DEPARTMENT OF CIVIL ENGINEERING
C.V. RAMAN COLLEGE OF ENGINEERING, BHUBANESWAR
(An autonomous Institute affiliated to BPUT, Odisha)
Third Year B. Tech Structure with effect from Academic Year 2017-2018
(Students taken admission in 2015-2016 and onwards)
SEMESTER V

Sl. No.	Code	Subject	Type	Teaching Scheme			Assessment Scheme						Credits
				L	P	T	ISA					ESA	
							Test 1	Test 2	HA	Tut.	CA	ESE	
S1	CE30101	ADVANCED MECHANICS OF MATERIAL	Theory – Core/MD	3	-	1	10	20	5	5	-	60	4
S2	CE30102	R.C.C. STRUCTURES	Theory – Core	3	-	1	10	20	5	5	-	60	4
S3	CE30103	IRRIGATION	Theory – Core/	3	-	-	15	20	5	-	-	60	3
S4	CE32171 CE32172	SURVEYING –II / GIS & REMOTE SENSING	Theory – Core	3	-	-	15	20	5	-	-	60	3
S5	CE30105	TRANSPORTATION ENGG.-I	Theory – Core	3	-	-	15	20	5	-	-	60	2
P1	CE30301	DESIGN OF R.C.C. STRUCTURES	Lab – Core	-	2	-	-	-	-	-	70	30	1
P2	CE30302	TRANSPORTATION ENGG. LAB	Lab – Core	-	2	-	-	-	-	-	70	30	1
P3	CE30303	CONCRETE LAB	Lab – Core	-	2	-	-	-	-	-	70	30	1
P4	CE34351	SURVEY-II LAB	Lab – SD/PD	-	2	-	-	-	-	-	70	30	1
MP	CE37397	MINI PROJECT	Project	-	4	-	-	-	-	-	70	30	2
CVV	CE37401	COMPREHENSIVE VIVA VOCE*	Oral	-	-	-	-	-	-	-	-	100	2
P5	HS37403	TECHNICAL SEMINAR	Lab	-	2	-	-	-	-	-	70	30	1
			Total:	**15**	**14**	**2**							**25**

* Based on core theory subjects.

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SEMESTER VI

Sl. No.	Code	Subject	Type	Teaching Scheme			Assessment Scheme						Credits
				L	P	T	ISA					ESA	
							Test 1	Test 2	HA	Tut.	CA	ESE	
S1	CE30106	STRUCTURAL ANALYSIS-II	Theory – Core / Theory – MD	3	-	1	10	20	5	5	-	60	4
S2	CE30107	WATER SUPPLY & SANITARY ENGG.	Theory – Core	3	-	1	10	20	5	5	-	60	4
S3	CE30108	TRANSPORTATION ENGG-II.	Theory – Core	3	-	-	15	20	5	-	-	60	3
S4	CE30109	STEEL STRUCTURES	Theory – Core	3	-	-	15	20	5	-	-	60	3
S5	MA31108	NUMERICAL AND OPTIMISATION TECHNIQUES	Theory – MD	3	-	-	15	20	5	-	-	60	2
P1	CE30304	DESIGN OF STEEL STRUCTURE	Lab – Core	-	2	-	-	-	-	-	70	30	1
P2	CE30305	ENVIRONMENTAL ENGG LAB.	Lab – Core	-	2	-	-	-	-	-	70	30	1
P3	CE30306	NUMERICAL COMPUTATION LAB	Lab – Core	-	2	-	-	-	-	-	70	30	1
P4	CE34352	DESIGN OF STRUCTURE AND FOUNDATION BY STAAD. Pro.	Lab – SD	-	2	-	-	-	-	-	70	30	1
MP	CE37398	MAJOR PROJECT STAGE -I	Project	-	4	-	-	-	-	-	70	30	2
CVV	CE37402	COMPREHENSIVE VIVA VOCE*	Oral	-	-	-	-	-	-	-	-	100	2
P5	IN37403	PRE PLACEMENT TRAINING	Lab	-	2	-	-	-	-	-	100	-	1
			Total:	**15**	**14**	**2**							**25**

* Based on core theory subjects.

C. V. Raman College of Engineering
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Bidyanagar, Mahura, Janla, Bhubaneswar-752054(Orissa)

CE30101: Advanced Mechanics of Materials

Credit: 03 **Teaching Scheme:** Theory 03 Hrs/Week

Prerequisites: The student should have knowledge of:

1. Engineering Mechanics
2. Mechanics of Solids
3. Differentiation and Integration
4. Differential Equations

Course Outcome: On completion of the course, the student will be able to analyze and solve the problems related to

1. Theory of Elasticity,
2. Theories of Failure and Thick Cylinders,
3. Unsymmetrical Bending and Shear Centre,
4. Curved Beam and Thin Walled Vessels
5. Fatigue in metals, stress concentration, and strain Rosettes.

Course Details:

Unit 1 : Elementary Concept of Elasticity:

U1.1: Stress in three dimensional bodies, equation of equilibrium, strain displacement relations, compatibility equations, stress strain relations, boundary conditions, governing differential equation (Cartesian Co-ordinates)

U1.2: Plane stress and plane strain, governing differential equation, Airy stress function, Solution of plane stress problems by Polynomials (Cartesian Co-ordinates)

Unit 2 : Theories of Failure:

U2.1: Maximum principle stress theory, Maximum shear stress theory, Maximum strain theory, Total strain energy theory, Maximum distortion theory, Octahedral shear stress theory and solution of problems.

U2.2 : Graphical representation and comparison of theories of failure in two dimensions.

U 2.3 : Thick Cylinders : Thick cylinders subject to internal and external fluid pressures compound cylinders, shrink-fit.

Unit 3: Unsymmetrical bending and Shear centre:

U3.1: Unsymmetrical bending, properties of beam cross-sections, slope of neutral axis, Stresses and deflection in unsymmetrical bending.

U3.2: Shear Centre for Thin-Wall Beam Cross Section.

Unit 4 : Curved Beam and Thin Walled Vessels :

U4.1: Bending of beam with large initial curvature, stress distribution in beam with rectangular; circular and trapezoidal cross section, stress in crane hooks, rings and chain links.

U4.2: Thin walled vessels subjected to internal pressure: To find membrane stresses in spherical vessels, conical tanks, cylindrical tanks and their combination.

Unit 5 : Special Topics:

U5.1: Repeated stresses in structural components, Fatigue of Metals, Endurance Limit, Factors Affecting the Endurance Limit.

U5.2: Concept of stress concentration, stress concentration factor and notch sensitivity.

U5.3: Resistance strain gauges and strain rosettes to determine principal strains and stresses at a point.

TEXT BOOKS:

1. L.S. Srinath, "Advanced Mechanics of Solids", Tata-McGraw Hill Publishing Co. Ltd., New Delhi.
2. S.P. Timoshenko, "Strength of materials", Part I and II, CBS Publishers & Distributers Pvt. Ltd.
3. A.P. Boresi, R.J. Schmidt and O.M Sidebottom, "Advanced Mechanics of materials", John Wiley and Sons.
4. Kamal Kumar and R.C. Ghai, "Advanced Mechanics of Materials", Khanna Publishers, New Delhi.

