of Finite element method.
CO 2	Develop finite element formulation of one and two dimensional problems and solve them.

CO 3	Assemble Stiffness matrices, Apply boundary conditions and solve for the displacements.
CO 4	Compute Stresses and Strains and interpret the result.
CO5	Formulate the finite element techniques.
CO6	Solve the isoparametric formulations and solutions.

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	Course Name	Category	L-T-P	Credits
20CE XX22	**STABILITY OF STRUCTURES**	**PEC**	**2-1-0**	**3**

Course Learning Objectives:

1. Concept and characteristics of stability problems.
2. Buckling of columns with remotes end conditions.
3. Importance of torsional and lateral buckling.
4. Buckling of rectangular and circular plates.
5. Approximate methods and application for finite difference methods.
6. Understand the buckling of columns.

Course Content:

UNIT I - INTRODUCTION **(Contact hours: 6)**

Concept of stability - Approaches to stability analysis - characteristics of stability problems.

UNIT-II **(Contact hours: 8)**

Buckling of Columns: Method of neutral equilibrium, Critical load of the Euler column, Linear column theory – Eigen value problem, Effective length concept, Higher order differential equation for columns initially bent columns, Effect of shear stress on buckling, eccentrically loaded columns, beam columns (Beam columns with concreted lateral load, distributed, load end moment), Inelastic buckling of columns, Double modulus theory, Tangent modulus theory, Shanley theory of inelastic column behavior.

UNIT-III **(Contact hours: 8)**

Approximate Methods of Analysis: Conservation of energy principles, Calculation of critical loads using approximate deflection curve, Principle of stationary potential energy, Raleigh-Ritz method, Buckling load of column with variable cross section, Galerkin's method, Calculation of critical load by finite differences, Unevenly spaced pivot points, Matrix stiffness method, Effect of axial load on bending stiffness-slope deflection equations, Buckling of column loaded along the length using energy methods.

UNIT-IV **(Contact hours: 8)**

a) Buckling of Frames: Modes of buckling, Critical load of a simple frame using neutral equilibrium, Slope deflection equations and matrix analysis.

b) Lateral buckling of cantilever and simply supported beams of rectangular and I-sections and use of energy method and finite differences.

UNIT-V **(Contact hours: 7)**

Buckling of Plates: Differential equation, Strain energy of bending, Critical load, Finite difference approach inelastic buckling of plates.

UNIT-VI **(Contact hours: 8)**

Matrix approach for Frames: Criterion for determination of critical loads, Stiffness influence coefficients for members without axial load, Derivation of stability functions, Problem involving Non-sways, Modified stiffness of beams, Frames with sway, Multi-bar frames.

Learning Resources:

TEXT BOOKS:

1. Chajes, "*A Principles of Structures Stability Theory*", Prentice Hall, 1974.

REFERENCE BOOKS :

1. Brush and Almorth, "*Buckling of Bars, Plates and Shells*",McGraw Hill book Company, 1st edition , 1975.

2. Seely, F.B, and Smith, J.O,"*Advanced Mechanics of Materials*", 12th printing Edition, John Wiley and Sons, Inc., New York. 1967.

3. Timoshenko.S, and Woinowsby - Krieger.S, "*Theory of Plates and Shells*",2nd Ed. McGraw - Hill Book Co., New York 1959.

4. Ashwini Kumar, "*Stability Theory of Structures*", Tata McGraw Hill Co., New Delhi, 1986

Web Resources:

1. IIT Madras, Dec-2017,'*Stability of Structures',NPTEL*"http://nptel.ac.in/courses/10125105105/"

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1	Understand the basic concepts of buckling in the columns.
CO2	Analyze the torsional buckling and lateral buckling in the frames.
CO3	Understand the modes of buckling.
CO4	Apply the matrix analysis in the frames.
CO5	Understand the concept of buckling of plates.
CO6	Understand the conservation of energy principles.

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX23	PRESTRESSED CONCRETE STRUCTURES	PEC	2-1-0	3

Course Learning Objectives:

1. Familiarize Students with concepts of prestressing.
2. Equip student with different systems and devices used in prestressing.
3. Understand the different losses of prestress including short and long term losses.
4. Familiarize students with the analysis and design of prestressed concrete members under flexure, shear and torsion.
5. Understand the behaviour of composite sections.
6. Determine the deflections in prestressed members.

Course Content:

UNIT I: Introduction &Methods of Prestressing (Contact hours: 7)

Historic development, General principles of prestressing, Pretensioning and post tensioning, Advantages and limitations of prestressed concrete, Materials, High strength concrete and high tensile steel their characteristics, Methods and Systems of Prestressing, Pre-tensioning and post tensioning methods, Different systems of prestressing like Hoyer System, Magnel System Freyssinet system and Gifford – Udall System.

UNIT – II: Losses of Prestress (Contact hours: 8)

Loss of prestress in pre-tensioned and post-tensioned members due to various causes like elastic shortening of concrete, shrinkage of concrete, creep of concrete, Relaxation of stress in steel, slip in anchorage, bending of member and wobble frictional losses.

UNIT – III: Analysis And Design of Sections For Flexure (Contact hours: 7)

Elastic analysis of concrete beams prestressed with straight, concentric, eccentric, bent and parabolic tendons, Allowable stress, Design criteria as per I.S Code, Elastic design of simple rectangular and I-section for flexure – Kern – lines, cable profile.

UNIT – IV: Analysis And Design of Section for Shear (Contact hours: 8)

Shear and Principal Stresses, Design for Shear in beams

UNIT – V: Composite Section (Contact hours: 6)

Introduction - Analysis of stress – Differential shrinkage – General designs and considerations

UNIT – VI: Deflections of Prestressed Concrete Beams (Contact hours: 8)

Importance of control of deflections, factors influencing deflections, short term deflections of uncracked member's prediction of long term deflections.

Learning Resources:

Text Books:

1. Krishna Raju, "*Prestressed Concrete*", 5th Edition,2012,Tata McGraw Hill Publishing Co..

Reference books;

1. Sinha.N.C.and.Roy.S.K, "*Fundamentals standardsof Prestressed Concrete*", S.Chand and Co., New Delhi 1998.

2. IS: 1343-1980, " *Code of practice for Prestressed concrete*", Bureau of Indian

Web Resources:

NPTEL, December 31 2009, '*prestressedconcretestructures'* "**URL** :http://nptel.ac.in/courses/105106117/"

Course Outcomes: At the end of this course; the student will be able to

CO1	Understand the different methods of prestressing.
CO2	Estimate the effective prestress including the short and long term losses.
CO3	Analyze and design prestressed concrete beams under flexure and shear.
CO4	Understand the relevant IS Codal provisions for prestressed concrete.
CO5	Examine composite sections.
CO6	Understand the importance of control of deflections.

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX24	ADVANCED REINFORCED CONCRETE STRUCTURES	PEC	2-1-0	3

Course Objectives: The student will be able

1. To understand the basic concepts of reinforced concrete members
2. To develop an idea about the design of shear walls
3. To familiarize with design and detailing of flat slabs and flat plates
4. To develop an idea about the design of special R.C. elements
5. To introduce the detailing and strengthening of existing structure
6. To analyze the rectangular water retaining tank.

Course Content:

UNIT I – INTRODUCTION: **(Contact hours: 7)**
Review of Basic Concepts - Behavior and Design of Reinforced Concrete members considering flexure, Torsion, combined with flexure and flexural shear, axial compression deflection and crack width as per IS-456-2000.

UNIT II - DESIGN OF SHEAR WALLS: **(Contact hours: 6)**
Behaviour and Design of Slender Columns - Design of R.C.Walls - Ordinatry and Shear walls - Design of Corbels - Deep beams and grid floors.

UNIT III - FLAT SLABS AND FLAT PLATES: **(Contact hours: 8)**
Design of flat slabs and flat plate - According to ACI method - Design of shear Reinforcement and Edge (Spandrel) beams - yield line theory & Hiller borg method of design of slabs.

UNIT IV - DESIGN OF SPECIAL R.C. ELEMENTS: **(Contact hours: 8)**
Limit Analysis of Concrete beams - moment - rotation curves - moment redistribution in continuous beams - Baker's method of plastic design - Design of cast in - situ frames.

UNIT V - DESIGN AND DETAILING OF STRUCTURES: **(Contact hours: 8)**
Detailing for ductility - Fire Resistance of buildings - Field control of concrete - Strengthening of existing structures - Design and detailing of structures according to different codes.

UNIT VI – LIQUID RETAINING STRUCTURES: **(Contact hours: 8)**

Basic design philosophy, Analysis and design of single cell rectangular water tanks subjected to hydrostatic loading based on plate theory.

Learning Resources:

Text Book:

1. Varghese.P.C, "*Advanced Reinforced Concrete Design*", Prentice Hall of India, Second Edition, 2009

References Books:

1. Pillai.S.V and Menon.D, "*Reinforced Concrete Design*", Tata McGraw Hill Book Co., first Edition, 2002.

2. Purushothaman.P. "*Reinforced Concrete Structural Elements*", Behaviour, Analysis and Design. Tata McGraw Hill 1986.

3. Park.R&Paulay.T, "*Reinforced Concrete Structures*", John Wiley and Sons, 2009

Web Resources:

1. NPETL 31 December 2009 "*Advanced Reinforced Concrete Design*", URL;http://nptel.ac.in/courses/10510516205/
2. IIT Madras, 2007, K. Ramesh, *e-Book on Engineering Fracture Mechanics*,. URL: http://apm.iitm.ac.in/smlab/kramesh/book_4.htm

Course Outcomes: At the end of this course; the student will be able to

CO1	Understand the behavior of the members under flexure, torsion and combined
CO2	Analyze the shear walls and deep beams
CO3	Evaluate the flat slabs and flat plates
CO4	Analyze the cast in - situ frames
CO5	Practice the detailing and strengthening of existing structure
CO6	To analyse and design the overhead tank design

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX25	ADVANCED CONCRETE TECHNOLOGY	PEC	3-0-0	3

Course Learning Objectives:

1. Define microstructure of concrete.
2. To understand the behavior of fresh and hardened concrete.
3. To understand factors affecting the strength, workability and durability of concrete.
4. To impart the methods of proportioning of concrete mixtures.
5. Demonstrate NDT methods for concrete.
6. To make aware the recent developments in concrete technology.

Course Content:

UNIT-I: Microstructure of Concrete (Contact hours: 6)

Definition, significance, microstructure of aggregate phase and hydrated cement paste, interfacial transition zone, microstructure-property relationships

UNIT-II: Admixtures (Contact hours: 9)

Significance – Nomenclature, Specifications and classifications –

Chemical Admixtures: Surface Active Chemicals – Set Controlling Chemicals

Mineral Admixtures: SCMs – Significance – Functions –

UNIT-III: Strength of concrete (Contact hours: 6)

Definition, strength-porosity relationship, failure modes in concrete, factors affecting compressive strength –characteristics and proportion of materials, curing conditions, testing parameters, behavior of concrete under uniaxial compression, uniaxial tension, shearing stress, biaxial and multi axial stresses.

UNIT-IV: Dimensional stability (Contact hours: 6)

Types of deformations, Elastic behavior – Nonlinearity of stress-strain relationship, types of elastic moduli, determination of static elastic modulus, Poisson's ratio, factors affecting modulus of elasticity, Drying shrinkage and creep, Thermal shrinkage, Extensibility and cracking

UNIT-V: Durability (Contact hours: 8)

General observations, Water as an agent of deterioration, Permeability of hardened cement paste, aggregate, and concrete, various causes of concrete deterioration, Sulphate attack

and its control, Alkali aggregate reaction and its control, Corrosion of embedded steel in concrete

UNIT-VI: Non-Destructive testing methods **(Contact hours: 06)**

Surface hardness methods, Penetration Resistance Techniques, Pullout tests, Maturity method, Absorption and permeability tests, Electrical methods, Electro chemical methods, Electro-magnetic methods, evaluation criteria, Assessment of reinforcement condition.

Learning Resources:

Text Books:

1. P. Kumar Mehta, Paulo J M Monteiro, " *Concrete microstructure, properties and materials*", 3rd edition, 2014, McGraw-Hill publications

Reference Books:

1. A M Neville, *'Properties of concrete'*, 5th edition,2011 Person India
2. Rafat Siddique *'Special Structural concrete'.2000*

Web Resources:

1. NPTEL, December 31 2009,' '*Concrete Engineering and Technology* '**URL:**'http://nptel.ac.in/syllabus/syllabus.php?subjectId=105104030

Course Outcomes: At the end of this course; the student will be able to

CO1	Understanding the testing of concrete materials as per IS code.
CO2	Know the procedure to determine the properties of fresh and hardened of concrete.
CO3	Design the concrete mix using ACI and IS code methods.
CO4	Select and design special concretes depending on their specific applications.
CO5	Gain ideas on non-destructive testing of concrete.
CO6	Know the different types of concrete.

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX26	Structural Dynamics	PEC	2-1-0	3

Course Learning Objectives:

The objective of this course is:

1. To introduce general theory of vibration and solve problems of single degree of freedom (SDOF) systems
2. To enable the learners to solve dynamic problems in multi-degree of freedom (MDOF) systems
3. To introduce dynamic analysis of continuous systems
4. To apply structural dynamic principles to the analysis of structures for seismic and wind loading.
5. To understand the response for damped and undamped free vibration systems.
6. To understand the basic concept of numerical methods.

Course Content:

UNIT-I: Concepts of Dynamics and Vibrations; **(Contact hours: 6)**
Discrete and Continuous systems, Free Body Diagramme, D-Alembert's Principle, Energy principle, Governing Equation of Motion for Free and forced Vibration, damped and Un-damped Vibration.

UNIT-II: Free Vibration **(Contact hours: 8)**
Response for Damped and Undamped free vibration systems, critically damped, under damped, over damped vibration systems and applications.

UNIT-III: Forced Vibration **(Contact hours: 7)**
Response for damped and undamped forced vibrations for harmonic, Periodic, Impulse and Earthquake loading.

UNIT-IV: **Numerical Methods** **(Contact hours: 8)**
Numerical Methods for free and forced Vibration Analysis, Central difference method, New marks method.

UNIT-V: **Multi Degree Freedom System** **(Contact hours: 8)**
Governing equation of motion for Multi Degree freedom system, Response of Multi-degree freedom Systems.

UNIT VI - Analysis for Wind Forces: **(Contact hours: 8)**
Wind effects on structures - static and dynamic - analysis for wind loads using BIS codes - quasi static method and gust factor method.

Learning Resources:

Text Books:

1. Anil K Chopra, "*Dynamics of Structures- Theory and applications to Earthquake Engineering"* 4th edition,2011, person India.
2. A.K.Jain, "Dynamics of structures with MATLAB Applications" 2016, Pearson Education India.

References Books:

1. Maria and Paz, "*Structural Dynamics- Theory and computation*" 5th Edition, 2006 ,Springer Publisher.
2. IS 1893 (Part-1)-2002, "*Earthquake resistant Design of Structures -Buildings*" Bureau of Indian standards, New Delhi
3. Clough &Penzein "*Dynamics of Structures*", McGraw Hill 1995.

Web Resources:

IIT Bombay, July 03, 2012, '*Structural dynamics'*,(NPTEL)
URL:http://nptel.ac.in/courses/105101006/

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1	Understand the fundamental theory of dynamic equation of motion.
CO2	Understand fundamental analysis methods for dynamic systems.
CO3	Observe the dynamic properties and behavior of civil structures.
CO4	Apply modeling approach of dynamic response in civil engineering applications.
CO5	Apply structural dynamics theory to earthquake analysis, response, and design of structures.
CO6	Understand the numerical methods for free and forced vibration analysis.