REFERENCE BOOKS:

1. F.B. Seely and J.O. Smith, "Advanced Mechanics of Materials", John Wiley and Sons.
2. Egor P. Popov and Toaden A. Bealan, "Engineering Mechanics of Solids", PHI Learning Pvt Ltd, Delhi.

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CE30101: Advanced Mechanics of Material

Credit: 01 **Teaching scheme:** Tutorial 01 Hr/Week

Prerequisites: The student should have knowledge of:

1. Engineering Mechanics
2. Mechanics of Solids
3. Differentiation and Integration
4. Differential Equations

Course Outcome: On completion of the course, the student will be able to analyze and solve the problems related to

1. Theory of Elasticity,
2. Theories of Failure and Thick cylinders,
3. Unsymmetrical Bending and Shear Centre,
4. Curved Beam and Thin Walled Vessels,
5. Fatigue in Metals , stress concentration and strain Rosettes.

Course Details:

1. Derivation of Governing differential equation in Three Dimensional elasticity.
2. Problem solving of plane stress problem by Polynomials.
3. Problem solving of Theories of Failure.
4. Problem solving of Thick Cylinders.
5. Problem solving of Compound Cylinders.
6. Problem solving of Unsymmetrical Bending.
7. Problem solving of Shear centre.
8. Problem solving of Curved Beams.
9. Problem solving of Thin Walled Vessels.
10. Problem solving of Strain Rosette.

References

1. F.B. Seely and J.O. Smith,"Advanced Mechanics of Materials", John Wiley and Sons.
2. Egor P. Popov and Toaden A. Bealan,"Engineering Mechanics of Solids", PHI Learning Pvt. Ltd, Delhi.

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CE30102: R.C.C STRUCTURES

Credit: 03 **Teaching Scheme: Theory 03 Hrs/Week**

Prerequisite: The Students should have knowledge of

1. Engineering Mechanics
2. Mechanics of Solids
3. Structural Analysis

Course Outcome: on completion of the course, the student will be able to design the following structural elements like

1. Different methods of design and its implementation.
2. Design of rectangular and flanged beam.
3. Design of slab and staircase
4. Design of footing different types of column
5. Design of different types of footing.

Course Details:

Unit-1 Introduction:
U1.1: Properties of concrete and reinforcing steel, philosophy, concept and methods of reinforced concrete design, introduction to limit state method, limit state of collapse and limit state of serviceability.
U1.2: application of limit state method to rectangular beams for flexure, shear, bond and torsion.

Unit-2: **design of rectangular and flanged beam:**
U2.1: Design of singly and doubly reinforced beams.
U2.2: Design of T and L beams.
U2.3: design of simply supported and continuous beam.

Unit-3: **design of slab and staircase:**
U3.1: Design of one way and two way slabs [simply supported and continuous] by limit state methods.

U3.2: Design of staircases.

Unit-4: design of columns:

U4.1: Design of short and long columns with axial and eccentric loadings.

Unit-5: design of footing:

U5.1: Design of isolated column footings.

U5.2: Design of Combined footings.

Text Books:

1. RCC Design-B.C.Punmia, A.K.Jain and A.K.Jain-Laxmi Publications
2. Design of Reinforced Concrete Structures: Pillai & Mennon, TMH Publications
3. IS 456, SP-16 and SP-32.

Reference Books:

1. Limit State Design-A.K.Jain, Neemchand & Bros, Roorkee
2. Design of concrete structures by J.N.Bandyopadhyay, PHI pvt ltd.
3. Limit State Design of Reinforced Concrete -P.C Verghese
4. S. K. Mallik and A. P. Gupta, Reinforced Concrete Design, Oxford and IBH 1999.
5. A. Nilson, D. Darwin, C. Dolan, Design of Concrete Structures (13th edition), Tata McGraw- Hill.

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CE30102: R.C.C STRUCTURES

Credit: 01 **Teaching Scheme: Tutorial 01Hrs/Week**

Prerequisite: The Students should have knowledge of

1. Engineering Mechanics
2. Mechanics of Solids
3. Structural Analysis

Course Outcome: On completion of the course, the student will be able to design the following structural elements like

1. Different methods of design and its implementation.
2. Design of rectangular and flanged beam.
3. Design of slab and staircase
4. Design of footing different types of column
5. Design of different types of footing.

List of Contents

Tutorial No. 1: Problem solving involving design of single reinforced section.
Tutorial No. 2: Problem solving involving design of double reinforced section.
Tutorial No. 3: Solving design problem on flanged beam.
Tutorial No. 4: Problem solving involving design of rectangular beam.
Tutorial No. 5: solving design problem on continuous beam.
Tutorial No. 6: Problem solving involving design of one-way slab.
Tutorial No. 7: Problem solving involving design of two-way slab.
Tutorial No. 8: solving design problem on rectangular column
Tutorial No. 9: solving design problem on circular column
Tutorial No. 10: solving design problem on square isolated footing.
Tutorial No. 11: Problem solving involving design of combined footing.
Tutorial No. 12: Problem solving involving design of staircase.

Text Books:

1. RCC Design-B.C.Punmia, A.K.Jain and A.K.Jain-Laxmi Publications
2. Design of Reinforced Concrete Structures: Pillai & Mennon, TMH Publications
3. IS 456, SP-16 and SP-32.

Reference Books:

4. Limit State Design-A.K.Jain, Neemchand & Bros, Roorkee
5. Design of concrete structures by J.N.Bandyopadhyay, PHI pvt ltd.
6. Limit State Design of Reinforced Concrete -P.C Verghese
7. S. K. Mallik and A. P. Gupta, Reinforced Concrete Design, Oxford and IBH 1999.
8. A. Nilson, D. Darwin, C. Dolan, Design of Concrete Structures (13th edition), Tata McGraw- Hill

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CE30103: Water Supply and Sanitary Engineering

Credit : 03 **Teaching Scheme** : Theory 03Hrs/ week

Prerequisites:

The students should have knowledge of

1. Basic characteristics of Water.

2. Basic knowledge on Water treatment processes.

Course outcome:

The students will be able to analyze

1. The requirement of water and supply it to public, sources, collection and transport of water.
2. Determine the water quality parameters and the allowable limits, Water borne diseases due to contamination of water.
3. Engineered system for water treatment.
4. Generation and collection of waste water, its disposal.
5. Engineered system for wastewater treatment.

Course Details:

Unit 1: Requirement of Water

Unit 1.1: General requirement for water supply, sources.

Unit 1.2: Collection of water in Intake, pumping and transportation of water, natural purification of water sources.

Unit 2: Water Quality

Unit 2.1: Quality of water, Physical, chemical and biological characteristics of water and their significance, water quality criteria, water borne diseases.

Unit 3: Engineered systems for water treatment

Unit 3.1: Aeration, sedimentation, softening, coagulation, filtration, adsorption, ion exchange, and disinfection.

Unit 3.2: Design on water treatment units and water distribution system.

Unit 4: Generation and collection of waste water

Unit 4.1: Sanitary, storm and combined sewerage systems, quantities of sanitary waste and storm water.

Unit 4.2: Design of sewerage system, wastewater treatment units: Primary, secondary and tertiary treatment of wastewater. Waste water disposal standards.

Unit 5: Biological wastewater treatment system

Unit 5.1: Basic of microbiology. Biological wastewater treatment system : Aerobic processes activated sludge process and its modifications.

Unit 5.2: Trickling filter, RBC, Anaerobic Processes conventional anaerobic digester, High rate and hybrid anaerobic reactors.

Unit 5.3: Sludge digestion and handling, Disposal of effluent and sludge.
Design on sludge digestion.

Text Books

1. Water Supply and Sanitary Engineering by G.S.Birdie & J.S.Biridie, Dhanpat Rai
Publishing
2. Water supply Engineering- Vol.-I by S.K.Garg by Khanna Publisher
3. Sanitary Engineering-Vol-II by S.K.Garg by Khanna Publisher
3. Water supply and sanitary engineering by Rangwala, Charotar Publishing

Reference Books:

1. Public health engineering by S.K.Duggal
2. Water Supply and Sewerage, E.W. Steel
3. Textbook of Water Supply Engineering, S.R. Kshira sagar
4. Sewerage and Sewage Treatment, S.R. Kshira sagar.

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CE32171 :: SURVEYING –II

Credits:03 **Teaching Scheme: Theory 03 Hrs/Week**

Prerequisites: The students have knowledge of

1. Chain triangulation, Theodolite
2. Different types of Error occurs during measurement
3. Plan of any structure

Course Outcome: The students will be able to

1. Calculate Horizontal and vertical distance of any point
2. Setting out of different types of curves
3. Do preliminary survey by triangulation method
4. Calculate errors of any traverse sections
5. Calculate the horizontal distance between two points using photogrammetry survey

Course Details:

Unit I : Tacheometry Surveying

U.1.1**.** General principles of stadia system, determination of stadia constants
U.1.2**.** Fixed and movable hair method, anallactic lens
U.1.3. Inclined sight with staff held vertical
U.1.4. Tangential method of tacheometry

Unit 2 : Curves

U.2.1.Types of curves, Elements of curves
U.2.2. Methods to set out different types of horizontal curves
U.2.3. Vertical curves

Unit 3 : Triangulation

U.3.1. Classification of triangulation system, triangulation figures
U.3.2. Reconnaisance, Intervisibility, Extension of Base line
U.3.3. Different types of corrections for Base line, Strength of figures

Unit. 4 : Theory of Errors
U.4.1. Definitions, Laws of weight
U.4.2. Normal equations, Distribution of errors
U.4.3. Most probable values

Unit.5 : Photogrammetry
U.5.1 Basic concepts, Definitions of technical terms
U.5.2 Different types of photograph, scale of photograph
U.5.3 Determination of length, Relief displacement of photograph

Text Books:

1. "A Text Book of Surveying-II", S.K.Duggal, TMH Publisher
2. "Surveying"- Vol-II and III, Dr.B.C. Punmia, Ashok K Jain, Arun K Jain; Laxmi Publishers

Reference Books:

1. Surveying, Vol-1 by R.Agor
2. Fundamentals of Surveying and Levelling. By R. Subramanian
3. Textbook-Surveying- by C-Venkatramaiah
4. N.N. Basak..Surveying and Levelling by N.N.Basak

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CE32172: GIS AND REMOTE SENSING

Credit: 03 **Teaching Scheme**: Theory 03Hrs/ week

Prerequisites:

The students should have knowledge of

1. Surveying
2. Probability and statistics
3. Basic computing

Course outcome:

After learning the course the students should be able to:

1. Understand fundamentals of remote sensing and GIS
2. Able to employ remote sensing and GIS in minor, major or mini projects

Course Details:

Unit 1: Introduction to Geographic Information System (GIS)

U1.1 Introduction to GIS, History of GIS, Early developments in GIS Applications of GIS,

U1.2 Introduction to Maps, History of Maps, Map Scales, Types of Maps, Map and Globe, *Georeferencing and Projection*: Understanding Earth, Coordinate System, Map Projection, Transformation and Georeferencing

U1.3 Cartographic Principles and Design: Introduction Map layout, Data presentation, Toposheet Indexing, Distribution Maps

Unit 2: GIS Data Models and Spatial Analysis

U2.1 Introduction to GIS Data Model, Vector Data Structure, Raster Data structure, Geodatabase and metadata, Data Storage, Database Structure Models, Database Management system

U2.2 Introduction to spatial analysis, Vector Operations and Analysis, Network Analysis, Raster Data Spatial Analysis. Interpolation techniques.

Unit 3: Basics of Remote Sensing

U3.1 Physics of Remote Sensing: Definition and Stages, Electromagnetic radiation, Electromagnetic Spectrum, Radiation Laws, Interaction Mechanism with Atmosphere and Earth Features, Atmospheric Windows and bands, Spectral Reflectance Curve

U3.2 **Platform and Sensors:** Ground, air and space borne platforms, Sensors: Imaging and non-imaging sensors, Active and Passive Sensors, Push broom Scanners, Characteristics of some Remote Sensing Satellites: LANDSAT, SPOT, IRS, IKONOS, QUICKBIRD etc.

U3.3 **Image interpretation and pre-processing :** Spectral, Spatial, Radiometric and Temporal Resolution, False Colour Composites, Elements of image interpretation, Visual and digital interpretation techniques, their advantages and limitations, Ground truth Collection, Image statistics, Radiometric Corrections, Geometric Corrections, Geo-referencing.

Unit 4: Digital Image processing

U4.1 Image Enhancement: Contrast enhancement, Band combinations, Ratioing, Spatial filtering, Edge enhancement, Special transformations, Image fusion.

U4.2 Information extraction: Supervised and Un-supervised Classification Techniques for land use / land cover mapping.

Unit 5: Global Positioning System:

U5.1 Satellite positioning: GPS and GLONASS - History and Developments, System Components, Signal Structure

U5.2 **GPS positioning:** Positioning concept (resection from space), Point positioning, Relative positioning, Static positioning, Kinematic positioning, Limitations

Text Books:

1. Lillesand & Keifer (2000) 'Remote Sensing and Image Interpretation' published by Wiley and Sons

2. Joseph George (2003) Fundamentals of Remote Sensing, University Press Hyderabad

3. Heywood (2002) An introduction to GIS ' Prentice Hall, ISBN o - 13061198-0

4. N.K. Agarwal (2004), Essentials of GPS, Spatial Network Pvt. Ltd.

Reference Books:

1. John R.J. 'Introductory Digital Image Processing – A Remote Sensing Perspective' Prentice Hall

2. Smith J.R (1997) 'Introduction to Geodesy : the Histrory and concepts of Modern Geodesy' Johnwiley and Sons ISBN 047116660X.