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX27	BRIDGE ENGINEERING	PEC	2-1-0	3

Course Learning Objectives:

The objective of this course is to:

1. Familiarize Students with different types of Bridges and IRC standards.
2. Equip student with concepts and design of Slab Bridges, T Beam Bridges, Box, Culverts.
3. Understand concepts of design of Plate Girder Bridges.
4. Familiarize with different methods of inspection of bridges and maintenance.
5. Understand the bridge methodologies.
6. Understand the basic concept of standard loading for bridge design.

Course Content:

UNIT –I: Introduction (Contact hours: 6)

History of Bridges; Components of a Bridge and its definitions; Classification of Road bridges, related structures, span length, classical examples of each type, history of analysis

UNIT – II: Selection of site and Initial Decision Process (Contact hours: 7)

Geotechnical investigations and implementations, **River Bridge: S**election of bridge site and planning, collection of bridge design data, hydrological calculation, Waterway calculation, scour calculation, depth of foundation, freeboard **Road Bridge:** Selection of bridge site and planning, collection of bridge design data, vertical clearance

UNIT – III: Standard Loading for Bridge Design as per IS codes (Contact hours: 10)

Road Bridges: IRC, BS code, AASHTO code, Dead load, Live load, Impact factor, Centrifugal force, Wind loads, hydraulic forces, longitudinal forces, seismic forces, earth pressure: Buoyancy, Lane concept, equivalent loads, traffic load, width of roadway and footway; Influence lines for statically; determinate structures. Influence lines (I.L.) for statically indeterminate structures; Transverse distribution of Live loads among deck longitudinal; Load combinations for different working state and limit state designs. **Railway Bridges:** Loadings for Railway Bridges; Railroad data; Pre-design considerations; Rail road vs. Highway bridges.

UNIT – IV: Super Structure (Contact hours: 8)

Selection of main bridge parameters, design methodologies; Choices of superstructure types; orthotropic plate theory, load distribution techniques; Grillage analysis; Finite element analysis (Preferable); Different types of superstructure (RCC and PSC);

Longitudinal Analysis of Bridge; Slab bridge and voided slab bridge; Beam-Slab bridge; Box Girder Bridge. **Transverse Analysis of Bridge:** Slab bridge and voided slab bridge, Beam-Slab bridge; Box Girder Bridge.

UNIT – V: Sub Structure: **(Contact hours: 8)**

Pier; Abutment; Wing walls; Importance of Soil Structure Interaction; Types of foundations; Open foundation; Pile foundation; Well foundation; Examples - Simply supported bridge, Continuous Bridge.

UNIT – VI: Bearings and Deck joints: **(Contact hours: 6)**

Different types of bridge bearings and expansion joints; Design of bearings and joints; **Railing for Highway Bridge:** Definitions; Classification of Highway Bridge parapets;

Learning Resources:

Text Books:

1. T.R. Jagadeesh and M.A. Jayaram, " *Design of Bridge Structures*", 2nd Edition 2009, PHI Learning Pvt. Ltd.

References Books:

1. D.J. Victor, "*Essentials of Bridge Engineering*", 6th Edition 2017,Oxford publications.
2. E.C Hambly, *"Bridge Deck Behavior "*,2 edition , December 31, 1990 E & FN SPON Publications
3. R.RAJAGOPALAN, "*Bridge Superstructure*", Tata McGraw- Hills Publishing Company Limited.
4. S. PONNUSWAMY, *"Bridge Engineering"*, Tata McGraw - Hills Publishing Company Limited.

Web Resources:

IIT madras, '*Bridge Engineering*' (NPTEL) "http://nptel.ac.in/syllabus/105999906/"

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1	Explain different types of Bridges with diagrams and Loading standards
CO2	Carryout analysis and design of Slab bridges, T Beam bridges, Box culvers and
CO3	suggest structural detailing
CO4	Carryout analysis and design of Plate girder bridges

CO5	Organize for attending inspections and maintenance of bridges and prepare reports.
CO6	Design the bridges.

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	Course Name	Category	L-T-P	Credits
20CE XX28	**REPAIR AND REHABILITATION OF STRUCTURES**	**PEC**	**3-0-0**	**3**

Course Learning Objectives:

1. Familiarize Students with deterioration of concrete in structures.
2. Equip student with concepts of NDT and evaluation.
3. Understand failures and causes for failures in structures.
4. Familiarize different materials and techniques for repairs.
5. Understand procedure to carryout Physical evaluation of buildings and prepare report.
6. Understand the maintenance and repair strategies.

Course Content:

UNIT –I: Deterioration of concrete Structures (Contact hours: 8)

Physical processes of deterioration like freezing and thawing, Wetting and Drying, Abrasion, Erosion, Pitting, Chemical processes like carbonation, chloride ingress, Corrosion, Alkali aggregate reaction, Sulphate attack, Acid Attack, temperature and their

causes, Mechanism, Effect, preventive measures – Cracks: cracks in concrete, type, pattern, quantification, measurement and preventive measures.

UNIT – II: Non Destructive Testing (Contact hours: 8)

Non destructive test methods for concrete including rebound hammer, Ultrasonic Pulse velocity, Rebar locator, Corrosion meter, Penetration resistance and Pull out test, core cutting- corrosion: Methods for corrosion measurement and assessment including half-cell potential and resistivity, Mapping of data.

UNIT – III: Failure of buildings (Contact hours: 7)

Definition of building failure-types of failures- Causes of failures- Faulty Design, Accidental over loading, poor quality of material and Poor construction practices – Fire damage- Methodology for investigation of failures- diagnostic testing methods and equipments- repair of cracks in concrete.

UNIT – IV: Materials and Tests (Contact hours: 8)

Materials for repair and rehabilitation- Admixtures- types of admixtures-purpose of using admixtures- chemical composition- Natural admixtures-Fibres- wraps- Glass and Carbon fibre wraps- Steel plates- concrete behavior under corrosion, disintegrated mechanisms-moisture effects and thermal effects –Visual investigation- Acoustical emission methods-Corrosion activity measurement- Chloride content- Depth of carbonation- Impact echo methods- UPV- Pullout Tests

UNIT – V: Repair Techniques (Contact hours: 8)

Grouting, Jacketing, Shot creating, externally bonded plates, Nailing, Underpinning and under water repair; Materials, Equipments, Precautions and Processes

UNIT – VI: Investigation of Structures (Contact hours: 6)

Distress, observation and preliminary test methods. Case studies; related to rehabilitation of bridge piers, dams, canals, heritage structures, corrosion and erosion damaged structures.

Learning Resources:

Text Books:

1. Modi, Poonam I. Patel, Chirag N, "*Repair and Rehabilitation of concrete structures*", 2016 PHI learning Pvt. Ltd.

References Books:

1. Allen R.T. & Edwards S.C, '*Repair of Concrete Structures'*, Blakie and Sons, UK , 1993,1st edition
2. Shetty M.S., "*Concrete Technology – Theory and Practice*", S.Chand and Company, 2008
3. P.C.Varghese, "*Maintenance, Repair and Rehabilitation and Minor works of Buildings*", 1st edition 2014.PHI learning Pvt. Ltd.
4. Denison Campbell, Allen and Harold Roper, "*Concrete Structures, Materials, Maintenance and Repair*", Longman Scientific and Technical UK, 1991.

Web Resources :

IIT Kanpur, Feb 13, 2014, '*Concrete Engineering technology*' (NPTEL) "https://nptel.ac.in/courses/105104030/"

COURSE OUTCOMES: At the end of the course, the student will be able to

CO1	Explain deterioration of concrete in structures
CO2	Carryout analysis using NDT and evaluate structures
CO3	Assess failures and causes of failures in structures
CO4	Carryout Physical evaluation and submit report on condition of the structure
CO5	Explain deterioration of concrete in structures
CO6	Understand the serviceability and durability of concrete.

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX29	Earthquake Resistant Design	PEC	2-1-0	3

Course Learning Objectives:

The objective of this course is:

1. Student will able to understand fundamentals of engineering seismology
2. To determine the design lateral forces by means of codal provisions.
3. Understand concepts of seismic design and design philosophies
4. To introduce the concept of ductility and corresponding detailing.
5. To expose the students to base isolation techniques earthquake induced damages.
6. To understand the engineering seismology.

Course Content:

UNIT: I **(Contact hours: 6)**

Engineering Seismology: Earthquake phenomenon cause of earthquakes-Faults- Plate tectonics-Seismic waves-Terms associated with earthquakes- Magnitude/Intensity of an earthquake-scales-Energy released-Earthquake measuring instruments Seismo- scope, Seismograph, accelerograph-Characteristics of strong ground motions- Seismic zones of India.

UNIT: II **(Contact hours: 8)**

Conceptual design: Introduction-Functional planning-Continuous load path-Overall form simplicity and symmetry-elongated shapes-stiffness and strength-Horizontal and Vertical members-Twisting of buildings-Ductility-definition-ductility relationships-flexible buildings-framing systems-choice of construction materials-unconfined concrete confined concrete masonry-reinforcing steel.

UNIT: III **(Contact hours: 7)**

Introduction to earthquake resistant design: Seismic design requirements-regular and irregular configurations-basic assumptions design earthquake loads-basic load combinations-permissible stresses-seismic methods of analysis-factors in seismic analysis-equivalent lateral force method-dynamic analysis response spectrum method-Time history method.

UNIT: IV **(Contact hours: 8)**

Reinforced Concrete Buildings: Principles of earthquake resistant deign of RC members- Structural models for frame buildings Seismic methods of analysis- Seismic deign methods- IS code based methods for seismic design- Seismic evaluation and retrofitting- Vertical irregularities- Plan configuration problems- Lateral load resisting systems- Determination of design lateral forces- Equivalent lateral force procedure- Lateral distribution of base shear.

UNIT: V **(Contact hours: 8)**

Masonry Buildings: Introduction- Elastic properties of masonry assemblage- Categories of masonry buildings- Behavior of unreinforced and reinforced masonry walls Behavior of walls- Box action and bands- Behavior of infill walls- Improving seismic behavior of masonry buildings- Load combinations and permissible stresses- Seismic design requirements- Lateral load analysis of masonry buildings.

UNIT – VI **(Contact hours: 8)**

Ductility Considerations in Earthquake Resistant Design of RC Buildings: Introduction- Impact of Ductility- Requirements for Ductility- Assessment of Ductility- Factors affecting Ductility- Ductile detailing considerations as per IS 13920. Behavior of beams, columns and joints in RC buildings during earthquakes-Vulnerability of open ground storey and short columns during earthquakes. Capacity Based Design: Introduction to Capacity Design, Capacity Design for Beams and Columns-Case studies.

Learning Resources:

TEXT BOOKS:

1. Pankaj Agarwal and Manish Shrikhande," *Earthquake Resistant Design of structures*" 2011,Prentice Hall of India Pvt. Ltd.

Reference books

1. T. Paulay and M.J.N. Priestly,'*Seismic Design of Reinforced Concrete and Masonry Building* ', John Wiley & Sons

2. Anand S.Arya,,"*Masory and Timber structures including earthquake Resistant Design*"–2009, Nem chand& Bros

3. S. K. Duggal, " *Earthquake Resistant Design of structures*", 2007, Oxford University Press

4. MihaTomazevic, " *Earthquake –Resistant Design of Masonry Building*" –, Imperial college Press.1999

5. C.V.R. Murty.--*Earthquake Tips – Learning Earthquake Design and Construction*

Reference Codes:

1. IS: 1893 (Part-1) -2002. "*Criteria for Earthquake Resistant – Design of structures*." B.I.S., New Delhi.

2. IS:4326-1993, " *Earthquake Resistant Design and Construction of Building*", Code of Practice B.I.S., New Delhi.

3. IS:13920-1993, " *Ductile detailing of concrete structures subjected to seismic force"– Guidelines*, B.I.S., New Delhi.

Web Resources:

IIT Bombay, April 5, 2013, '*Introduction to Earth quake engineering*' (NPTEL)

1. https://nptel.ac.in/courses/105101004/

COURSE OUTCOMES: At the end of the course, the student will be able to

1	Understand the seismology, tectonic plates and seismic zones in India.
2	Apply the concept of Earthquake Resistant Design & concept of lateral load distribution on buildings.
3	Determine the lateral forces generated in the structure due to earthquake.
4	Apply the concept of ductile detailing in RC structures.
5	Design Principles of earthquake resistant of concrete members.
6	Understand the capacity design for beams and columns.

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX30	**Pavement Analysis and Design**	**PEC**	**3-0-0**	**3**

Course Learning Objectives:

1. To understand the types of pavements.
2. To understand the stress analysis in flexible pavements.
3. To understand the stress analysis in rigid pavements.
4. To design the flexible pavements.
5. To understand the maintenance of highways.
6. To design the rigid pavements.

Course Content:

UNIT-I: Types of Pavements **(Contact hours: 5)**

Types of pavement – Factors affecting design of pavements – wheel loads –ESWL Concept- tyre pressure – contact pressure, Material characteristics – Environmental and other factors.

UNIT- II: Stresses in Flexible Pavements **(Contact-hours: 8)**

Stresses in flexible pavement – layered systems concept -one layer system – Business Two layer system – Burmister Theory for Pavement Design.

UNIT-III: Stresses in Rigid Pavements **(Contact hours: 8)**

Stresses in rigid pavements – relative stiffness of slab, modulus of sub-grade reaction, Westergaard's stresses due to warping, stresses due to loads, stresses due to friction.

UNIT- IV: Flexible Pavement Design **(Contact hours: 8)**

Pavement design: CBR Method of Flexible Pavement Design- IRC method of flexible pavement design, AASHTO Method of Flexible Pavement design, IRC:58-2002, IRC:58-2015.

UNIT V: Rigid Pavement Design **(Contact hours: 8)**

IRC method of Rigid pavement design – Importance of Joints in Rigid Pavements- Types of Joints – Use of Tie Bars and Dowell Bars. AASHTO method of Rigid pavement design.

UNIT VI: Highway Maintenance **(Contact hours: 8)**

Need for Highway Maintenance- Pavement Failures- Failures in Flexible Pavements- Types and Causes-Rigid Pavement Failures- Types and causes- Pavement Evaluation- Falling weight Deflectometer, Benkleman Beam method- Strengthening of Existing

Pavements- Overlays.

Learning Resources:

Text Books:

1. Pavement Analysis and Design by Yong H Huang, Second edition 2002.

Reference books:

1. Yoder and Wit Zork, '*Principles of Pavement Design*', wiley inter science publication,2nd edition 1975.
2. C. JotinKhinsty and B. Kent Lall, '*Transportation engineering', third edition 2009.*

Web Resources:

1. IIT Kharagpur, '*Introduction to Transportation Engineering*' (Lecture 24 to 40)

URL: http://www.nptelvideos.in/2012/11/introduction-to-transportation.html

Course outcomes: At the end of the course, the student will be able to

CO 1	Understand the types of pavements.
CO 2	Understand the stress analysis in flexible pavements.
CO 3	Understand the stress analysis in rigid pavements.
CO 4	Design the flexible pavements.
CO 5	Understand the maintenance of highways.
CO 6	Design the rigid pavements.

Assessment Method:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX31	**Urban Transportation and Planning**	**PEC**	**3-0-0**	**3**

Course Learning Objectives:

1. To understand the urban development and travel characteristics.
2. To understand the concepts of trip generations.
3. To understand the concepts of mode choice analysis.
4. To understand the preparation of plans and its evaluations.
5. To understand the urban development and travel characteristics.
6. To understand the concepts of trip distributions.