C.V. Raman College of Engineering,
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CE30105: Transportation Engineering-I

Credit : 02 **Teaching Scheme** : Theory 03Hrs/ week

Prerequisites:

The students should have knowledge of
1. Civil Engineering materials
2. Mathematical geometry
3. Engineering Survey

Course outcome:

The students will be able to
1. Analyze and design various types of pavements and characterize the materials to be used for construction
2. Design the road geometrics
3. Understand the fundamentals and features of traffic flow and their implementation in design of pavement and road geometrics.

Course Details:

Unit 1: Introduction and Pavement material

U 1.1: Modes of transportation, importance of highway transportation.
U 1.2: Properties of subgrade, sub-base , base course and surface course materials.
U 1.3: Test on subgrade soil, aggregates and bituminous materials.

Unit 2: Highway alignment

U 2.1: History of road construction.
U 2.2: Principle of highway planning, road development plans.
U 2.3: Highway alignments requirements, engineering surveys for highway location.

Unit 3: Geometric design

U 3.1: Design controls.
U 3.2: Highway cross section elements, cross slope or camber, road width, road margins, typical cross sections of roads.
U 3.3: Design speed, sight distance.
U 3.4: Design of horizontal and vertical alignments, horizontal and vertical curves.

Unit 4: Pavement design

U 4.1: Introduction to pavement design. Factors affecting flexible pavement and rigid pavement design.

U 4.2: Introduction to IRC method of pavement design.

U 4.3: Construction procedure of flexible and rigid pavements.

U 4.4: Pavement failures and maintenance.

Unit 5: Traffic Engineering

U 5.1: Traffic Engineering definition and scope.

U 5.2: Fundamentals of traffic flow.

U 5.3: Prevention of road accidents, parking types.

U 5.4: Types of road intersections.

Text Books

1. S.K.Khanna and CEG Justo, "Highway Engineering", Nemchand Bros, Roorkee.
2. L.R. Kadiyali, "Traffic Engineering and Transport Planning", Khanna Publishers, New Delhi.

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CE30301: DESIGN OF R.C.C STRUCTURES

Credits: 01 **Teaching Scheme: Laboratory 02 Hrs/Week**

Prerequisites: The Students have knowledge of

1. Civil Engineering Drawing
2. Structural Analysis
3. STAAD PRO

Course Outcomes: At the end of the course the Students will able to

1. Design the various elements of concrete structures.
2. Draw the details of various structural members.
3. Design a building with different structural elements by STAAD PRO.

Course Details:

1. Design and detailing of singly reinforced sections.
2. Design and detailing of doubly reinforced sections.
3. Design and detailing of flanged sections.
4. Design and detailing of one way slab.
5. Design and detailing of two way slab.
6. Design and detailing short square column.
7. Design and detailing short circular column.
8. Design and detailing of staircases.
9. Design and detailing of isolated footings.
10. Design and detailing of framed building with different structural elements: manual and using commercial software (STAAD PRO).

References

1. RCC Design-B.C.Punmia, A.K.Jain and A.K.Jain-Laxmi Publications
2. Design of Reinforced Concrete Structures: Pillai & Mennon, TMH Publications

IS 456, SP-16 and SP-32.

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CE30302: TRANSPORTATION ENGINEERING LAB

Credits: 01 **Teaching Scheme:** Laboratory 02 Hrs/Week

Prerequisites: Basic knowledge on properties of aggregate and bitumen.

Course Outcomes: The Students will able to
1. Understand the desirable properties of aggregates.
2. Understand the properties of binder to be used in road construction.
3. Understand the application of job mix formula.
4. Understand the preparation of Marshall sample and its' use.

Course Details:

Tests on Aggregate:
Experiment No.1: Determination of aggregate crushing value.
Experiment No.2: Determination of Los Angeles abrasion value of aggregates.
Experiment No.3: Determination of aggregate impact value.
Experiment No.4: Determination of flakiness index and elongation index of coarse aggregate.
Experiment No.5: Determination of specific gravity and water absorption of coarse aggregate.

Tests on Bitumen:
Experiment No.6: Determination of penetration value of bitumen.
Experiment No.7: Determination of softening point value of bitumen.
Experiment No.8: Determination of ductility value of bitumen.
Experiment No.9: Determination of specific gravity of bitumen.
Experiment No.10: Marshall method of mix design.

References

1. S.K. Khanna and CEG Justo ,"Highway Engineering", Nemchand Bros.,Roorkee.

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CE30303: CONCRETE LAB

Credits: 01 **Teaching Scheme: Laboratory 02 Hrs/Week**

Prerequisites: The Students have knowledge of

1. Civil Engineering material

Course Outcomes: At the end of the course the Students will able to

1. Aware of different test on concrete.
2. To know mix design.

Course Details:

Experiment-1: Workability test of concrete:-

a. slump test
b. compaction factor test
c. flow table test

Experiment -2: Cube Test of Concrete(Nominal Mix)

Experiment-3: Cylinder Test for Concrete(Nominal Mix): Determination of axial stress, longitudinal strain, lateral strain and Poision's ratio. Plotting of stress-strain curve and determination of modulus of elasticity.

Experiment-4: Split Tensile Strength Test of Concrete

Experiment-5: Prism test for determining modulus of rupture of concrete

Experiment-6: Design of Concrete Mix (As per Indian Standard Method)

Experiment-7: Failure of RC beams in bending and shear (two point and one Point loading).

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CE34351: SURVEY-II LAB

Credits: 02 **Teaching Scheme:** Laboratory 02 Hrs/Week

Prerequisites: Basic Knowledge of survey -I theory and also labs.

Course Outcomes: The Students will able to

1. Measure horizontal distance and vertical distance using tacheometer.
2. Measure horizontal, vertical and angle using Total station

Course Details:

Experiment No.1: Determination of sensitivity of bubble tube
Experiment No.2.(a) Determination of Tacheometric constants
(b) Solution of Height and Distance using Tacheometer
Experiment No.3: Measurement of Distance, angle and height using Total Station
Experiment No.4: Layout of Building using total Station
Experiment No.5: Setting out of simple circular curve and Transition curve using Total Station
Experiment No.6: Measurement of angles and distances using Differential Global Positioning system(DGPS)

References

1. Surveying- Vol-II and III, B.C. Punmia.

SEMESTER-VI

C. V. Raman College of Engineering

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CE30106: STRUCTURAL ANALYSIS-II

Credit : 03 **Teaching Scheme** : Theory 03Hrs/ week

Prerequisites:

The students should have knowledge of

4. Engineering Mechanics
5. Mechanics of Solids
6. Structural Analysis-I

Course outcome:
After learning the course the students should be able to Analyze and solve the problems related to

1. Beams and frames by plastic analysis method.
2. Continuous beams and portal frames by slope deflection, moment distribution and kani's method.
3. Two hinged fixed arches and suspension cables with two hinged girders.
4. Matrix method of analysis.
5. Continuous beams and Trusses by stiffness and flexibility method.

. **Course Details:**

Unit 1: Plastic Analysis:

U1.1 Introduction: plastic modulus, shape factor, plastic moment of resistance, load factor, plastic analysis of beams.
U1.2 Upper bound, lower bound and uniqueness theorems and application to plastic analysis of simple beams, continuous beams and simple rectangular portal frames.

Unit 2: Slope Deflection, Moment Distribution and Kani's Method:
U2.1 Analysis of continuous beams and plane frames by slope deflection method.
U2.2 Analysis of continuous beams and plane frames by moment distribution method.

U2.3 Analysis of continuous beam and simple portals by Kani's method.

Unit 3: Analysis of Arches and Suspension Cables:

U3.1 Analysis of two hinged arches for dead and live loads.
U3.2 Analysis of Fixed arches.
U3.3 Analysis of Suspension cables with two hinged stiffening girders.

Unit 4: Matrix Method of Structural Analysis:

U4.1 Introduction and different approach to matrix method, Generalized co-ordinate systems
U4.2 Flexibility and stiffness matrix.
U4.3 Relationship between flexibility and stiffness matrix.
U4.4 Force and displacement method.

Unit 5: Flexibility and Stiffness Matrix

U5.1 Application of stiffness matrix method to continuous beams and simple trusses.
U5.2 Application of flexibility matrix method to continuous beams and simple trusses.

Text Books:

1. Structural Analysis-II, by S.S Bhavikatti, Vikas Publishing House Pvt. ltd, Noida, Fourth edition. 2011.
2. Basic Structural Analysis by C.S Reddy, TATA McGraw-Hill, New Delhi, Third Edition. 2011.
3. Limit Analysis of Structures, V.K. Manicka Selvam, Dhanpat Rai Publications(P), Ltd, New Delhi

Reference Books:

1. Theory of Structure by S.Ramamurtham and R.Narayan, Dhanpat Rai publishing company, New Delhi, Ninth edition-2011.
2. Indetreminate Structures by J.S Kinney.
3. Structural Analysis, V.S Prasad
4. Structural Analysis a matrix approach by Pandit and Gupta, TMH Publisher
5. C.K. Wang, 'Intermediate Structural Analysis', Tata McGraw Hill.

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CE30106: STRUCTURAL ANALYSIS-II

Credit: 01 **Teaching Scheme:** Tutorial 01 Hr/Week

Prerequisite: The Students should have knowledge of

1. Engineering Mechanics
2. Mechanics of Solids
3. Structural Analysis-I

Course Outcome:
After learning the course the students should be able to Analyze and solve the problems related to

1. Beams and frames by plastic analysis method.
2. Continuous beams and portal frames by slope deflection, moment distribution and kani's method.
3. Two hinged fixed arches and suspension cables with two hinged girders.
4. Matrix method of analysis.
5. Continuous beams and Trusses by stiffness and flexibility method.

List of Contents

Tutorial No. 1: To find the shape factor for different cross-sections.
Tutorial No. 2: Solving the problem for beams by plastic analysis method.
Tutorial No. 3: Solving the problem of frames by kinematic method.
Tutorial No. 4: Solving the problems of continuous beam by slope deflection method.
Tutorial No. 5: Solving the problems of continuous beam by moment distribution method.
Tutorial No. 6: Solving the problems of plane frames by slope deflection method.
Tutorial No. 7: Solving the problems of plane frames by moment distribution method.
Tutorial No. 8: Solving the problems of portal frames by kani's method.
Tutorial No. 9: Solving the problems of two hinged arch for dead and live loads.
Tutorial No. 10: solving the problems suspension cable.
Tutorial No. 11: solving the problems by Stiffness method.

Tutorial No. 12: solving the problems by Flexibility method

Text Books:

1. Structural Analysis-II, by S.S Bhavikatti, Vikas Publishing House Pvt. ltd, Noida, Fourth edition. 2014.

2. Basic Structural Analysis by C.S Reddy, TATA McGraw-Hill, New Delhi, Third Edition. 2011.

3. Limit Analysis of Structures, V.K. Manicka Selvam, Dhanpat Rai Publications(P), Ltd, New Delhi

Reference Books:

1. Theory of Structure by S.Ramamurtham and R.Narayan, Dhanpat Rai publishing company, New Delhi, Ninth edition-2011.

2. Indetreminate Structures by J.S Kinney.

3. Structural Analysis, V.S Prasad

4. Structural Analysis a matrix approach by Pandit and Gupta, TMH Publisher

5. C.K. Wang, 'Intermediate Structural Analysis', Tata McGraw Hill.

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CE30107: Irrigation Engineering

Credit : 03 **Teaching Scheme** : Theory 03Hrs/ week

Prerequisites:

The students should have knowledge of

1. Fluid mechanics and hydraulics
2. Basics of environmental engineering
3. Basics of design of concrete structures
4. Basic knowledge of geotechnical engineering

Course outcome:

The students will be able to

1. Comprehend, analyze and solve problems related to
   i. Estimation of water requirement of crop, efficiency and frequency of irrigation and its application on field
   ii. Design of regime channels and lined canals
   iii. Water logging and drainage engineering
2. Comprehend, analyze and solve the problems related to hydraulic structures like
   i. Design of various canal structures
   ii.Planning and design of weir and barrage
   iii.Design of gravity concrete dam and earth dam

Course Details:

UNIT-1 : Water requirement of crops and application of water to farm

U.1.1. Introduction: Necessity of Irrigation in India, Advantages and disadvantages of Irrigation, Techniques of water distribution in firms, Quality of irrigation water.

U.1.2.Water requirements of Crops: Crops and crop season, Duty and Delta, Consumptive use, Irrigation requirements, Estimation of consumptive use of water by climatic approaches, Irrigation efficiencies, Soil moisture-irrigation relationship.

UNIT -2 : Canal and Drainage Engineering

U.2.1. Canal Irrigation: Classification of canals, Canal losses, Alignment of canals, Design of stable channels using Kennedy's and Lacey's theory, Garret's diagram, Cross section of irrigation canals

U.2.2. Lining of Irrigation Canals: Advantages and economics of lining, Various types of lining, Design of lined canals.

U.2.3. Reclamation of Water Logged and Saline Soils: Causes and control of water logging. Reclamation of saline and alkaline land, Surface and Sub-surface drainage.

UNIT – 3: Head Works

U.3.1. Diversion Head works: Weirs and Barrages, Types of weirs and barrages, Layout of a diversion head works, Introduction to different components of a diversion head works.

U.3.2. Design of weirs and barrages: Bligh's creep theory, Design of weir using Bligh's theory, Lane's weighted creep theory, Khosla's theory, Khosla's method of independent variables, Exit gradient.

UNIT – 4: Canal Structures

U.4.1.Canal Falls: Necessity, Proper location, Types, Design and detailing of one type of fall.

U.4.2. Cross-Drainage Works: Types of CD works, Selection of a suitable type to suite a particular condition, Design consideration for CD works.

UNIT – 5: Dams and Spillways

U.5.1. Gravity Dams: Typical cross section, Various forces acting on gravity dam, Combination of forces for design, Modes of failure and criteria for structural stability, High and low gravity dam, Design of high dam, Typical section of low gravity dam.