Course Content:

UNIT-I: Urban Travel Demand (Contact hours: 8)

Urban Development, transport problems and travel characteristics, Need for planning and overall planning process, Components of travel demand: Independent variables &Travel Attributes, Demand function and assumptions in demand estimation, Sequential travel demand modeling, Study Area: Zoning, cordon lines and screen lines

Data requirements for demand estimation: Socio-Economic surveys, Land use Surveys, Traffic and Transport surveys, Study of reports and proposals.

UNIT-II: Trip Generation (Contact hours: 8)

Trip characteristics, Factors influencing trip production and attraction, Trip rates, Zonal regression models, Category analysis, Personal trip generation models

UNIT-III: Trip Distribution (Contact hours: 5)

Factors influencing trip distribution, Trip Length-Frequency Diagram, Growth Models: Growth factor methods, Linear Programming method, Opportunity models, Gravity opportunity model.

UNIT-IV: Mode Choice Analysis (Contact hours: 8)

Factors influencing mode choice, Zonal regression models, Utility maximization, Discrete Choice Situation, Binary and multinomial logit models, Probability curves, Probit and nested logic models.

UNIT-V: Traffic Assignment (Contact hours: 8)

Need for assignment, Objectives, Diversion curves, Shortest path algorithms Assignment techniques: all or nothing assignment technique, capacity restraint assignment technique, multi path assignment technique, Link flows: sufficiency and deficiency analysis.

UNIT-VI: Plan Preparation and Evaluation (Contact hours: 8)

Types of plans: conceptual plans, master plan etc., Short term planning Vs long term planning, Corridor identification and evaluation techniques, Role of mass transit in urban transportation, Alternate systems of different mass transit systems, Multimodal integration and master plan preparation.

Learning Resources:

Text Books:

1. Dr. L.R. Kadiyali, "Traffic Engineering and Transport Planning", 6 thedition, Khanna Publishers, 1999.

Reference books:

1. 1. Thirumurthy A.M., "Environmental Facilities and Urban Development in India – A System Dynamic Model for Developing Countries, Academic Foundations, 1 st Edition, India, 1992.

Web Resources:

1.IIT Madras, '*Urban transportation planning*'
URL: http://www.nptelvideos.in/2012/11/urban-transportation-planning.html

Course outcomes: At the end of the course, the student will be able to

CO 1	Understand the urban development and travel characteristics.
CO 2	Understand the concepts of trip generations.
CO 3	Understand the concepts of mode choice analysis.
CO 4	Understand the preparation of plans and its evaluations.
CO 5	Understand the urban development and travel characteristics.
CO 6	Understand the concepts of trip distributions.

Assessment Method:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX32	**WATERSHED MANAGEMENT**	**PEC**	**3-0-0**	**3**

Course Learning Objectives:

1. To understand the impact of land use changes on various hydrological cycle parameters and soil erosion.
2. To understand different watershed behaviour.
3. Familiarize with rainfall-runoff modelling
4. To be able to interpret runoff data and quantify erosion by using various modelling methods
5. To study water quality issues, storm water management and drought management
6. To understand land use classification and impact of land use changes on hydrological cycle parameters.

Course Content:

UNIT-I: Introduction and Basic Concepts (Contact hours: 7)

Concept of watershed, introduction to watershed management, different stakeholders and their relative importance, watershed management policies and decision making. Cultivated and non cultivated lands, watershed committees and post project management.

UNIT-II: Sustainable Watershed Approach & Watershed Management Practices (Contact hours: 8)

Sustainable integrated watershed management, natural resources management, agricultural practices, integrated farming, Soil erosion and conservation; Watershed Management Practices in Arid and Semiarid Regions, Case studies, short term and long term strategic planning.

UNIT-III: Integrated Watershed Management: (Contact hours: 8)

Introduction to integrated approach, Integrated water resources management, conjunctive use of water resources, rainwater harvesting; roof catchment system.

Watershed Modeling:

Standard modeling approaches and classifications, system concept for watershed modeling, overall description of different hydrologic processes, modeling of rainfall-runoff process, subsurface flows and groundwater flow.

UNIT-IV: Social Aspects of Watershed Management: (Contact hours: 8)

Community participation, Private sector participation, Institutional issues, Socio-economy, Integrated development, Water legislation and implementations, Case studies.
Use of modern techniques in watershed management:
Applications of Geographical Information System and Remote Sensing in Watershed Management, Role of Decision Support System in Watershed Management.

UNIT-V: Management of Water Quality: (Contact hours: 7)
Water quality and pollution, types and Sources of pollution**,** water quality modeling, environmental guidelines for water quality
Storm Water and Flood Management:
Storm water management, design of drainage system, reservoir operation, case studies on flood damage.

UNIT-VI: Drought Management: (Contact hours: 7)
Drought assessment and classification, drought analysis techniques, drought mitigation planning
Water Conservation and Recycling:
Perspective on recycle and reuse, Waste water reclamation, community based reservoirs, village tanks, farm ponds, percolation tanks in water conservation

Learning Resources:

Text Book:

1. Murty, J.V.S. "*Watershed Management*", 2nd edition 2017 , New Age Intl., New Delhi .

Reference Books:

1. Purandare, A.P., Jaiswal A.K., '*Waterhed Development in India'*, NIRD, Hyderabad, 1995
2. Allam, Gamal Ibrahim Y., '*Decision Support System for Integrated Watershed Management'*,Colorado State University, 1994.
3. Murthy, J.V.S., '*Watershed Management in India'*, Wiley Eastern, New Delhi, 1994 .
4. Vir Singh, Raj , '*Watershed Planning and Management'*, Yash Publishing House, Bikaner, 2000.

Web Resources:

1. IIT Bombay, July 06 2012, '*Watershed Management'*, URL: https://nptel.ac.in/courses/105101010/

COURSE OUTCOMES: At the end of the course, student will be able to

1	Understand the concepts of watershed management and its effect on land, water and ecosystem resources
2	Analyze public policies and practices of watershed planning
3	Assess the impact of watershed planning through case studies
4	Develop control and mitigation techniques for watershed problems
5	Suggest drought control measures, water conservation structures, including design
6	suggest water conservation measures for a watershed

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests/Assignments (In Semester)	Monthly tests (In Semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	**Course Name**	**Category**	**L-T-P**	**Credits**
20CE XX33	**IRRIGATION AND WATERPOWER ENGINEERING**	**PEC**	**3-0-0**	**3**

Course Learning Objectives:

1. To take up the basic concepts of irrigation and familiarize with different types of irrigation techniques.
2. To know the importance, features and uses of diversion and impounding structures.
3. To explore about the importance of rivers, reservoirs and silt control.
4. To learn about basics of irrigation, consumptive use and design a channel through kennedy's theory, lacey's theory.
5. To explore different types of hydro power plants and their suitability.
6. To familiarize with runoff river plant and pumped storage plant.

Course Content:

UNIT-I: Introduction to Irrigation **(Contact hours: 7)**

Advantages and ill effects of Irrigation, types of Irrigation, methods of application of Irrigation water, Indian soils, methods of improving soil fertility, preparation of land for Irrigation.

UNIT-II: Soil-water-plant relationship **(Contact hours: 8)**

Vertical distribution of soil moisture, soil moisture constants, soil moisture tension, consumptive use, estimation of consumptive use, Duty and delta, factors affecting duty, irrigation efficiencies.

UNIT-III: Canal Structures **(Contact hours: 7)**

Types of falls and their location, design principles of Sarda type fall, trapezoidal notch fall and straight glacis fall. Canal regulation works, principles of design of distributary and head regulators, canal outlets, types of canal modules, proportionality, sensitivity and flexibility.

UNIT-IV: Canal Design **(Contact hours: 8)**

Design of a lined canal – Design of best economic channel section – Rectangular and Trapeziodal channel; Design of unlined canal on Non-alluvial and Alluvial soils – Kennedy's regime theory and Lacey's regime theory.

UNIT-V: Diversion and Impounding Structures **(Contact hours: 7)**

Weirs – elementary profile of a weir – weirs on pervious foundations, types of impounding structures, percolation ponds, tanks, sluices and weirs, gravity dams, earth dams, Arch dams, Spillways, factors affecting location and type of dams, forces on dam, hydraulic design of dams.

UNIT-VI: Water Power Engineering **(Contact hours: 8)**

Water power – types of hydro power schemes – runoff river plant, pumped storage plant, tidal power plants, hydro power potentials of India. Economic considerations of water power gross and net head – available power; Estimation of hydro-power; Power duration curve; assessment of water power potential - Load curve; Load factor; Capacity factor; Utilization factor; Diversity factor; Load duration curve; Firm Power; Secondary power; Types of Nhydel schemes; Forebay; Intake structures; Penstocks; Surge tank; Tail race; Turbines; Selection of suitable type of turbine.

Learning Resources:

Text Book:

1. Dr. B.C. Punmia& Dr. Pande B.B. Lal, "*Irrigation and water power Engineering*", Laxmi Publications Pvt. Ltd., New Delhi, 12th ed., Laxmi Publication, 1992.

Reference Books

1. S. K. Garg, "*Irrigation Engineering and Hydraulic Structures*", 23rd ed., Khanna Publishers, Delhi, 2009.
2. Asawa, G.L., "*Irrigation Engineering*", New Age International Publishers, 2000
3. Dr. P.N. Modi, "*Irrigation, Water Resources & Water Power Engineering*", 7th ed., Standard Book House, New Delhi, 2008.

Web Resources:

1. IIT Kharagpur, December 31 2009, '*Water Resources Engineering'*, URL: https://nptel.ac.in/courses/105105110/

COURSE OUTCOMES: At the end of the course, student will be able to

1	An exposure to irrigation engineering and understanding of calculating water requirement for canal design
2	An understanding of reservoir planning and canal structures
3	Design of unlined canal using silt theories.
4	Understand functions of regulating and cross drainage works.
5	Understand the basic terminology of water power engineering
6	To study about power duration curve, load factor and capacity factor

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests/Assignments (In Semester)	Monthly tests (In Semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX34	**ADVANCED HYDRAULICS**	**PEC**	**3-0-0**	**3**

Course Learning Objectives:

1. To understand the physical processes of fluid flow analytically and empirically.
2. To classify the types of flows in open channel and to design open channel sections in a most economical way with minimum wetted perimeter.
3. To study standard and direct step methods of G.V. F profile computation
4. To study about non-uniform flows in open channels and to learn about the characteristics of hydraulic jump.
5. To understand the waves and surges in unsteady flow situation
6. To impart the knowledge about various hydraulic turbines and pumps

Course Content:

Unit I: Open Channel Flow: **(Contact hours: 7)**

Kinds of open channel flow, channel geometry, types and regimes of flow, Velocity distribution in open channel, wide open channel, specific energy, critical flow and its computation, Energy in non-prismatic channel, momentum in open channel flow, specific force.

Unit II: Uniform Flow: **(Contact hours: 8)**

Qualification of uniform flow, velocity measurement, Manning's and Chezy's formula, determination of roughness coefficients**,** Determination of normal depth and velocity, most economical sections, non-erodible channels**,** Flow in a channel section with composite roughness, flow in close conduit with open channel flow.

Unit III: Varied Flow: **(Contact hours: 8)**

Dynamic equations of gradually varied flow, assumptions and characteristics of flow profiles, classification of flow profile, draw down and back water curves, profile determination, graphical integration, direct step and standard step method, numerical methods, flow through transitions, dynamic equation of spatially varied flow, Analysis of spatially varied flow profile, computation of spatially varied flow using numerical integration.

Unit IV: Hydraulic Jumps: **(Contact hours: 8)**

Hydraulic jump, types of jump, basic characteristics of jump, length and location of jump, jump as energy dissipation, control of jump, surges, surge channel transitions.

Unit V: Flow Through Non-Prismatic Channel Section: (Contact hours: 7)

Sudden transition, sub-critical flow through sudden transition, flow through culverts, flow through bridge piers, obstructions, channel junction.

Unit VI: Turbines: (Contact hours: 7)

Application of momentum principle, impact of jets on plane and curved plates, turbines, classification, radial flow turbines, Axial flow turbines, impulse and reaction turbines, draft tube and cavitations, performance of turbines, centrifugal pump, minimum speed to start the pump, Multistage pumps, jet and submersible pumps, positive displacement pumps, reciprocating pump, negative slip, flow separation conditions

Learning Resources:

Text Book:

1. V.T. Chow: "*Open-channel hydraulics*." ,2009, McGraw Hill Publications (1959,1973)

Reference Books:

1. Rajesh Srivastava: "*Flow through open channels*".Oxford University Press (2008).
2. K. Subramanya: "*Flow in open channels*". 3rd Edition, 2008, Tata McGraw Hill (1997)
3. H. Chaudhury: "*Open channel flow*". Second Edition. Springer (2008)

Web Resources:

1. IISC Bangalore, April 09 2014, '*Water Resources Systems (Modelling Techniques and Analysis)'*, URL: http://nptel.ac.in/syllabus/105108130/

COURSE OUTCOMES: At the end of the course, student will be able to

1	Understand and be able to use the energy and momentum equations.
2	Become familiar with open channel cross sections, hydro-static pressure distribution and Manning's law
3	Determine water surface profiles for gradually varied flow in open channels
4	Flood waves/surges magnitude travelling towards upstream/downstream direction
5	To determine efficiency of centrifugal and submersible pumps
6	To be familiar with different types of turbines and their efficiencies.

Course Nature		Theory		
Assessment Method				
Assessment Tool	Weekly tests/Assignments (In Semester)	Monthly tests (In Semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	Course Name	Category	L-T-P	Credits
20CE XX36	**Advanced Foundation Engineering**	**PEC**	**3-0-0**	**3**

Course Learning Objectives:

1. To Analysis and interpretation of soil exploration data.
2. To estimate the soil parameters for design of foundations.
3. To design the shallow foundations.
4. To understand the concept of pile foundations.
5. To understand the concept of retaining walls.
6. To understand the concept of reinforced earth.

Course Content:

UNIT –I: Soil exploration: **(Contact hours: 5)**

Analysis and interpretation of soil exploration data, estimation of soil parameters for foundation design.

UNIT –II: Shallow Foundations: **(Contact hours: 8)**

Methods for bearing capacity estimation, total and differential settlements of footing and raft, code provisions. Design of individual footings, strip footing, combined footing, rigid and flexible mat, buoyancy raft, basement raft, underpinning.

UNIT –III: Pile Foundations: **(Contact hours: 8)**

Estimation load carrying capacity of single and pile group under various loading conditions. Pile load testing (static, dynamic methods and data interpretation), settlement of pile foundation, code provisions, design of single pile and pile groups, and pile caps. Well Foundations: Types, components, construction methods, design methods (Terzaghi, IS and IRC approaches), check for stability, base pressure, side pressure and deflection.

UNIT –IV: Retaining Walls: **(Contact hours: 8)**

Types (types of flexible and rigid earth retention systems: counter fort, gravity, diaphragm walls, sheet pile walls, soldier piles and lagging). Support systems for flexible retaining walls (struts, anchoring), construction methods, stability calculations, design of flexible and rigid retaining walls, design of cantilever and anchored sheet pile walls.

UNIT –V: Soil-Foundation Interaction: **(Contact hours: 8)**

Idealized soil, foundation and interface behavior. Elastic models of soil behavior; Elastic-plastic and time dependent behavior of soil. Beams and plates on elastic foundation; numerical analysis of beams and plates resting on elastic foundation.

UNIT –VI: Reinforced Earth: **(Contact hours: 8)**

Geotechnical properties of reinforced soil, shallow foundation on soil with reinforcement, retaining walls with reinforcements, design considerations equations.