U.5.2. Earth Dams: Types, Causes of failure, Preliminary section of an earth dam, Seepage control in earth dams

U.5.3. Spillways: Descriptive study of various types of spillways.

Text Books:

1. Irrigation Engineering and Hydraulic Structures by S. K. Garg, Khanna Publication, New Delhi
2. Irrigation Engg. By B.C. Punmia and Pande, Laxmi Publication, New Delhi

3. Irrigation Engg. By Birdie and Das, Dhanpat Rai, New Delhi
4. Irrigation Engg. By Sharma and Sharma, S. Chand and Company, New Delhi

Reference Books :

1. Irrigation Engineering by B. Singh, Nem Chand and sons, Roorkee
2. Theory and Design of Irrigation Structures, Nem Chand and Bros, Roorkee
3. Irrigation Engineering by I. E. Hook, John Wiley and sons, New York
4. Irrigation by J.D. Zimmerman, John Wiley and sons, New York.

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CE30107: Irrigation Engineering

Credit : 01 **Teaching Scheme**: Tutorial 01 Hr/ week

Prerequisites:

The students should have knowledge of

1. Estimation of water requirement of crops And Techniques of distribution of water to farms
2. Theories and empirical relationships, Garret diagram for designing regime and lined channels.
3. Basics of hydraulic and structural design of various canal structures like canal fall, cross drainage works, head regulator etc
4. Basic knowledge of planning and design of barrage, gravity concrete and earth dams

Course outcome:

The students will be able to

1. Comprehend, analyze and solve problems related to
   i. Estimation of water requirement of crop, efficiency and frequency of irrigation and its application on field
   ii. Design of regime channels and lined canals
   iii. Water logging and drainage engineering
2. Comprehend, analyze and solve the problems related to hydraulic structures like
   i. Design of various canal structures
   ii. Planning and design of weir and barrage
   iii. Design of gravity concrete dam and earth dam

Discussion and Assignment Details:

1. Problems related to irrigation water distribution in farms
2. Problems related to estimation of water requirement of crop, and frequency of irrigation
3. Design of regime channels using Kennedy's theory and Garret diagram
4. Design of regime channels using Lacey's theory
5. Design of lined canal and problems involving economics of canal lining
6. Planning and procedure involving design details of atleast one canal fall , preferably straight glacis fall

7 &8. Planning and procedure/steps involving design details of atleast one type of C.D. work coming under (i) Canal over drain and (ii) Canal below drain

9 & 10. Design of concrete gravity dam and problems related to small dam and large dam(gravity)

11. Phreatic lines across earthen dam and its failure criteria

12. Planning of different types of Spillways suitable to specific site requirements.

Text Books:

1. Irrigation Engineering and Hydraulic Structures by S. K. Garg, Khanna Publication, New Delhi

2. Irrigation Engg. By B.C. Punmia and Pande, Laxmi Publication, New Delhi

3. Irrigation Engg. By Birdie and Das, Dhanpat Rai, New Delhi

4. Irrigation Engg. By Sharma and Sharma, S. Chand and Company, New Delhi

Reference Books :

1. Irrigation Engineering by B. Singh, Nem Chand and sons, Roorkee

2. Theory and Design of Irrigation Structures, Nem Chand and Bros, Roorkee

3.Irrigation Engineering by I. E. Hook, John Wiley and sons, New York

4. Irrigation by J.D. Zimmerman, John Wiley and sons

5. Relevant B.I.S. codes.

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CE30108: Transportation Engineering- II

Credit : 03 **Teaching Scheme** : Theory 03Hrs/ week

Prerequisites:

The students should have knowledge of
1. Modes of transportation such as highways, railways, waterways and airways
2. Stations and yards and airports
3. Various geometric features of highway alignment
4. Various resistances such as wind resistance, air resistance etc.

Course outcome:

The students will be able to
1. Analyze and design railway track.
2. Understanding and designing the various features airports

Course Details:

Railway Engineering:

Unit 1: History of Indian railways
U 1.1: History of Indian railways, traction, gauges, permanent way, problems of multi gauge system.
U 1.2: Alignments and survey.

Unit 2: Railway track and its components
U 2.1: Permanent way track components, Type of rail sections.
U 2.2: Coning of wheels, creep of rails, wear and failure in rails
U 2.3: Ballast requirements, sleeper requirements, types of sleepers.
U 2.4: Joints, fittings and fixtures,
U 2.5: Ballast, sleepers various train resistances and drainage.

Unit 3: Geometric design
U 3.1: Geometric design, alignments, gradients, grade compensation.
U 3.2: Super-elevation, negative sup-elevation, cant, cant deficiency, negative cant, horizontal curves, transition curves.
U 3.3: Points and crossing, signalling and interlocking, station yards.

Airport Engineering:

Unit 4: Airport planning
U 4.1: Airport planning, aircraft characteristics and configurations.
U 4.2: Site selection, zoning laws.
U 4.3: Imaginary surfaces, approach zones, turning zones.
U 4.4: Runway and taxiway, runway length and corrections.

Unit 5: Airport layout and Geometric elements
U 5.1: Geometric elements, exit taxiway, separation clearance
U 5.2: ICAO and FAA specifications.
U 5.3: Airport layout, holding apron, hangers, parking, terminals, traffic control, marking, lighting, heliports.

Text Books

1. S.C Saxena and S.P Arora, "Railway Engineering", 6th Edition, Dhanapat Rai Publications,New Delhi
2. S.K.Khanna and M.G.Arora, "Airport Planning and Design", 6th Edition, Nemchand & Bros., Roorkee.
3. Satish Chandra & M.M Agrawal,"Railway Engineering" Oxford University Press,New Delhi.

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CE30109: STEEL STRUCTURES

Credit: 03 **Teaching Scheme: Theory 03 Hrs/Week**

Prerequisites: The students have knowledge of

1. Engineering Mechanics
2. Mechanics of Solids
3. Structural Analysis

Course Outcome: on completion of the course, the student will be able to design the following structural elements like

1. Different methods of design and its implementation.
2. Design of different types of connection.
3. Design of tension member and compression member.
4. Design of different types of beam and plate girder.
5. Design of different types of roof truss.

Unit 1: Introduction to steel structure:

U1.1: Introduction, advantages/disadvantages of steel, structural steel, rolled steel section, various types of loads, design philosophy
U1.2: Limit state design method; limit states of strength and serviceability, probabilistic basis for design.
U1.3: Bolted Connections, Failure of Bolted Joints, Specifications for Bolted Joints, Analysis and design of bolted connections.
U1.4: Welded connections- assumptions, types, design of fillet welds, intermittent fillet weld, plug and slot weld, failure of welded joints, welded joints vs bolted and riveted joints.

Unit 2: Design of tension member:

U2.1: Tension members, types, net cross-sectional area, types of failure, slenderness ratio, design of tension members, gusset plate.

Unit 3: Design of compression member:

U3.1: Compression members, effective length, slenderness ratio, types of cross-section, classification of cross-section, design of axially loaded compression members.

U3.2: Design of column lacing and column battening.

U3.3: Design of Column Slab base, Design of Column Gusseted base. Design of Foundation Bolts.

.

Unit 4: Design of beam and plate girders

U4.1: Design of beams, types of c/s, lateral stability of beams, lateral torsional buckling, bending and shear strength, web buckling and web crippling, deflection, design procedure.

U4.2: Plate girder, Design of plate girder, Plastic section modulus, Design of a Welded plate girder,

Unit 5: Design of Roof trusses**:**

U5.1: Selection of the type of trusses, Loads and Load combinations in roof trusses, Design procedure, Design of component members in a roof truss.

Text Books:

1. Design of steel structures by S.S.Bhavikatti, I.K. International Publishing house, New Delhi. 4.
2. Limit state design of steel structures by S.K. Duggal, Tata McGrawhill

Reference Books:

1. Steel Structures- Design & Practice by N. Subramanian, Oxford University Press.
2. Design of Steel Structures by B.C. Punmia, A.K. Jain and A.K. Jain. Laxmi Publishers.
3. 2. Design of Steel Structures, Vol. 1, By Ram Chandra and Veranda Gehlot. Scientific
4. Publishers, Jodhpur.
5. 3. Design of Steel Structures by L.S. Negi, Tata McGraw Hill Book Co.

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CODE:MA31108: Numerical and Optimization Techniques

Credits: 02 **Teaching Scheme: -** Theory 03 Hrs/Week

Prerequisites: Mathematics –I, Mathematics – II, Mathematics -IV.

Objectives:

1. To make students aware of Advanced Interpolation techniques such as Spline and Hermite Interpolations.
2. To enlighten the students with the different numerical techniques to find eigen values of matrices.
3. To make students aware Techniques Graffe's Square Root and Lin – Bairstow's Methods to find roots of equations.
4. To make students aware of multi – step methods to solve initial value problems involving ordinary differential equations.
5. To enlighten the students with the basic concepts of modeling a practical problem into a linar programming problem and solving it by Graphical and Simplex Methods.
6. To introduce the Assignment and Transportation problems and methods to obtain their optimized solutions
7. To make students aware of the iterative methods such as Fibonacci Search and Golden Section Search Methods to obtain optimal solution of unconstrained non-linear programming problems.
8. To make students aware of solving nonlinear programming problems with constraints using Lagrange's Multiplier Methods.
9. To make students aware of solving Quadratic Programming Problems by Wolfe's Method.

Course Details:

Unit 1

Interpolation: **(08 Hrs)**

U1.1. Piecewise Linear, Quadratic, and Cubic Interpolation, Cubic Hermite and Piecewise Cubic Hermite Interpolation, Quadratic and Cubic Spline Interpolation. **[T_1]**

Method of Least Square. **[T_2]**

U1.2. Self Study Topics : Central difference Interpolation formulae.

Unit 2

Eigen Values And Eigen Vectors and Solution of Equations: (08 Hrs)

U2.1. Eigen Values and Eigen Vectors: Basic power method, Rayleigh Quotient, Shifted power method, Inverse power method, QR method. **[T_1]**

Solution of Equations: Graffe's Root-Squaring Method, Lin – Bairstow's Method. **[T_2]**

U2.2. Self Study Topics : Solution of system of Linear equations by Newton-Raphson Method

Unit 3

Numerical Solutions of Initial Value Problems of Ordinary Differential Equations: (08 Hrs)

U3.1. Adams-Bashforth (2^{nd}, 3^{rd}, and 4^{th} Order) Methods, Milne's Method, Adams-Moulton (2^{nd}, 3^{rd}, and 4^{th} Order) Methods, Simpson's Method, Adams-Bashforth-Moulton Predictor-Corrector (2^{nd}, 3^{rd}, and 4^{th} Order) methods, Milne – Simpson's Predictor-Corrector method. **[T_1]**

U3.2. Self Study Topics : Stability Analysis of Multi Step Methods.

Unit 4

Linear Programming Problem Methods: (08 Hrs)

U4.1. Definition and Illustration on Formulation of Linear Progrraming problems, Notion of Solutions of Linear Programming Problems, Basic, Feasible, Optimal, De-generate, and Unbounded Solutions, Graphical Method, Simplex Method, and Big – M Methods to solve Linear Programming Problems. **[T_3]**

Transportation Problems: Transportation problems and their solutions by – North – West Corner Rule, Least Cost Method and Vogel's Approximation Method. Optimized Solutions of Transportation problems by MODI's Method. **[T_3]**

Assignment Problems: Assignment problems and their solutions by Hungarian Method. **[T_3]**

U4.2. Self Study Topics : Duality in Linear Programming Programming and Dual Simplex Method.

Unit 5

Nonlinear Programming Problem Methods: **(08 Hrs)**

U5.1. **Non-linear programming:** Introduction to non-linear programming.
Unconstrained optimization: Single and Multivariable Unconstrained Optimization, Fibonacci and Golden Section Search methods.
Constrained optimization with equality constraint: Lagrange multiplier Methods
Constrained optimization with inequality constraint: Kuhn-Tucker Conditions, Solution of Quadratic programming Problems by Wolfe's Method. **[T_3]**

U5.2. Self Study Topics : Integer Programming Probmlem Methods – Branch and Bound and Cutting Plane Methods.

Note: Five assignments to be given to the students on self study, comprising of one assignment from each unit.

Text Books:

T1. Applied Numerical Analysis Using MATLAB, L.V. Fausett, Pearson Education, Second Edition,2011.
Chapters 4(4.3), 5(5.1(5.1.1 – 5.1.3), 5.2(5.2.1), 5.3(5.3.1), 8(8.2, 8.3), 12(12.3 (12.3.1 – 2.3.4)).

T2. Introductory Method of Numerical Analysis, S. S. Sastry, PHI Learning PVT LTD, New Delhi, Fourth Edition, 2009.
Chapters 2(2.9, 2.10), 4(4.2(4.2.1, 4.2.2), 4.3(4.3.1)).

T3. Operations Research- Principle and Practice, A. Ravindran, D. T. Philips, J. Solberg, Wiley India Pvt Ltd, Second Edition, 2006.
Chapters 2(2.1 – 2.7), 3(3.2, 3.3), 11(11.1 – 11.3, 11.6, 11.9, 11.10).

Reference Books

R1. Numerical Methods For Scientific and Engineering Computation, M. K. Jain, S. R. K. Iyengar,
R.K. Jain, New Age International Publishers, Sixth Edition, 2014.

R2. Numerical Analysis and Computational Procedures, S. A. Mollah, Books and Allied (P) Limited, Fifth Edition,2013.

R3. Numerical Mathematics and Computing, W.Cheney and D. Kincaid, Thomson/CENGAGE Learning, Fifth Edition, 2014.

R4. Numerical Methods for Engineers, S.K.Gupta, New Age International, Second Edition 1995.

R5. Applied numerical methods with MATLAB, Steven C. Chapra, Tata McGraw-Hill Publishing Company Limited, New Delhi, Second Edition, 2007.