Learning Resources:

Textbooks:

1. V.N.S. Murthy, "*Advanced Foundation Engineering*", 2010, CBS Publishers and Distributors.

References books:

1. A.P.S. Selvadurai, "*Elastic Analysis of Soil-Foundation Interaction*", 2013, Elsevier Scientific Publishing Company.
2. Braja M. Das, "*Principles of Foundation Engineering*", 7th Edition, 2013, PWS Publishing Company.
3. Joseph Bowles, "*Foundation Analysis and Design*", 5th Edition, 2001, McGraw-Hill Book Company.

Web Resources:

1. IIT Kharagpur, '*Lecture series on Advanced Foundation Engineering'*
   URL: http://nptel.ac.in/courses/105105039/16

Course outcomes: At the end of the course, the student will be able to

CO 1	Analysis and interpretation of soil exploration data.
CO 2	Estimate the soil parameters for design of foundations.
CO 3	Design the shallow foundations.

CO 4	Understand the concept of pile foundations.
CO 5	Understand the concept of retaining walls.
CO 6	Understand the concept of reinforced earth.

Assessment Method:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	Course Name	Category	L-T-P	Credits
20CE XX37	**Ground Improving Techniques**	**PEC**	**3-0-0**	**3**

Course Learning Objectives:

1. To understand the concepts of grouting and dewatering.
2. To understand the methods of densification.
3. To understand the soil stabilization techniques.
4. To understand the concepts of earth reinforcement.
5. To understand the concepts of geo synthetics.
6. To understand the problems with expensive soils.

Course Content:

UNIT -I: **(Contact hours: 8)**

Dewatering: methods of de-watering- sumps and interceptor ditches- single, multi stage well points - vacuum well points, Horizontal wells-foundation drains-blanket drains-criteria for selection of fill material around drains –Electro-osmosis. **Grouting:** Objectives of grouting- grouts and their properties- grouting methods-ascending, descending and stage grouting, hydraulic fracturing in soils and rocks- post grout test.

UNIT-II: **(Contact hours: 8)**

In-situ Densification: In – situ densification methods in granular Soils– Vibration at the ground surface, Impact at the Ground Surface, Vibration at depth, Impact at depth. In – situ densification methods in Cohesive soils – preloading or dewatering, Vertical drains – Sand Drains, Sand wick, geodrains – Stone and lime columns – thermal methods.

UNIT-III: **(Contact hours: 5)**

Stabilization: Methods of stabilization-mechanical-cement- lime-bituminous-chemical stabilization with calcium chloride, sodium silicate and gypsum.

UNIT-IV: **(Contact hours: 8)**

Reinforced Earth: Principles – Components of reinforced earth – factors governing design of reinforced earth walls – design principles of reinforced earth walls.

UNIT-V: **(Contact hours: 8)**

Geo-synthetics: Geo-textiles- Types, Functions and applications – geo-grids and geo-membranes – functions and applications.

UNIT-VI: **(Contact-hours: 8)**

Expansive soils: Problems of expansive soils – tests for identification – methods of determination of swell pressure. Improvement of expansive soils – Foundation techniques in expansive soils – under reamed piles.

Learning Recourses:

Text book:

1. Purushotham Raj, '*Ground Improvement Techniques*', 2nd Edition, 2016, Laxmi Publications, New Delhi.

References books:

1. Hausmann M.R., '*Engineering Principles of Ground Modification*', 1st Edition, 1990, McGraw-Hill International Edition.
2. Moseley M.P., '*Ground Improvement'*, 2nd Edition, 2004, Blackie Academic and Professional, Boca Taton, Florida, USA.
3. Xanthakos P.P, Abramson, L.W and Brucwe, '*Ground Control and Improvement*', 1st Edition, 1994, John Wiley and Sons.

Web Resources:

1. Indian Institute of Science, Bangalore, '*Group Improvement*'
   URL: https://nptel.ac.in/courses/105108075/

Course outcomes: At the end of the course, the student will be able to

CO 1	Understand the concepts of grouting and dewatering.
CO 2	Understand the methods of densification.
CO 3	Understand the soil stabilization techniques.
CO 4	Understand the concepts of earth reinforcement.

CO 5	Understand the concepts of geo synthetics.
CO 6	Understand the problems with expensive soils.

Assessment Method:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	Course Name	Category	L-T-P	Credits
20CE XX38	**CONSTRUCTION PLANNING AND MANAGEMENT**	**PEC**	**3-0-0**	**3**

Course Learning Objectives:

1. Learners shall appreciate the scope and challenges of typical construction projects.
2. To make the learners able to draft the notice inviting tender and tender documents for projects.
3. To plan the project as well as to execute the project as per the initial plan.
4. To control the project cost overrun and time overrun by proper Scheduling and resource allocation& leveling.
5. To understand the optimization of resources.
6. To understand the Equipment selection and utilization, Equipment Costs, maintenance cost.

Course Content:

UNIT- I: **(Contact hours: 8)**

Introduction to Civil Engineering Project Management: General Scope, Useful Terms, Life Cycle, Phases of Construction, Challenges, Functions, Responsibility of an engineer etc.

UNIT- II: **(Contact hours: 8)**

Contractual Relation and Contract Management: Various parties involved, Contracts-Types, Stages of awarding contract, Disputes and Arbitration.

UNIT -III: **(Contact hours: 8)**

Network Based Project Management Techniques: Time Management - Work Break Down Structure, Project Planning, Events, Activities, Scheduling Techniques, Gantt Charts, AoN, Time-Cost Trade-offs, Illustrations & Exercises.

UNIT -IV: **(Contact hours: 5)**

Resource Scheduling, Project Monitoring : Resource- Allocation, Leveling, Applying Improvement Factor.

Precedence Diagram Method, earned value of money concept, Project Control Process.

UNIT -V: **(Contact hours: 8)**

Introduction to Construction Technology: Quality in Construction, Safety in Construction, Earthwork, Form work, Concreting, Drilling and Blasting, Piling, De-watering, Guest Lecture by Experts.

UNIT- VI: **(Contact hours: 8)**

Introduction to Construction Equipment: Equipment selection and utilization, Equipment Costs. State of the art case studies.

Learning Resources:

Text Books:

1. B.C. Punmia&K.K.Khandelwal, '*Project planning and control with PERT and CPM*', 4th Edition, 2016, Laxmi Publications Pvt Ltd.,

Reference Books:

1. Schexnayder, C. J. and Mayo, R. E., '*Construction Management Fundamentals'*,2nd Edition, 2008, International Edition, McGraw-Hill.
2. Peurifoy, R. L., Schexnayder, C. J. and Shapira, A., '*Construction Planning, Equipment, and Methods'*, 8th Edition, 2010, Tata McGraw-Hill, New Delhi. 7th Edison.

Web Resources:

1. IIT Madras, '*Project Planning & Control'*

URL: https://nptel.ac.in/courses/105103093/

Course outcomes: At the end of the course, the student will be able to

CO 1	Learners shall appreciate the scope and challenges of typical construction projects.
CO 2	Make the learners able to draft the notice inviting tender and tender

	documents for projects.
CO 3	Plan the project as well as to execute the project as per the initial plan.
CO 4	Control the project cost overrun and time overrun by proper Scheduling and resource allocation& leveling.
CO 5	Understand the optimization of resources.
CO 6	Understand the Equipment selection and utilization, Equipment Costs, maintenance cost.

Assessment Method:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	Course Name	Category	L-T-P	Credits
20CE XX39	**Infrastructure Planning and Management**	**PEC**	**3-0-0**	**3**

Course Learning Objectives:

1. To understand the Basic Concepts Related to Infrastructure.
2. To understand the concepts of organization in the field of Infrastructure.
3. To understand the Private Involvement in Infrastructure.
4. To understand the Successful Infrastructure Planning and Implementation.
5. To understand the Strategies for Successful Infrastructure Project Implementation.
6. To understand the development of infrastructure.

Course Content:

UNIT-I: **(Contact hours: 5)**

An overview of Basic Concepts Related to Infrastructure:

Introduction to Infrastructure, An Overview of the Power Sector in India, An Overview of the Water Supply and Sanitation Sector in India. An overview of the Road, Rail, Air and Port Transportation Sectors in India. An overview of the Telecommunications Sector in India. An overview of the Urban Infrastructure in India.

UNIT-II: **(Contact hours: 8)**

Organizations and Players in the field of Infrastructure: An overview of the Rural Infrastructure in India. An Introduction to Special Economic Zones. The Stages of an Infrastructure Project Lifecycle. An Overview of Infrastructure Project Finance - I. An Overview of Infrastructure Project Finance - II.

UNIT III: **(Contact hours: 8)**

Private Involvement in Infrastructure:A Historical Overview of Infrastructure Privatization. The Benefits of Infrastructure Privatization. Problems with Infrastructure Privatization. Privatization of Infrastructure in India: Case Study of the Tirupur Water Supply Project. Privatization of Road Transportation Infrastructure in India.

UNIT IV: **(Contact hours: 9)**

Challenges to Successful Infrastructure Planning and Implementation: Mapping and Facing the Landscape of Risks in Infrastructure Projects. Economic and Demand Risks: The Case of the Vadodhara-Halol Expressway. Political Risks - I: The case of the Chand-Cameroon Pipeline. Political Risks - II: The Dabhol Power Plant Case Study. Socio-Environmental Risks - I: The Case of Bujagali Dam in Uganda-Environmental Risks - II: The Case of Conoco's Oil Exploration in America.

UNIT V: **(Contact hours: 9)**

Strategies for Successful Infrastructure Project Implementation: Risk Management Framework for Infrastructure Projects.Shaping the Planning Phase of Infrastructure Projects to mitigate risks. Designing Sustainable Contracts. Introduction to Fair Process and Negotiation. Negotiating with multiple Stakeholders on Infrastructure Projects.

UNIT VI: **(Contact hours: 9)**

Development of Infrastructure: Sustainable Development of Infrastructure. Information Technology and Systems for Successful Infrastructure Management. Innovative Design and Maintenance of Infrastructure Facilities. Infrastructure Modeling and Life Cycle Analysis Techniques. Capacity Building and Improving the Governments Role in Infrastructure Implementation. An Integrated Framework for Successful Infrastructure Planning and Management - Infrastructure Management Systems and Future Directions.

Learning Resources:

Text Books:

1. Alvin S. Goodman and MakarandHastak, '*Infrastructure Planning Handbook: Planning, Engineering, and Economic*', 1st Edition, 2006, McGraw-Hill Professional Publications.

References Books

1. Michael Phiri, '*BIM in Healthcare Infrastructure: Planning, Design and Construction'*, ICE Publishing , 2016.
2. SandroFabbro, '*Mega Transport Infrastructure Planning: European Corridors in Local-Regional Perspective*', 1st Edition, 2015, Springer publications.
3. James V Parkin and Deepak Sharma,*'Infrastructure Planning*', 1st Edition, 1999, Thomas Telford Ltd publications.

Web Resources:

1. IIT Madras, '*Lecture series on Infrastructure planning and management*'
URL: **https://nptel.ac.in/courses/105106115/**

Course outcomes: At the end of the course, the student will be able to

CO 1	Understand the Basic Concepts Related to Infrastructure.
CO 2	Understand the concepts of organization in the field of Infrastructure.
CO 3	Understand the Private Involvement in Infrastructure.
CO 4	Understand the Successful Infrastructure Planning and Implementation.
CO 5	Understand the Strategies for Successful Infrastructure Project Implementation.
CO 6	Understand the development of infrastructure.

Assessment Method:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX40	**Construction Economics and Finance**	**PEC**	**3-0-0**	**3**

Course Learning Objectives:

1. To understand the concept quantifying alternatives for decision making.
2. To understand the concepts of Time value of money.
3. To understand the comparison of alternatives.
4. To understand the concepts of depreciation, inflation and taxes and cost – estimating
5. To understand the concepts of equipment economics
6. To understand the concepts of introduction to financial management

Course Content:

UNIT-I: **(Contact hours: 5)**

Introduction: Basic Principles - Time value of money, Quantifying alternatives for decision making, Cash flow diagrams.

UNIT-II: **(Contact hours: 8)**

Time Value of money: Equivalence- Single payment in the future (P/F, F/P), Present payment compared to uniform series payments (P/A, A/P), Future payment compared to uniform series payments (F/A, A/F), Arithmetic gradient, Geometric gradient.

UNIT-III: **(Contact hours: 8)**

Comparison of Alternatives: Comparison of alternatives: Present, future and annual worth method of comparing alternatives, Rate of return, Incremental rate of return, Break-even comparisons, Capitalized cost analysis, Benefit-cost analysis.

UNIT-IV: **(Contact hours: 8)**

Depreciation, Inflation and Taxes and Cost – Estimating: Depreciation, Inflation, Taxes; Types of Estimates, Approximate estimates – Unit estimate, Factor estimate, Cost indexes, Parametric estimate, Life cycle cost.

UNIT V: **(Contact hours: 8)**

Equipment economics: Equipment costs, Ownership and operating costs, Buy/Rent/Lease options, Replacement analysis.

UNIT VI: **(Contact hours: 8)**

Introduction to Financial management: Construction accounting, Chart of Accounts, Financial statements – Profit and loss, Balance sheets, Financial ratios, Working capital management.

Learning Resources:

Text Books:

1. Phillip F. Ostwald, '*Construction Cost Analysis and Estimating*',1st Edition, 2000, Prentice Hall, Upper Saddle River, New Jersey.

Reference Books:

1. Peterson, S. J., '*Construction Accounting and Financial Management*',3rd Edition, 2012, Pearson Education, New Jersey.
2. Peurifoy, R. L., Schexnayder, C. J. and Shapira, A., '*Construction Planning, Equipment, and Methods*', 9thEdition., 2018,Tata McGraw-Hill, New Delhi.

Web Resources:

1. IIT Guwahati, *'Construction Economics and Finance*'
URL: https://nptel.ac.in/courses/105103023/

Course outcomes: At the end of the course, the student will be able to

CO 1	Understand the concept quantifying alternatives for decision making.
CO 2	Understand the concepts of Time value of money.
CO 3	Understand the comparison of alternatives.
CO 4	Understand the concepts of depreciation, inflation and taxes and cost – estimating
CO 5	Understand the concepts of equipment economics
CO 6	Understand the concepts of introduction to financial management

Assessment Method:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX41	REMOTE SENSING AND GIS	PEC	3-0-0	3

Course Learning Objectives:

1. To study the basic principles of remote sensing, characteristics of the instrument used for remote sensing
2. To understand the basic concepts of microwave remote sensing
3. To understand the GIS, background, development and components of GIS
4. To familiarize with vector and raster data analysis
5. To study the analysis of various spatial and non-spatial data in GIS
6. To study the different areas of applications of remote sensing and GIS

Course Content:

UNIT I: EMR and Its Interaction with Atmosphere & Earth Material (Contact hours: 7)

Definition of remote sensing and its components – Electromagnetic spectrum – wavelength regions important to remote sensing – Wave theory, Particle theory, Stefan-Boltzman and Wein's Displacement Law – Atmospheric scattering, absorption – Atmospheric windows spectral signature concepts – typical spectral reflective characteristics of water, vegetation and soil.

UNIT II: Platforms and Sensors (Contact hours: 8)

Types of platforms – orbit types, Sun-synchronous and Geosynchronous – Passive and Active sensors – resolution concept – Pay load description of important Earth Resources and Meteorological satellites – Airborne and space borne TIR and microwave sensors.

UNIT III: Image Interpretation and Analysis (Contact hours: 7)

Types of Data Products – types of image interpretation – basic elements of image interpretation - visual interpretation keys – Digital Image Processing – Pre-processing – image enhancement techniques – multispectral image classification – Supervised and unsupervised.

UNIT IV: Geographic Information System (Contact hours: 9)

Introduction – Maps – Definitions – Map projections – types of map projections – map analysis GIS definition – basic components of GIS – standard GIS softwares – Data type –

Spatial and non-spatial (attribute) data – measurement scales – Data Base Management Systems (DBMS).

UNIT V: Data entry, storage and analysis (Contact hours: 7)

Data models – vector and raster data – data compression – data input by digitization and scanning attribute data analysis – integrated data analysis – Modeling in GIS Highway alignment studies – Land Information System.

UNIT-VI: Remote Sensing Applications (Contact hours: 7)

Watershed management, Rainfall-runoff modeling, Irrigation management, Flood mapping, Drought assessment, Environmental monitoring, other applications.

Learning Resources:

Text Book:

1. Anji Reddy, M. (2001). *Textbook of Remote Sensing and Geographical Information System*. 4th Edition, 2012, BS Publications, Hyderabad.

Reference Books:

1. Lillesand, T.M., Kiefer, R.W. and J.W.Chipman. (2004). *Remote Sensing and Image Interpretation*. 7th Edition, 2015, John Willey and Sons (Asia) Pvt. Ltd., New Delhi. Pp:763.
2. Lo. C.P.andA.K.W.Yeung (2002), *Concepts and Techniques of Geographic Information Systems*, 2nd Edition, 2012, Prentice-Hall of India Pvt. Ltd., New Delhi.
3. Peter A.Burrough, Rachael A.McDonnell (2000). "*Principles of GIS"*, 3rd Edition, 2015, Oxford University Press.
4. Ian Heywood (2000). *An Introduction to GIS*, 4th Edition, 2012, Pearson Education Asia

Web Resources:

1. IISC Bangalore, April 09 2014, 'Remote Sensing', URL: https://nptel.ac.in/courses/105108077/

COURSE OUTCOMES: At the end of the course, student will be able to

1	Analyze the principles and components of photogrammetry and remote sensing
2	Describe the process of data acquisition of satellite images and their characteristics
3	Compute an image visually and digitally with digital image processing techniques.
4	Explain the concepts and fundamentals of GIS

5	Develop skills in developing vector and raster datasets.
6	Compute knowledge of remote sensing and GIS in different civil engineering applications

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests/Assignments (In Semester)	Monthly tests (In Semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	**Course Name**	**Category**	**L-T-P**	**Credits**
20CE XX42	**ENVIRONMENTAL GEOTECHNICS**	**PEC**	**3-0-0**	**3**

Course Learning Objectives:

1. Concepts and principles of Geo - environmental Engineering.
2. Geotechnical aspects of planning and design of MSW and Hazardous Waste Landfills
3. Geotechnical aspects of planning and design of slurry ponds - ash ponds and tailing ponds.
4. Geotechnical aspects of detection and monitoring of subsurface contamination and control and remediation of contaminated sites.
5. Rehabilitation of waste dumps and geotechnical re-use of waste.

Course Content:

UNIT-I: **(Contact hours: 08)**

Introduction, Sources & Impact of Contamination and Soil-Waste Interaction, Concepts of Integrated SWM & Geo-environmental Engineering

UNIT-II: **(Contact hours: 07)**

Principles and Planning of Landfills, Construction Aspects and Site Selection of Landfills Liners for Landfills

UNIT-III: **(Contact hours: 07)**

Landfill Covers, Generation and Control of Leachate, Leachate treatment Gas from Landfills, Stability of Slopes and Settlement of Landfills

UNIT-IV: **(Contact hours: 08)**

Monitoring and Detection of Subsurface Contamination, Costs,

UNIT V: **(Contact hours: 07)**

Rehabilitation of Old Dumps and Contaminated Sites, Geotechnical Re use of wastes

UNIT VI: **(Contact hours: 08)**

Planning & Design of Slurry Ponds, Incremental Raisings and Failures of Slurry Ponds, Environmental Control Measures at Slurry Ponds.

Learning Resources:

1. Raffaello Cossu , Rainer Stegmann , Solid Waste Landfilling Concepts, Process, Technologies , Elsevier Inc.,2019
2. R. W. Sarsby , Environmental Geotechnics ,2000 ,Thomas Telford ,2000
3. N. Dixon, E. J. Murray, D. R. V. Jones , Geotechnical Engineering of Landfills Thomas Telford, 1998
4. Raymond Nen Yong, H. R. Thomas, Hywel R. Thomas, Geo-environmental Engineering, Thomas Telford, 1997

Web Resources:

URL: https://nptel.ac.in/courses/105/101/105101196/

Course outcomes: At the end of the course, the student will be able to:

CO 1	Understand the geo environmental challenges
CO 2	Design the landfills and liners for landfills
CO 3	Understand the principles of landfills and environmental control measures of landfill wastes
CO 4	Understand the aspects of detection & monitoring of subsurface contamination and control & remediation of contaminated sites
CO 5	Understand the aspects of rehabilitation and control of contaminated slurry deposited wastes
CO 6	Understand various environmental control measures and geo technical reuse of waste

Assessment Method:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	**Course Name**	**Category**	**L-T-P**	**Credits**
20CE XX43	**SUSTAINABLE BUILDING MATERIALS**	**PEC**	**3-0-0**	**3**

Course Learning Objectives:

1. Concepts of sustainability in the context of building and conventional engineered building materials.
2. Low impact materials: minimize impact on natural environment through recycled

Concept of recycling

3. To make the students realize the role of sustainable construction practices.

Course Content:

UNIT-I **(Contact hours: 6)**

Introduction, Embodied energy, Operational energy in Building and Life cycle energy. Ecological Foot Print.

UNIT- II **(Contact hours: 7)**

Role of Materials: CO_2 emissions – Cement, Alternative cements and cementitious materials, Alternative fuels for cements. Sustainability issues for concrete, Role of quality, minimization of natural resource utilization,

UNIT – III **(Contact hours:6)**

Recycled aggregate, Energy for grinding crushing of cement & aggregate, Reduction in Operational energy, Role of materials and thermal conductivity, Comparative energy performance Indoor air quality

UNIT-IV **(Contact hours:7)**

Paints, Adhesive and sealants for use in building, Volatile organic content (VOC) emission issues and indoor air quality for Sustainability and Health hazard, Operational energy reduction and net zero building.

UNIT-V **(Contact hours:8)**

Radiation budget, Surface water balance, Effects of trees and microclimatic modification through greening, Use of renewable energy in buildings, basic concepts and efficiency.

UNIT-VI **(Contact hours:7)**

Energy Conservation in Buildings – Codes, Methodology, Green Building Design Strategies – Process – Rating Systems

Learning Resources:

1. Whole Building Life Cycle Assessment: Reference Building Structure and Strategies, Frances Yang , American Society of Civil Engineers , 2018
2. Eco-efficient Construction and Building Materials , Fernando Pacheco- Torgal, Woodhead Publishing , 2013
3. Sustainable Construction Materials, Ravindra K et al, Woodhead Publishing, 2016

Web Resources:

URL: https://nptel.ac.in/courses/105/102/105102195/

Course outcomes: At the end of the course, the student will be able to:

CO 1	Understand the sustainability of buildings and engineered building materials
CO 2	Understand the sustainability of lower carbon cements and concrete with alternative material sustainability
CO 3	Understand the Recycled aggregate minimizing consumption of natural resources including water and superior bricks kilns
CO 4	Understand VOC and Optimization for design of building for energy efficiency

CO 5	Understand the concepts of BIPV and other renewable energy in buildings
CO 6	Understand the concepts of ECBC, LEED, GRIHA etc

Assessment Method:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	Course Name	Category	L-T-P	Credits
20CE XX44	**Functional Efficiency of Buildings**	**PEC**	**3-0-0**	**3**

Course Learning Objectives:

1) To expose the students to the concepts functional design of building for thermal aspects and energy efficiency; especially in tropical climates i.e. in Indian context.
2) To make the student capable of performing fenestration design for natural ventilation and day lighting & design of space for external and internal noise control.

Course Content:

UNIT-I: **(Contact hours: 07)**

Environmental Factors: Tropical environments and site environments, Human response to environments - Thermal, Noise, Visual; Comfort indices.

UNIT-II: **(Contact hours: 08)**

Thermal environment for Buildings: Heat exchange of building with environment; Effect of solar radiation; Thermal properties of material and sections and their influence. Steady and periodic heat transfer in buildings

UNIT-III: **(Contact hours: 07)**

Design for energy efficiency: Selection of envelope elements - Orientations, shape, Glasses and shading devices.

UNIT-IV: **(Contact hours: 08)**

Natural ventilation: Purpose of ventilation, Mechanisms, Fenestration Design for natural ventilation.

UNIT V: **(Contact hours: 07)**

Noise and Buildings: Basic acoustics and noise, Planning, Sound in free field, protection against external noise. Internal noise sources and protection against air borne & structure borne noise.

UNIT VI: **(Contact hours: 08)**

Day lighting: Lighting principles and fundamentals, daylight prediction and Design of fenestration

Learning Resources:

1. Koenigsberger, O.H., Ingersoll, T.G., Mayhew, A., Szokolay,S.V., "Climatic Design - Manual of Tropical Housing and Building", Orient Longman Private Ltd. Chennai, India, 2006.
2. Croome, J.D. & Roberts, B.M.,"Air-Conditioning And Ventilation Of Buildings Vol-I". Pergamon Press.
3. Foreman, J.E.K.,"Sound Analysis And Noise Control". Van Nostrand Reinhold. 1990.
4. Z. Maekawa, Jens H. Rindel, P. Lord , Environmental and Architectural Acoustics, CRC Press, 2011

Web Resources:

URL: https://nptel.ac.in/courses/105/102/105102175/

Course outcomes: At the end of the course, the student will be able to

CO 1	Understand the concepts of Environmental Factors, Human response to thermal Environment
CO 2	Understand the Response of building to thermal environment
CO 3	Understand Heat flow computations and Transmission matrix
CO 4	Understand about Structural control and design for energy efficiency

CO 5	Understand about acoustics and noise, internal noise sources
CO 6	Understand about Lighting principles and fundamentals

Assessment Method:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	Course Name	Category	L-T-P	Credits
20CE XX45	**Decision Making methods in Civil Engineering**	**PEC**	**3-0-0**	**3**

Course Learning Objectives:

1. To introduce the student to the concept of Mathematical approaches for managing and operating various systems related civil engineering projects
2. To understand the optimization of project scheduling
3. To learn the models to optimize and control Inventory.
4. To improve ability to make decisions and conduct analysis in support of others' decision making in the face of uncertainty, complexity, and multiple competing objectives.

Course Content:

Course Content:

UNIT-I: **(Contact hours: 8)**

System Approach: Definition, classification, and characteristics of systems - Philosophy of modelling – Goals and Objectives – Basics of system analysis concept – steps in systems engineering.

UNIT-II: **(Contact hours: 9)**

Linear Programming: Basic Linear Programming Problems and Applications; Various Components of LP Problem Formulation, Simultaneous Equations and Graphical Method;

Definitions: Feasible Solution, Basic and non-basic Variables, Basic Feasible Solution,

UNIT-III: **(Contact hours: 9)**

Network Analysis: Activity, Event, Network links. Critical Path Method (CPM), Program Evaluation and Review Technique (PERT), Methodology in CPM/PERT Technique, Shortest Path: Floyd Algorithm; Maximal Flow Problem (Ford-Fulkerson); PERT-CPM (Cost Analysis, Crashing, Resource Allocation excluded). Analysis of network as LPP.

UNIT-IV: **(Contact hours: 9)**

Inventory Control (IC): Definitions, Reasons and meaning of Keeping Inventories. Objectives and benefits of IC; Techniques of IC; Introduction to EOQ Models of Deterministic and Probabilistic inventory; Safety Stock; Buffer Stock.

UNIT V: **(Contact hours: 9)**

Multiple Criteria Decision-Making methods: Basic Concepts of Decision Making, Problem Structuring, MCDM Categories. MCDM methods – TOPSIS, PROMETHEE Method, ELECTRE Method.

UNITVI: **(Contact hours: 9)**

Analytical Hierarchy Problem and Analytical Network Problem: Basics and Principles of AHP & ANP, Design Hierarchy and Make Judgments, Methods to Calculate Relative Weights, Calculating Total Weights, Measuring Inconsistency, Introduction to "Expert Choice".

Text Books:

1. Taha, H.A., “Operations Research”, McMillan Publication Co., New York, 1995.
2. Vedula, S., and Majumdar, P.P. Water Resources Systems – Modeling Techniques and Analysis Tata McGraw Hill, New Delhi, Fifth reprint, 2010.

Reference Books:

1. Gupta, P.K., and Man Mohan, “Problems in Operations Research”, (Methods and Solutions), Sultan Chand and Sons, New Delhi, 1995.
2. Chaturvedi, M.C., “Water Resources Systems Planning and Management”, Tata McGraw Hill, New Delhi, 1997.
3. Hiller, F.S., and Liebermann, G.J., “Operations Research”, CBS Publications and Distributions, New Delhi, 1992.

Web Resources:

1. IISc Bangalore, ‘Lecture Series on Water Resources Systems Planning and Management’.
   URL: https://nptel.ac.in/courses/105/108/105108081/

2. IISc Bangalore, 'Lecture Series on Water Resources Systems: Modeling Techniques and Analysis'.
   URL: https://nptel.ac.in/courses/105/108/105108130/
3. IIT Roorkee, '*Lecture series on Operations Research'*.
   URL: https://nptel.ac.in/courses/111/107/111107128/
4. IIT Madras, 'Lecture series on Introduction to Operations Research'.
   URL: https://nptel.ac.in/courses/110/106/110106062/
5. IIT Madras, 'Lecture series on Advanced Operations Research'
   URL: https://nptel.ac.in/courses/112/106/112106131/
6. IIT Roorkee, 'Lecture series on MCDM Techniques using R'
   URL: https://nptel.ac.in/courses/110/107/110107115/

Course outcomes:

CO 1	Optimize and control inventory efficiently
CO 2	Manage water resource systems effectively
CO 3	Optimize the project schedule
CO 4	Select the project wisely for executions.
CO 5	Make decisions and conduct analysis of complex situations

Assessment Method:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	Course Name	Category	L-T-P	Credits
20CE XX46	**CONSTRUCTION SAFETY MANAGEMENT**	**PEC**	**3-0-0**	**3**

Course Learning Objectives:

1. To learn and understand the importance of safety in construction projects.

2. To learn the ways of effective safety management system and ensure safe construction workplace and projects
3. To understand the advantage of following safety policies and educate the workers.

Course Content:

UNIT -1: Introduction to Safety Management – Safety in Indian Construction Sites, Industrial Safety, Health Management, Environment Management, IS Safety Codes

UNIT – 2: Protective Clothing & Safety Equipment – requirement and equipments, Need for Safety training & Courses – Employees

UNIT – 3 : Physical Injury hazards – scaffolding, formwork Structural framework, roof work, cranes & heavy lifting, transport & mobile plants, highways, tunneling , sewers & confined spaces , demolition & contaminated sites, work over water.

UNIT – 4 : Health Hazards – Chemical, physical & biological hazards , Site arrangements for health safety & welfare – first-aid facilities and first-aiders , Reporting injuries and investigation of accidents, Legislation – Health & safety policy statements.