R6. Applied Numerical Methods for Engineering, R.J. Schilling and S.L.Harris, CENGAGE learning, 2000.
R7. Numerical Solution of Differential Equations, M. K. Jain, New Age International (P) Limited, Publishers, 2nd Edition, 2002.
R8. Operations Research, S. Kalavathy, Vikash Publishing HousePrivate Limited, Fourth Edition, 2013.
R9. Operations Research, S. D.Sharma, Kedar Nath Ram Nath & CO.Publishers Meerut thirteenth Edition, 2001.
R10. Operations Research, K. Swarup, P. K. Gupta, Man Mohan, Sultan Chand & Sons, New Delhi. 12th Edition, 2003.
R11. Operation Research Concept and Cases, F.S.Hillier and G.J.Lieberman ,TMH, 8th Edition, 2007.
R12. Optimization for engineering Design Algorithm and Examples, Kalyanmoy Deb, PHI Learning Private Limited, New Delhi, 2009.

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CE30304: DESIGN OF STEEL STRUCTURES

Credits: 01 **Teaching Scheme: Laboratory 0Hrs/Week**

Prerequisites: The Students should have knowledge on

1. Civil Engineering Drawing

3. Structural Analysis

Course Objective: At the end of the course, the students will be able to

1. Design the various elements of steel structures.
2. Draw the details of different connections.
3. Draw the details of various structural members.

Course Details:

1. Types of steel sections and their properties
2. Design and detailing of bolted connections.
3. Design and detailing of welded connections.
4. Design and detailing of tension members.
5. Design and detailing of compression members.
6. Design and detailing of lacing and battening system.
7. Design and detailing of slab base.
8. Design and detailing of gusseted base.
9. Design and detailing of beams and plate girders
10. Design and detailing of roof truss

Reference Books:

1. Design of steel structures by S.S.Bhavikatti, I.K. International Publishing house, New Delhi. 4.
2. Limit state design of steel structures by S.K. Duggal, Tata McGrawhill.

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CE30305: Environmental Engineering Laboratory

Credits: 01 **Teaching Scheme:** Laboratory 02 Hrs/Week

Prerequisites:

1. Basic Knowledge of Environmental Science
2. Basic knowledge on Physical, Chemical and Biological characteristics of Water.

Course Outcomes: The Students will able to

1. Determine the physical characteristics of water like turbidity, pH,total solids,suspended solids,etc.
2. Determine the chemical characteristics of water like acidity and alkalinity, optimum coagulant dose required for different water samples.
3. Determine the biological characteristics of water like microbial count and there permissible values.

Course Details:

A. <u>Water Quality Analysis</u>

1. Determination of pH (Electrometric and Colorimetric) of different water samples.
2. Determination of turbidity by using Nephelometer of different water samples.
3. Determination of alkalinity and acidity of any water samples.
4. Determination of Optimum dose of coagulants by jar test of any water samples.
5. Determination of Total Hardness of any water samples.
6. Determination of Total solids and suspended solids of different water samples.
7. Determination of Residual chlorine of any water samples.
8. Determination of Dissolved Oxygen of different water samples.
9. Determination of Biochemical Oxygen Demand of any water sample.

B. <u>Microbiological Analysis of Water</u>

1. Microbiological culture analysis of bacterial samples
2. MPN Test

Laboratory Manual:

1. Environmental Engineering Laboratory Manual.
2. Standard Methods for the Examination of Water and Wastewater- AWWA, APHA, WEF, (USA), 20th edition, 2001.

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CE30306: NUMERICAL COMPUTATION LAB

Credit : 01 Teaching scheme: Laboratory 2 Hrs/ week

Prerequisites: Mathematics –I, Mathematics – II, Mathematics –IV, Programming in C.

Objectives:

1. To make students aware of Advanced Interpolation techniques such as Spline and Hermite Interpolations.
2. To enlighten the students with the different numerical techniques to find eigen values of matrices.
3. To make students aware of multi – step predictor – corrector methods to solve initial value problems involving ordinary differential equations.
4. To enlighten the students with the basic concepts of modeling a practical problem into a linear programming problem and solving it by Graphical and Simplex Methods. The students also get enlightened with the Transportation and Assignment Problems.
5. To make students aware of solving nonlinear programming problems with constraints using Lagrange's Multiplier Methods.
6. To make students aware of solving Quadratic Programming Problems by Wolfe's Method.

Detailed Syllabus

1. Write a computer oriented algorithm & the corresponding C /MATLAB Program to fit a straight line of the form y = a x + b, for a given data, using the method of least square.
2. Write a computer oriented algorithm & the corresponding C/MATLAB Program to fit a nth degree polynomial of the form $y = \sum_{i=0}^{n} c_i x^i$ for a given data by the method of least square.
3. Write a computer oriented algorithm & the corresponding C/MATLAB to find a root using Secant method.
4. Write a computer oriented algorithm & the corresponding C/MATLAB to find the smallest positive root using Newton- Raphson method.

5. Write a computer oriented algorithm & the corresponding C/MATLAB to find the solution of the system of linear equations using Gauss Elimination Method.
6. Write a computer oriented algorithm & the corresponding C/MATLAB to interpolate y using the given pair of values of x and y by Lagrange's interpolation.
7. Write a computer oriented algorithm & the corresponding C/MATLAB to find the derivative at the initial point using Newton 's Forward and Backward Difference Method.
8. Write a computer oriented algorithm & the corresponding C/MATLAB to find the derivative at the final point using Hermite Interpolation Method.
9. Write a computer oriented algorithm & the corresponding C/MATLAB to integrate Numerically using Trapezoidal & Simpson's Rules.

Write a computer oriented algorithm & the corresponding C/MATLAB to integrate Numerically using Romberg Method.

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CE34352: DESIGN OF STRUCTURE AND FOUNDATION BY STAAD.PRO

Credit: 01 **Teaching scheme:** Theory 02 Hrs/Week

Prerequisites: The student should have knowledge of:

1. Structure analysis
2. Design of R.C.C structure
3. Shear force and bending moment.

Course Outcome: On completion of the course, the student will be able to analyze and solve the problems related to

1. Design of Geometric structure.
2. Design and Analyse of bar bending schedule.
3. Determination of reaction, bending moment, shear force diagram using STAAD.PRO.
4. Able to write a compiled design report consisting job information.

Course Details:

1. To design an element of given section using linear, radial and irregular Grid.
2. To design an element using geometric coordinate system.
3. Determination of bending moment, reaction and shear force of concrete beam/column/frame.
4. Design of a concrete frame structure (consist arch shape also) using different Staad tools.
5. Assigning of different type of supports/loading i.e member load , plate load e.t.c.
6. Assigning of seismic load and wind load on given concrete structure
7. Design of RC beams and column as per IS456.
8. Analysis and post processing of the given structure.
9. Assigning of different types of steel section on beam/ column/frame.
10. Introduction and application of staad foundation.

References

3. M Vignesh kumar “Structural Modeling,Analysis &Design Using Staad Pro software” Lambert Acadmic publication .
4. Krishnan sathia “Principles of structural analysis-static and dynamic loads” .