UNIT – 5: Safety organization, safety management contracting & sub-contracting – Pre-contract activities, survey & investigation, Design & specification for safe construction – management and costs of safety, Safety groups & schemes

UNIT – 6: Risk, reliability - information on safety – posters, publications, films and videos, Case studies

Learning Resources:

1. Kwaku.A., Tena, Jose, M. Guevara, Fundamentals of Construction Management and Organisation,Reston Publishing Co., Inc., 1985
2. John V. Grimaldi , Safety Management , Richard D Irwin ,1994
3. Construction Project Management , Kumar Neeraj Jha , Pearson Publications,2011
4. Occupational Safety & Health Administration [OSHA] – guidelines – electrical hazards ,crane safety, scaffold use, concrete & masonry construction , material handling ..,http://www.osha.gov/pls/publications/publication.html

Course outcomes: At the end of the course, the student will be able to:

CO 1	To identify any underlying causes and implications for the design and operation of the safety and health management system
CO 2	To understand the requirements of safety and health legislation
CO 3	To understand the safe working procedures for specialized or heavy works at site
CO 4	To realize the need for the organization to develop an understanding of risks and risk control
CO 5	To connect the quality, the work place environment, safety and health of employees

Assessment Method:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	Course Name	Category	L-T-P	Credits
20CE XX51	**GROUND WATER HYDROLOGY**	**OEC**	**3-0-0**	**3**

Course Learning Objectives:

1. To understand the sources of ground water, aquifers, water occurrence in different types of rocks
2. To understand the ground water potential theory and movement of ground water through Theis's method and Jacob's method
3. To study about open well and tube well.
4. To study the evaluation of aquifer parameters through pumping test, recuperation test and methods of ground water investigation

5. To study the ground water contamination and recharge methods
6. To familiarize with ground water investigations

Course Content:

UNIT-I: Introduction (Contact hours: 8)

Ground water utilization & historical background, ground water in hydrologic cycle, ground water budget, and ground water level fluctuations & environmental influence, literature/ data/ internet resources. Origin & age of ground water, rock properties affecting groundwater, groundwater column, zones of aeration & saturation, aquifers and their characteristics/classification, groundwater basins & springs, Darcy's Law, permeability & its determination, Dupuit assumptions, heterogeneity &anisotropy, Ground water flow rates & flow directions, general flow equations through porous media

UNIT-II: Advanced Well Hydraulics (Contact hours: 7)

steady/ unsteady, uniform/ radial flow to a well in a confined/ unconfined /leaky aquifer, well flow near aquifer boundaries/ for special conditions, partially penetrating/horizontal wells & multiple well systems, well completion/ development/ protection/ rehabilitation/ testing for yield

UNIT-III: Pollution and Quality Analysis of Ground Water (Contact hours: 7)

Municipal/industrial /agricultural /miscellaneous sources & causes of pollution, attenuation/ underground distribution / potential evaluation of pollution, physical /chemical /biological analysis of ground water quality, criteria & measures of ground water quality, ground water salinity & samples, graphical representations of ground water quality

UNIT-IV: Surface/ Sub-Surface Investigation Of Ground Water(Contact hours: 8)

Geological /geophysical exploration/ remote sensing / electric resistivity /seismic refraction based methods for surface investigation of ground water, test drilling & ground water level measurement, sub-surface ground water investigation through geophysical / resistivity /spontaneous potential /radiation / temperature / caliper / fluid conductivity / fluid velocity /miscellaneous logging. Concept& methods of artificial ground water recharge, recharge mounds & induced recharge, wastewater recharge for reuse, water spreading.

UNIT-V: Saline Water Intrusion in Aquifers (Contact hours: 7)

Ghyben-Herzberg relation between fresh & saline waters, shape & structure of the fresh & saline water interface, upcoming of saline water, fresh-saline water relations on oceanic islands, seawater intrusion in Karst terrains, saline water intrusion control.

UNIT-VI: Groundwater Recharge Techniques (Contact hours: 8)

Direct methods: Percolation tank, flooding, stream augmentation, ditch and furrow system, contour bund and subsurface method of recharge. Indirect methods: induced recharge and aquifer modification method. Methods and techniques of ground water recharge in urban and rural areas.

Learning Resources:

Text Book:

1. D. K. Todd and L. F. Mays, "*Groundwater Hydrology*", 3rd edition 2011 ,John Wiley and sons.

Reference Books:

1. Raghunath H.M., '*Ground Water'* – Wiley Eastern Publications
2. K. R. Karanth, "*Hydrogeology*", 1st edition 2017 TataMcGraw Hill Publishing Company.
3. Bower H,*'Ground Water Hydrology*',1st edition 2017 McGraw Hill,

Web Resources:

1. IIT Kharagpur, June 11 2015, '*Ground Water Hydrology'*, URL: https://nptel.ac.in/courses/105105042/

COURSE OUTCOMES: At the end of the course, student will be able to

1	Understand the nature of groundwater and its role in water cycle
2	Understand Darcy's law and the ground water flow equation.
3	Use suitable data to calculate the exploitable storage, specific yield and specific retention of an aquifer.
4	Capable of interpreting groundwater field data and identify contamination.
5	Allot ground water usage according to sustainable yield.
6	Learn modelling of ground water and its management

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests/Assignments (In Semester)	Monthly tests (In Semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX52	WATER RESOURCES SYSTEMS	OEC	3-0-0	3

Course Learning Objectives:

1. To provide in depth coverage of tools of analysis, namely optimization and simulation.
2. To forecast and predict problems in hydrology.
3. To formulate and solve flood routing models for linear hydrologic systems
4. Develop rainfall-runoff models using simulation techniques
5. To provide the theoretical framework for analysis based on economics of water and the design of water systems
6. To familiarize with multipurpose reservoir operations.

Course Content:

Unit I: Introduction and Optimization (Contact hours: 7)

Definitions and types of systems, Optimization: Functions of a single variable, Optimization: Functions of multiple variables, constrained optimization and introduction to linear programming, CPM and PERT Techniques.

Unit II: Linear Programming (Contact hours: 7)

Graphical method**,** Linear Programming: Simplex method, Linear Programming: Multiple solutions, Linear Programming: Unbounded and infeasible problems, Linear Programming: Dual problem

Unit III: Dynamic Programming (Contact hours: 8)

Introduction to Dynamic Programming, Dynamic Programming: Water allocation problem and reservoir operation problem and Capacity expansion and shortest route problems

Unit IV: Reservoir Simulation and Modelling (Contact hours: 8)

Simulation: Introduction to Multi-objective planning, Multi-objective planning, Reservoir sizing, Reservoir capacity using Linear Programming, reservoir operations, multi reservoir systems, Stationary policy using Dynamic Programming and Hydropower generation

Unit V: Basic Probability theory (Contact hours: 8)

Basic probability theory, Chance constrained Linear Programming for reservoir operation and design and Stochastic Dynamic Programming for reservoir operation.

Unit VI: Reservoir operation **(Contact hours: 7)**

Fuzzy optimization for water quality control and reservoir operation, Conjunctive use of ground and surface water, Hydropower optimization, Crop yield optimization, Multi-basin and multi-reservoir systems.

Learning Resources:

Text Book:

1. Vedula,S. and Mujumdar,P.P.(2005) '*Water Resources Systems : Modelling Techniques and Analysis'*, 1st Edition, 2005,Tata McGraw Hill, New Delhi.

Reference Books:

1. Loucks, D.P. and Ellco Van Beek (2005) '*Water Resources Systems Planning and Management :An Introduction to Methods, Models and Applications*.', 1st Edition, 2017, UNESCO, Netherlands.
2. Mays L.W and Tung Y-K,(1992) '*Hydrosystems Engineering and Management'*, 1st Edition,2002, McGraw Hill, USA
3. Simonovic,S.P.(2009*) 'Managing Water Resources : Methods and Tools for a Systems Approach*', 1st Edition, 2008, UNESCO Publishing, France

Web Resources:

1. IISC Bangalore, April 09 2014, 'Water *Resources Systems (Modelling Techniques and Analysis)*', URL: http://nptel.ac.in/syllabus/105108130/

COURSE OUTCOMES: At the end of the course, student will be able to

1	Understand the fundamentals of economic theory as applied to water resources
2	Be familiar with optimization and simulation modelling
3	design and solve optimization models of water systems
4	conduct model-based analysis of integrated water resources systems
5	Understand current issues of importance in water resources management, including water scarcity, ecohydrology and climate change.
6	Develop optimal reservoir operation system

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests/Assignments (In Semester)	Monthly tests (In Semester)	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX53	Environmental Management and Impact Assessment	OEC	3-0-0	3

Course objectives:

1 To provide a basic understanding of the EIA process as it is used for research, planning, project or program evaluation, monitoring, and regulatory enforcement.
2 To compare and contrast different EIA methodologies
3 To summarize environmental impact assessment of human activities in soil, surfacewater, air and biological environment.
4 To explain various types of environmental audit, acts and rules.
5 To record environmental Impact assessment statement for various Industries
6. To introduce students to the legal, economic, social, administrative and technical process preparing and/or evaluating environmental impact documents.

Course Content:

UNIT I: Basic concept of EIA **(Contact hours: 7)**

Definition, Initial environmental Examination, Elements of EIA, - factors affecting E-I-A Impact evaluation and analysis, preparation of Environmental Base map, Classification of environmental parameters.

UNIT II: E I A Methodologies **(Contact hours: 7)**

Introduction, Criteria for the selection of EIA Methodology, E I A methods, Ad-hoc methods, matrix methods, Network method, Environmental Media Quality Index method, overlay methods, cost/benefit Analysis.

UNIT III: E I A in soil, surface water, Air and Biological environment

(Contact hours: 7)

Introduction and Methodology for the assessment of soil and ground water, Procurement of relevant soil quality, Impact prediction, Assessment of Impact significance, Identification and incorporation of mitigation measures

Methodology for the assessment of Impacts on surface water environment, Air pollution sources, generalized approach for assessment of Air pollution Impact.

Assessment of Impact of development Activities on Vegetation and wildlife, environmental Impact of Deforestation – Causes and effects of deforestation.

UNIT – IV: Environmental Audit & Environmental legislation (Contact hours: 8)

Objectives of Environmental Audit, Types of environmental Audit, Audit protocol, stages of Environmental Audit, onsite activities, evaluation of Audit data and preparation of Audit report.

UNIT-V: Environmental Acts and Rules (Contact hours: 8)

The Environmental Protection Act, The water Act, The Air (Prevention & Control of pollution Act.), Wild life Act, Water CessAct,The Public Liability Insurance Act ,Environmental Protection Rules, The Hazardous Wastes (Management and Handling) Rules, EIA Notification, Public Interest Litigations.

UNIT-VI Case Studies (Contact hours: 8)

Case studies and preparation of Environmental Impact assessment statement for various Industries.

Learning Resources:

Text Book:

1. Y. Anjaneyulu, '*Environmental Impact Assessment Methodologies'*, 2nd Edition, 2010, B.S. Publication, Sultan Bazar, KAKINADA.

Reference books:

1. Suresh K. Dhaneja by '*Environmental Science and Engineering'*– 2013, S.K., Katania& Sons Publication., New Delhi.

2. Dr H.S. Bhatia '*Environmental Pollution and Control'*–2nd Edition, 2018, Galgotia Publication (P) Ltd, Delhi

3. J. Glynn and Gary W. Hein Ke , '*Environmental Science and Engineering'*, by– 2nd Edition, 1996, Prentice Hall Publishers

Web resources :

1. IIT Kharagpur, jan 10 2010***'Environmental Impact Assessment'*** http://nptel.ac.in/syllabus/syllabus.php?subjectId=105103024

B. Tech Civil Engineering, Admitted Batch: 2020-21

COURSE OUTCOMES: At the end of the course, the student will be able to

CO 1	Acquire a better understanding of social impact of development on environment define the basic concepts of environmental impact assessment
CO 2	Experience environmental planning and auditing activities
CO 3	Summarize environmental impact assessment of human activities in soil, surface water, air and biological environment.
CO 4	Explain various types of environmental audit, acts and rules.
CO 5	Record environmental impact assessment statement for various industries
CO 6	Participate in interdisciplinary environmental report preparation teams

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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Course Code	Course Name	Category	L-T-P	Credits
20CE XX54	**Modern Construction Materials**	**OEC**	**3-0-0**	**3**

Course Learning Objectives:

1. To understand the properties of engineering materials.
2. To understand the behavior of concrete and advantages of high strength concrete.
3. To understand the types of steel and advantages of alloy steel.
4. To understand the types of plastic and advantages of reinforced polymers.
5. To understand the concepts of types and properties of water proofing compounds.
6. To understand the concepts of types & differences between smart and intelligent materials.

Course Content:

UNIT-I **(Contact hours: 5)**

INTRODUCTION OF ENGINEERING MATERIALS:

Introduction of Engineering Materials, Properties of the engineering materials, need of advanced materials in civil engineering.

UNIT-II **(Contact hours: 8)**

SPECIAL CONCRETES-Concretes, Behavior of concretes – Properties and Advantages of High Strength and High-Performance Concrete – Properties and Applications of Fiber Reinforced Concrete, Self-compacting concrete, Alternate Materials to concrete on high performance & high Strength concrete.

UNIT-III **(Contact hours: 8)**

METALS -Types of Steels – Manufacturing process of steel – Advantages of new alloy steels –Properties and advantages of aluminium and its products – Types of Coatings & Coatings to reinforcement – Applications of Coatings.

UNIT-IV **(Contact hours: 8)**

COMPOSITES-Types of Plastics – Properties & Manufacturing process – Advantages of Reinforced polymers – Types of FRP – FRP on different structural elements – Applications of FRP.

UNIT-V **(Contact hours: 8)**

OTHER MATERIALS -Types and properties of Water Proofing Compounds – Types of Non-weathering Materials and its uses – Types of Flooring and Facade Materials and its application, concrete admixtures and construction chemicals.

UNIT-VI **(Contact hours: 8)**

SMART AND INTELLIGENT MATERIALS -Types & Differences between Smart and Intelligent Materials – Special features – Case studies showing the applications of smart & Intelligent Materials.

Learning Resources:

Text Books:

1. P.C.Varghese, '*Building Materials*', 2nd Edition, 2015, Prentice-Hall, India.

Reference Books:

1. William D. Callister Jr., David G. Rethwisch, *'Materials Science and Engineering:An introduction',* 9th Edition , 2013, John Wiley .

2. V. Raghavan, '*Materials Science and Engineering*', 6th Edition, 2015, PrenticeHallIndia Learning Private Limited.

3. R.A. Higgins, '*Properties of Engineering Materials*', 2nd Edition, 1994, Industrial Press.

4. Eds. J.M. Illston and P.L.J. Domone, '*Construction materials: Their nature and behavior*', 4th Edition, 2010, Spon Press.
5. J.F.Young,S. Mindess, R.J. Gray &A.Bentur, '*The Science and Technology of Civil Engineering Materials*', 1st Edition, 1997, Prentice Hall.

Web Resources:

1. IIT Madras, '*Modern Construction Materials*'
URL: https://nptel.ac.in/courses/105106053/

Course outcomes: At the end of the course, the student will be able to

CO 1	Understand the properties of engineering materials.
CO 2	Understand the behavior of concrete and advantages of high strength concrete.
CO 3	Understand the types of steel and advantages of alloy steel.
CO 4	Understand the types of plastic and advantages of reinforced polymers.
CO 5	Understand the concepts of types and properties of water proofing compounds.
CO 6	Understand the concepts of types & differences between smart and intelligent materials.

Assessment Method:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX55	**Green Buildings and Landscape**	**OEC**	**3-0-0**	**3**

Course Learning Objectives:

1. To understand the green building trends and technologies.
2. To understand the concept of green energy and its sustainable development.
3. To understand the concept of ecosystems and ecology principles.
4. To understand the concept of landscape.
5. To Design of landscape.
6. To understand the concept global warming.

Course Content:

UNIT-I: **(Contact hours: 8)**

Green innovation & sustainability: Criteria for choosing appropriate green energy technologies, life cycle cost; the emerging trends - process /product innovation, technological environmental leap –frogging; Eco/green technologies for addressing the problems of water, Energy, Health, Agriculture and Biodiversity-WEHAB (eco–restoration/Phyto-remediation, ecological sanitation, renewable energy technologies, industrial ecology, and appropriate green technologies); design for sustainability.

UNIT-II: **(Contact hours: 5)**

Green energy and sustainable development;The inseparable linkages of life supporting systems, biodiversity and ecosystem services and their implications for sustainable development.

UNIT-III: **(Contact hours: 8)**

Global warming; greenhouse emissions, impacts, mitigation and adaptation; future energy systems- clean/green energy technologies; international agreements / conventions on energy and sustainability - United Nations Framework Convention on Climate Change (UNFCC); sustainable development .

UNIT-IV: **(Contact hours: 8)**

Ecological principles: Ecological principles, Concept of ecosystems, ecosystem theories, energy resources and their inter-linkages, energy flow, the impacts of human activities on energy flow in major man-made ecosystems-agricultural, industrial and urban ecosystems.

UNIT V: **(Contact hours: 8)**

Over view, introduction to landscape: Categories, and materials in landscape, Objective and professional scope of landscape design.

UNITVI: **(Contact hours: 8)**

Landscape design: Introduction to history of landscape design. Land form Design. Behavior of the people.

Learning Resources:

Text Books:

1. George Acquaah, '*Horticulture Principles and Practice*', 4th Edition, 2008, PHI Learning Pvt.Ltd. New Delhi.

Reference Books:

1. Brian Hackett, '*Planting design*', 1st Edition, 1979, McGraw-Hill Book Company.
2. Gordon Halfacre and john A Barden, '*Horticulture*', 1st Edition, 1979, McGraw-Hill Book Company.
3. G.S .Saini, '*A Textbook of Ornamental Gardening'*, 2013, Aman Publishing House, Meerut.
4. V.Kumaresan, '*Horticulture*', 2010, Saras Publication.
5. An illustrative Handbook on Landscape Design prepared by the Instructor and TA as a part of the environmental research.

Web Resources:

1. IIT Kharagpur, '*Lecture series on Green buildings and Landscape'*.

URL: https:// nptel.ac.in/courses/124107002/

Course outcomes: At the end of the course, the student will be able to

CO 1	Understand the green building trends and technologies.
CO 2	Understand the concept of green energy and its sustainable development.
CO 3	Understand the concept of ecosystems and ecology principles.
CO 4	Understand the concept of landscape.
CO 5	Design of landscape.
CO 6	Understand the concept global warming.

Assessment Method:

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX56	Civil Engineering- Societal & Global Impact	OEC	3-0-0	3

Course Learning Objectives:

Upon successful completion of this course, the student will be able to:

1. Understanding of the impact which CivilEngineering has on the Society at large and on the global arena.

2. Civil Engineering projects have an impact on the Infrastructure, Energy consumption and generation, Sustainability of the Environment.

3. Projects have an impact on the Aesthetics of the environment, Employment creation, Contribution to the GDP, and on a more perceptible level, the Quality of Life.

4. Gain awareness about the importance of Civil Engineering and the impact it has on the Society and at global levels.

5. Gain awareness about the impact of Civil Engineering for the various specific fields of human endeavor.

6. Be in a position to think innovatively to ensure Sustainability.

Course Content:

UNIT I: **(Contact hours: 8)**

Introduction to Course and Overview; Understanding the past to look into the future: Pre industrial revolution days, Agricultural revolution, first and second industrial revolutions, IT revolution; Recent major Civil Engineering breakthroughs and innovations; Present day world and future projections, Ecosystems in Society and in Nature; the steady erosion in Sustainability; Global warming, its impact and possible causes; Evaluating future requirements for various resources; GIS and applications for monitoring systems; Human Development Index and Ecological Footprint of India Vs other countries and analysis.

UNIT II: **(Contact hours: 8)**

Understanding the importance of Civil Engineering in shaping and impacting the world; The ancient and modern Marvels and Wonders in the field of Civil Engineering; Future Vision for Civil Engineering.

UNIT III: **(Contact hours: 7)**

Infrastructure - Habitats, Megacities, Smart Cities, futuristic visions; Transportation (Roads, Railways & Metros, Airports, Seaports, River ways, Sea canals, Tunnels (below ground, under water); Futuristic systems (ex, Hyper Loop)); Energy generation (Hydro, Solar (Photovoltaic, Solar Chimney), Wind, Wave, Tidal, Geothermal, Thermal energy); Water provisioning; Telecommunication needs (towers, above-ground and underground cabling); Awareness of various Codes & Standards governing Infrastructure development; Innovations and methodologies for ensuring Sustainability.

UNIT IV: **(Contact hours: 7)**

Environment- Traditional & futuristic methods; Solid waste management, Water purification, Wastewater treatment & Recycling, Hazardous waste treatment; Flood control (Dams, Canals, River interlinking), Multi-purpose water projects, Atmospheric pollution; Global warming phenomena and Pollution Mitigation measures, Stationarity and non-stationarity; Environmental Metrics & Monitoring; Other Sustainability measures; Innovations and methodologies for ensuring Sustainability.

UNIT V: **(Contact hours: 8)**

Built environment – Facilities management, Climate control; Energy efficient built environments and LEED ratings, Recycling, Temperature/ Sound control in built environment, Security systems; Intelligent/ Smart Buildings; Aesthetics of built environment, Role of Urban Arts Commissions; Conservation, Repairs & Rehabilitation of Structures & Heritage structures; Innovations and methodologies for ensuring Sustainability.

UNIT VI: **(Contact hours: 7)**

Civil Engineering Projects – Environmental Impact Analysis procedures; Waste (materials, manpower, equipment) avoidance/ Efficiency increase; Advanced construction techniques for better sustainability; Techniques for reduction of Green House Gas emissions in various aspects of Civil Engineering Projects; New Project Management paradigms & Systems (Ex. Lean Construction), contribution of Civil Engineering to GDP, Contribution to employment(projects, facilities management), Quality of products, Health & Safety aspects for stakeholders; Innovations and methodologies for ensuring Sustainability during Project development.

Learning Resources:

Text Books:

1. *Žiga*Turk (2014), '*Global Challenges and the Role of Civil Engineering'*, Chapter 3 in:Fischinger M. (eds) Performance-Based Seismic Engineering: Vision for an Earthquake Resilient Society. Geotechnical, Geological and Earthquake Engineering, Vol. 32. Springer, Dordrecht

Reference Books:

1. Brito, Ciampi, Vasconcelos, Amarol, Barros (2013) '*Engineering impacting Social, Economical and Working Environment'*, 120th ASEE Annual Conference and Exposition
2. NAE Grand Challenges for Engineering (2006), '*Engineering for the Developing World, The Bridge'*, Vol 34, No.2, Summer 2004.
3. Allen M. (2008) '*Cleansing the city'*. Ohio University Press. Athens Ohio.
4. Ashley R., Stovin V., Moore S., Hurley L., Lewis L., Saul A 2010). London Tideway Tunnels Programme – Thames Tunnel Project Needs Report – Potential source control and SUDS applications: Land use and retrofit options

Course Outcomes: At the end of the course, the student will be able to

CO 1	Understand the importance of Civil Engineering.
CO 2	Know about the ecosystems.
CO 3	Understand the Environmental Impact Analysis procedure.
CO 4	Demonstrate about energy efficient built environment.
CO 5	Gain knowledge about solid waste management.
CO 6	Gain awareness of various codes and standard governing infrastructure development.

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX57	Solid and Hazardous Waste management	OEC	3-0-0	3

Course objectives:

1. To impart the knowledge about the methods of collection and optimization of collection routing of municipal solid waste.
2. To acquire the principles of treatment of municipal solid waste.
3. To know the impact of solid waste on the human health.
4. To learn the criterion for selection of landfill and its design.
5. To plan the methods of processing such as composting the municipal solid waste.
6. To gain the knowledge about fundamentals of electronic waste management

UNIT-I: Municipal Solid Waste Management-Fundamentals

Sources; composition; generation rates; collection of waste; separation, transfer and transport of waste; treatment and disposal options

UNIT-II: Hazardous Waste Management-Fundamentals:

Characterization of waste; compatibility and flammability of chemicals; fate and transport of chemicals; health effects

UNIT-III: Physicochemical and Biological Treatment of Solid and Hazardous Waste

Chemical treatment processes for MSW (combustion, stabilization and solidification of hazardous wastes); physicochemical processes for hazardous wastes (soil vapor extraction, air stripping, chemical oxidation); ground water contamination and remediation

UNIT-IV: Landfill Design

Landfill design for solid and hazardous wastes; leachate collection and removal; landfill covers; incineration.

UNIT V: Electronic waste management

E- Waste overview: Introduction, Categories in E- Waste, why we need to manage/Recycle, Environmental and health hazards, sources of E- Waste; E- Waste management: Estimation of E- Waste, Existing E waste recycling technologies, Regulatory frameworks in India, Objectives of E- Waste draft rules, Responsibilities of state pollution board committee, Responsibilities of central board committee, Guidelines on implementation of E waste rules, New additions in E waste rules 2015.

UNIT- VI: Relevant Regulations

Municipal solid waste (management and handling) rules; hazardous waste (management and handling) rules; biomedical waste handling rules; flyash rules; recycled plastics usage rules; batteries (management and handling) rules

Course outcomes:

On successful completion of the course, student will be able to

1. Design the collection system of solid waste of a town.
2. Design treatment of municipal solid waste and landfill.
3. Know the criteria for selection of landfill.
4. Characterize the solid waste.
5. Know the relevant rules and regulations of municipal solid waste management.
6. Practice electronic waste management.

Text Books

1. Vesilind P.A., Worrell W. and Reinhart D.R., "Solid Waste Engineering", Thomson Books.
2. Bhide A.D. and Sundaresan B.B., "Solid Waste Management, Collection, Processing and Disposal", Nagpur.

References:

1. Pichtel, John. Waste Management Practices: Municipal, Hazardous and Industrial. CRC Press, Taylor and Francis Group, 2005.
2. LaGrega, Michael D., Buckingham, Philip L. and Evans, Jeffrey C. Hazardous Waste Management. Waveland Press Inc., Reissue Edition, 2010.
3. Electronic Waste Management and Treatment Technology by Majestic Narasimha Varaprasad and Meththika Vithanage.

Video Reference

Title	Expert Name	Affiliation	Web link
Solid and Hazardous Waste management	Dr. Indumathi Nambi	IIT Madras	http://nptel.ac.in/courses/105106056/

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B. Tech Civil Engineering, Admitted Batch: 2020-21

Course Code	Course Name	Category	L-T-P	Credits
20CE XX58	**AIR POLLUTION AND ITS CONTROL**	**PEC**	**3-0-0**	**3**

Course objectives:

1 To provide a solid basis for assembling a common approach focusing on air pollution control
2 To classify the pollutants and their sources
3 To describe general air pollution problems and episodes
4 To explain the effects of air pollutants on man, material and vegetation
5 To apply the knowledge of meteorology in design of plume dispersion model.
6 To illustrate the theory and working of pollution control devices

Course Content:

UNIT I: Introduction to Air pollution (Contact hours: 07)
Air Pollution – Definitions, Scope, Significance and Episodes, Air Pollutants – Classifications – Natural and Artificial – Primary and Secondary, point and Non- Point, Line and Areal Sources of air pollution- stationary and mobile sources

UNIT II: Effects of Air pollution (Contact hours:07)
Effects of Air pollutants on man, material and vegetation: Global effects of air pollution – Green House effect, Heat Islands, Acid Rains, Ozone Holes etc.

UNIT III: Thermodynamics and Kinetics of Air pollution (Contact hours:07)
Thermodynamics and Kinetics of Air-pollution – Applications in the removal of gases like SOx, NOx, CO, HC etc., air-fuel ratio.

UNIT IV: Meteorology and plume Dispersion (Contact hours:08)
Meteorology and plume Dispersion; properties of atmosphere; Heat, Pressure, Wind forces, Moisture and relative Humidity, Influence of Meteorological phenomena on Air Quality-wind rose diagrams.

UNIT-V Plume Dispersion Model (Contact hours:08)
Lapse Rates, Pressure Systems, Winds and moisture plume behavior and plume Rise Models; Gaussian Model for Plume Dispersion.

UNIT-VI Control of Air pollution **(Contact hours:08)**

Control of particulates – Control at Sources, Process Changes, Equipment modifications, Equipment's – Settling Chambers, Centrifugal separators, filters Dry and Wet scrubbers, Electrostatic precipitators.

Learning Resources:

Text Books:

1. M.N.Rao and H.V.N.Rao , "*Air pollution* ' ' 1st Edition, 1989– Tata Mc.Graw Hill Company.

Reference:

1.R.K. Trivedy and P.K Goel, "*An introduction to Air pollution*". by ',2nd Edition, 2005, B.S. Publications.

2. Wark and Warner *"Air pollution*" –3rd Edition, 1997, Harper & Row, New York.

Web resources

NPTEL HRD, February 18, 2008 ,'*Air pollution &Control'* http://nptel.ac.in/courses/105104099/

COURSE OUTCOMES: At the end of the course, the student will be able to

CO 1	acquire the knowledge and understanding to evaluate air quality management
CO 2	to understand the type and nature of air pollutants
CO 3	analyse the general air pollution problems and episodes
CO 4	analyse the effects of air pollutants on man, material and vegetation
CO 5	to apply the knowledge of meteorology in design of plume dispersion model.
CO 6	to illustrate the theory and working of pollution control devices

Course Nature		**Theory**		
Assessment Method				
Assessment Tool	Weekly tests	Monthly tests	End Semester Test	Total
Weightage (%)	10%	30%	60%	100%

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**********THE END**********

Rajiv Gandhi University Of Knowledge Technologies-AP
Constituted under the Act 18 of 2008

NUZVID - RK VALLEY-SRIKAKULAM-ONGOLE

B. Tech Civil Engineering, Admitted Batch: 2020-21

DEPARTMENT OF CIVIL ENGINEERING

COURSE STRUCTURE AND DETAILED SYLLABI OF B.TECH PROGRAMME MINOR IN CIVIL ENGINEERING

Effective from the batches admitted in 2020-21 onwards

B. Tech Civil Engineering, Admitted Batch: 2020-21

CONTENTS

Each student need to complete a total of 6 courses and 2 labs for being awarded minor degree in Civil Engineering. Out of them, 2 courses are mandatory courses and other 4 courses are elective courses, which the student had not already studied in their major engineering discipline.

Mandatory courses: Surveying -1 and Structural Analysis

Total Credits: 21 (Theory Courses: 6 x 3 =18, Laboratory: 2 x 1.5 = 03)

Prerequisites:

1. Minimum 8.00 CGPA up to E2S2

Compulsory Courses

S.No	Subject Code	Subject Name	L-T-P	Credits
1	**CE2101**	Building Materials and Construction	**3-0-0**	**3**
2	**CE2103**	Mechanics of fluids	**2-1-0**	**3**
3	**CE2104**	Mechanics of Materials-1	**2-1-0**	**3**
4	**CE2105**	Surveying-1	**2-1-0**	**3**
5	**CE2204**	Structural Analysis	**2-1-0**	**3**
6	**CE2206**	Water Resources engineering	**3-0-0**	**3**
7	**CE3103**	Environmental Engineering-1	**3-0-0**	**3**
8	**CE3104**	Estimation & Costing	**3-0-0**	**3**
9	**CE3105**	Transportation Engineering-1	**3-0-0**	**3**
10	**CEXXXX**	Remote sensing & GIS	**3-0-0**	**3**
11	**CEXXXX**	Repair and Rehabilitation of Structures	**3-0-0**	**3**
12	**CEXXXX**	Urban Transportation & Planning	**3-0-0**	**3**
13	**CEXXXX**	Air Pollution and control	**3-0-0**	**3**
14	**CE2181**	Mechanics of Materials Lab	**0-0-3**	**1.5**
15	**CE2182**	Surveying Lab	**0-0-3**	**1.5**
16	**CE3182**	Transportation Engineering Lab	**0-0-3**	**1.5**
17	**CE3282**	Environmental Engineering Lab	**0-0-3**	**1.5**
			Total Credits	

ANNEXURE – III

Establishing equivalency of courses between the earlier pattern and current courses

S. No	Name of the course & Subject Code with credits in old regulations				Name of the similar course & Subject Code with credits in current regulations (2020-2021)			Percentage of syllabus common in both regulations	Equivalency established (Yes/NO)
	Batch	Year & SEM	Code	Name	Year & SEM	Code	Name		
1	2011	E2SEM1	CE2102	Construction Materials and Introduction of Design	E2SEM1	CE2102	Concrete Technology	75%	YES
2	2011	E2SEM1	CE2103	Mechanics of Solids	E2SEM1	CE2104	Mechanics of Materials - I	60%	NO
3	2011	E3SEM1	CE3104	Design of concrete structures	E3SEM1	CE3102	Design of Reinforced Concrete Syllabus	100%	YES
4	2011	E3SEM2	CE3203	Design of Steel Structures	E3SEM2	CE3202	Design of Steel Structures	95%	YES
5	2011	E3SEM2	CE3103	Hydraulics Engineering	E2SEM2	CE2201	Hydraulics Engineering	80%	Yes
6	2012	E2SEM2	CE2201	Mechanics of Fluids	E2SEM1	CE2103	Mechanics of Fluids	75%	YES
7	2012	E2SEM2	CE2203	Structural Analysis	E2SEM2	CE2204	Structural Analysis	85%	YES
8	2012	E2SEM2	CE2204	Water Supply Engineering	E3SEM1	CE3103	Environmental Engineering - I	95%	YES

9	2012	E3SEM1	CE3105	Concrete Structures Design	E3SEM1	CE3102	Design of Reinforced Concrete Syllabus	**100%**	**YES**
10	2012	E3SEM1	CE4102	Sanitary Engineering	E3SEM2	CE3203	Environmental Engineering - II	**95%**	**YES**
11	2012	E3SEM1	CE3102	Soil Mechanics	E2SEM2	CE2203	Soil Mechanics	**95%**	**YES**
12	2012	E3SEM1	CE3101	Transportation Engineering	E3SEM1	CE3105	Transportation Engineering - I	**90%**	**YES**
13	2012	E3SEM2	CE3202	Building Planning and Drawing	E3SEM2	CE3201	Building Planning and Computer Aided Drawing Lab	**40%**	**NO**
14	2012	E3SEM2	CE3203	Design of Steel Structures	E3SEM2	CE3202	Design of Steel Structures	**95%**	**YES**
15	2012	E3SEM2	CE3204	Foundation Engineering	E3SEM2	CE3204	Foundation Engineering	**100%**	**YES**
16	2012	E3SEM2	CE3103	Hydraulics Engineering	E2SEM2	CE2201	Hydraulics Engineering	**80%**	**YES**
17	2012	E4SEM1	CE4111	Estimation and Costing	E3SEM1	CE3104	Estimation and Costing	**85%**	**YES**
18	2013	E1SEM1	CE1101	Engineering Drawing	E1SEM1	CE1114	Engineering Graphics and Computer Drafting	**80%**	**YES**
19	2013	E1SEM1	CE2101	Surveying-I	E2SEM1	CE2105	Surveying - I	**90%**	**YES**
20	2013	E1SEM2	CE1202	Building Materials & Constructions	E2SEM1	CE2101	Building Materials and Construction	**90%**	**YES**
21	2013	E1SEM2	CE2201	Mechanics of Fluids	E2SEM1	CE2103	Mechanics of Fluids	**75%**	**YES**
22	2013	E1SEM2	CE2103	Mechanics of Solids	E2SEM1	CE2104	Mechanics of Materials - I	**60%**	**NO**

23	2013	E1SEM2	CE2205	Surveying-II	E2SEM2	CE2205	Surveying - II	**80%**	**YES**
24	2013	E2SEM1	CE3103	Hydraulics Engineering	E2SEM2	CE2201	Hydraulics Engineering	**80%**	**YES**
25	2013	E2SEM1	CE2106	Mechanics of Solids 2	E2SEM2	CE2202	Mechanics of Materials - II	**90%**	**YES**
26	2013	E2SEM1	CE2105	Structural Analysis 1	E2SEM2	CE2204	Structural Analysis	**80%**	**YES**
27	2013	E2SEM1	CE2202	Water Resource Engineering 1	E2SEM2	CE2206	Water Resources Engineering	**90%**	**YES**
28	2013	E2SEM2	CE2207	Design of Reinforced Concrete Structures	E3SEM1	CE3102	Design of Reinforced Concrete Syllabus	**100%**	**YES**
29	2013	E2SEM2	CE2208	Design of Steel Structures	E3SEM2	CE3202	Design of Steel Structures	**95%**	**YES**
30	2013	E2SEM2	CE2206	Environmental Engineering	E3SEM1	CE3103	Environmental Engineering - I	**95%**	**YES**
31	2013	E2SEM2	CE2204	Soil Mechanics	E2SEM2	CE2203	Soil Mechanics	**90%**	**YES**
32	2013	E2SEM2	CE2203	Transportation Engineering	E3SEM1	CE3105	Transportation Engineering - I	**90%**	**YES**
33	2013	E2SEM3	CE2902	Building Planning and Drawing& CAD	E3SEM2	CE3201	Building Planning and Computer Aided Drawing Lab	**40%**	**NO**
34	2013	E2SEM3	CE2901	Foundation Engineering	E3SEM2	CE3204	Foundation Engineering	**95%**	**YES**
35	2013	E3SEM2	CE2201	Design of Reinforced Concrete Structures	E3SEM1	CE3102	Design of Reinforced Concrete Syllabus	**100%**	**YES**
36	2013	E3SEM2	CE2202	Design of Steel Structures	E3SEM2	CE3202	Design of Steel Structures	**95%**	**YES**

37	2013	E3SEM2	CE3112	Estimation & Costing	E3SEM1	CE3104	Estimation and Costing	**96%**	**YES**
38	2013	E3SEM2	CE2204	Foundation Engineering	E3SEM2	CE3204	Foundation Engineering	**90%**	**YES**
39	2013	E3SEM2	CE3253	Pre-Stressed Concrete	Elective	CEXX23	Pre-stresses Concrete Structures	**95%**	**YES**
40	2013	E4SEM1	CE4154	Introduction to Finite Element Analysis		CEXX21	Finite Element Method	**95%**	**YES**
41	2013	E4SEM2	CE4255	Introduction to Structural dynamics and Earth quake Engineering		CEXX26	Structural Dynamics	**80%**	**YES**
42	2013	E4SEM2	CE4214	Modern Construction Materials		CEXX54	Modern Construction Materials	**100%**	**YES**
43	2013	E4SEM2	CE4264	Urban Transport Planning		CEXX31	Urban Transport Planning	**100%**	**YES**
44	2014	E1SEM1	CE1101	Engineering Drawing	E1SEM1	CE1114	Engineering Graphics and Computer Drafting	**80%**	**YES**
45	2014	E1SEM2	CE1204	Building Materials and Concrete Technology	E2SEM1	CE2101	Building Materials and Construction	**50%**	**NO**
46	2014	E1SEM2	CE1203	Engineering Geology	E1SEM2	CE1202	Engineering Geology	**90%**	**YES**
47	2014	E1SEM2	CE1201	Engineering Mechanics	E1SEM2	CE1201	Engineering Mechanics	**90%**	**YES**
48	2014	E1SEM2	CE1202	Fluid Mechanics	E2SEM1	CE2103	Mechanics of Fluids	**100%**	**YES**
49	2014	E1SEM2	CE1205	Surveying	E2SEM1	CE2105	Surveying - I	**90%**	**YES**

50	2014	E1SEM3	CE1301	Mechanics of Materials	E2SEM1	CE2104	Mechanics of Materials – I	**60%**	**NO**
51	2014	E2SEM1	CE2102	Hydraulics Engineering	E2SEM2	CE2201	Hydraulics Engineering	**100%**	**YES**
52	2014	E2SEM1	CE2104	Soil Mechanics	E2SEM2	CE2203	Soil Mechanics	**100%**	**YES**
53	2014	E2SEM1	CE2101	Structural Analysis	E2SEM2	CE2204	Structural Analysis	**80%**	**YES**
54	2014	E2SEM1	CE2103	Water Resources Engineering	E2SEM2	CE2206	Water Resources Engineering	**90%**	**YES**
55	2014	E2SEM2	CE2201	Design of Reinforced Concrete Structures	E3SEM1	CE3102	Design of Reinforced Concrete Syllabus	**100%**	**YES**
56	2014	E2SEM2	CE2202	Design of Steel Structures	E3SEM2	CE3202	Design of Steel Structures	**95%**	**YES**
57	2014	E2SEM2	CE2205	Environmental Engineering	E3SEM1	CE3103	Environmental Engineering – I	**90%**	**YES**
58	2014	E3SEM1	CE3122	Air Pollution and Control		CEXX35	Air Pollution and Control	**100%**	**YES**
59	2014	E3SEM1	CE3121	Environmental Engineering-II	E3SEM2	CE3203	Environmental Engineering – II	**90%**	**YES**
60	2014	E3SEM1	CE3131	Ground Improvement Technique		CEXX37	Ground Improvement Techniques	**100%**	**YES**
61	2014	E3SEM1	CE3111	Introduction to Construction Management		CEXX38	Construction Planning and Management	**80%**	**YES**
62	2014	E3SEM2	CE3112	Estimation & Costing	E3SEM1	CE3104	Estimation and Costing	**98%**	**YES**

63	2014	E3SEM2	CE3253	Pre-Stressed Concrete	Elective	CEXX23	Pre-stresses Concrete Structures	**95%**	**YES**
64	2014	E3SEM2	CE3271	Remote Sensing and GIS	Elective	CEXX41	Remote Sensing and GIS	**100%**	**YES**
65	2014	E3SEM2	CE3223	Solid and Hazardous Waste Management	**NOT AVAILABLE**				
66	2014	E4SEM1	CE4552	Advanced Concrete Technology	Elective	CEXX25	Advanced Concrete Technology	**80%**	**YES**
67	2014	E4SEM1	CE4154	Introduction to Finite Element Analysis	Elective	CEXX21	Finite Element Method	**95%**	**YES**
68	2014	E4SEM2	CE4255	Introduction to Structural Dynamics and Earth quake Engineering	Elective	CEXX26	Structural Dynamics	**80%**	**YES**
70	2014	E4SEM2	CE4214	Modern Construction Materials	Elective	CEXX54	Modern Construction Materials	**100%**	**YES**
71	2015	E1SEM1	CE1102	Engineering drawing	E1SEM1	CE1114	Engineering Graphics and Computer Drafting	**80%**	**YES**
72	2015	E1SEM1	CE1101	Engineering Mechanics	E1SEM2	CE1201	Engineering Mechanics	**90%**	**YES**
73	2015	E1SEM1	CE1103	Surveying	E2SEM1	CE2105	Surveying – I	**90%**	**YES**
74	2015	E1SEM2	CE1204	Building Materials and Construction	E2SEM1	CE2101	Building Materials and Construction	**80%**	**YES**
75	2015	E1SEM2	CE1203	Engineering Geology	E1SEM2	CE1202	Engineering Geology	**90%**	**YES**
76	2015	E1SEM2	CE1202	Fluid Mechanics	E2SEM1	CE2103	Mechanics of Fluids	**100%**	**YES**

77	2015	E1SEM2	CE1201	Mechanics of Materials	E2SEM1	CE2104	Mechanics of Materials – I	**60%**	**NO**
78	2015	E2SEM1	CE2105	Concrete Technology	E2SEM1	CE2102	Concrete Technology	**90%**	**YES**
79	2015	E2SEM1	CE2102	Hydraulic Engineering	E2SEM2	CE2201	Hydraulics Engineering	**80%**	**YES**
80	2015	E2SEM1	CE2104	Soil Mechanics	E2SEM2	CE2203	Soil Mechanics	**90%**	**YES**
81	2015	E2SEM1	CE2101	Structural Analysis	E2SEM2	CE2204	Structural Analysis	**80%**	**YES**
82	2015	E2SEM1	CE2103	Water Resource Engineering	E2SEM2	CE2206	Water Resources Engineering	**90%**	**YES**
83	2015	E2SEM2	CE2201	Design of Reinforced Concrete Structures	E3SEM1	CE3102	Design of Reinforced Concrete Syllabus	**100%**	**YES**
84	2015	E2SEM2	CE2202	Design of Steel Structures	E3SEM2	CE3202	Design of Steel Structures	**95%**	**YES**
85	2015	E2SEM2	CE2205	Environmental Engineering	E3SEM1	CE3103	Environmental Engineering – I	**95%**	**YES**
86	2015	E2SEM2	CE2204	Foundation Engineering	E3SEM2	CE3204	Foundation Engineering	**90%**	**YES**
87	2015	E2SEM2	CE2203	Transportation Engineering	E3SEM1	CE3105	Transportation Engineering - I	**90%**	**YES**
88	2015	E3SEM1	CE3111	Construction Planning and Management	Elective	CEXX38	Construction Planning and Management	**80%**	**YES**
89	2015	E3SEM1	CE3121	Environmental Engineering - II	E3SEM2	CE3203	Environmental Engineering - II	**90%**	**YES**
90	2015	E3SEM1	CE3131	Ground Improvement Techniques	Elective	CEXX37	Ground Improvement Techniques	**100%**	**YES**

91	2015	E3SEM1	CE3161	Pavement Analysis and Design	Elective	CEXX30	Pavement Analysis and Design	**100%**	**YES**
92	2016	E1SEM1	CE1102	Engineering Drawing	E1SEM1	CE1114	Engineering Graphics and Computer Drafting	**80%**	**YES**
93	2016	E1SEM1	CE1101	Engineering Mechanics	E1SEM2	CE1201	Engineering Mechanics	**90%**	**YES**
94	2016	E1SEM1	CE1103	Surveying	E2SEM1	CE2105	Surveying – I	**90%**	**YES**
95	2016	E1SEM2	CE1204	Building Materials and Construction	E2SEM1	CE2101	Building Materials and Construction	**80%**	**YES**
96	2016	E1SEM2	CE1203	Engineering Geology	E1SEM2	CE1202	Engineering Geology	**90%**	**YES**
97	2016	E1SEM2	CE1202	Fluid Mechanics	E2SEM1	CE2103	Mechanics of Fluids	**75%**	**YES**
98	2016	E1SEM2	CE1201	Mechanics of Materials	E2SEM1	CE2104	Mechanics of Materials - I	**80%**	**YES**
99	2016	E2SEM1	CE2102	Hydraulics Engineering	E2SEM2	CE2201	Hydraulics Engineering	**80%**	**YES**
100	2016	E2SEM1	CE2104	Soil Mechanics	E2SEM2	CE2203	Soil Mechanics	**95%**	**YES**
101	2016	E2SEM1	CE2101	Structural Analysis	E2SEM2	CE2204	Structural Analysis	**80%**	**YES**
102	2016	E2SEM1	CE2103	Water Resources Engineering	E2SEM2	CE2206	Water Resources Engineering	**90%**	**YES**

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