SYLLABUS III YEAR B.TECH. (CIVIL ENGINEERING)
AUTONOMOUS REGULATIONS 2019

(Effective for the batches admitted in 2019-20 onwards)

DEPARTMENT OF CIVIL ENGINEERING

ANIL NEERUKONDA INSTITUTE OF TECHNOLOGY & SCIENCES (A)
(Affiliated to AU, Approved by AICTE & Accredited by NBA)
SANGIVALASA, Bheemunipatnam Mandal, Visakhapatnam District-531162

INSTITUTE VISION

- To emerge as a world class technical institution

INSTITUTE MISSION

To impart holistic technical education by providing

- The state of the art infrastructure
- Exceptional technical and teaching expertise
- Best of human value

VISION OF THE DEPARTMENT

- To emerge as a leading Civil Engineering Department globally

MISSION OF THE DEPARTMENT

- Empower our students with contemporary and industry relevant skills in Civil Engineering using outstanding technical and teaching expertise and best of infrastructure
- Nurture holistic development of our students inculcating universal human values and life skills for serving the society as leaders of their profession

Program Educational Objectives (PEOs)

PEO1: Successfully practice Civil Engineering in construction industry, public sector and entrepreneurship, ensuring a prosperous professional career.

PEO2: Pursue higher education and Research for professional development contributing to the advancement of civil engineering through lifelong learning

PEO3: Demonstrate leadership abilities actively contributing to societal needs with a focus on sustainable development and human values.

Program Outcomes

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilitiesrelevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one‘s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes

1. Plan and develop safe, economical and sustainable buildings and other structures based on applicable professional standards, codes and ethics.
2. Analyze and solve stability problems in soils for design of foundations and earth structures and plan and design highway, railway and other transportation systems based on applicable safety standards, codes and ethics.
3. Plan and develop irrigation and water supply systems and analyze and solve problems due to pollution of air, water and land leading to a nourished, richer and healthy society.

III Year Course structure

Semester - I

Course Code	Title of the course	Category	Periods						Sessionals Marks	Semester end Exam marks	Total Marks	Credits
			L	T	P	E	O	Total				
CIV311	Open Elective-I#	OE	2	1	0	1	2	6	40	60	100	3
CIV312	Fluid Mechanics-II	PC	2	1	0	2	4	9	40	60	100	3
CIV313	Geotechnical Engineering – II	PC	2	1	0	2	3	8	40	60	100	3
CIV314	Reinforced Concrete Structures-I	PC	2	1	0	2	2	7	40	60	100	3
CIV315	Structural Analysis – II	PC	2	1	0	2	3	8	40	60	100	3
CIV316	Fluid Mechanics Lab-I	PC	0	0	3	0	1	4	50	50	100	1.5
CIV317	Quantitative Aptitude-I & Verbal Aptitude-I	HS	0	0	3	1	3	7	100	0	100	1.5
CIV318	Geotechnical Engineering Lab-II	PC	0	0	3	0	1	4	50	50	100	1.5
CIV319	Technical Seminar**	PR	0	0	3	0	1	4	-	-	-	-
Total			**10**	**5**	**12**	**10**	**20**	**57**	**400**	**400**	**800**	**19.5**

Semester - II

Course Code	Title of the course	Category	Periods						Sessionals Marks	Semester end Exam	Total Marks	Credits
			L	T	P	E	O	Total				

										marks		
CIV321	Open Elective-II[#]	OE	2	1	0	1	2	6	40	60	100	3
CIV322	Estimation & Costing	PC	2	1	0	2	3	8	40	60	100	3
CIV323	Reinforced Concrete Structures-II	PC	2	1	0	2	3	8	40	60	100	3
CIV324	Transportation Engineering-I	PC	2	1	0	1	2	6	40	60	100	3
CIV325	Water Resources Engineering – I	PC	2	1	0	2	2	7	40	60	100	3
CIV326	Computer Applications in Civil Engineering Lab-I	PC	0	0	3	0	2	5	50	50	100	1.5
CIV327	Quantitative Aptitude-II & Soft Skills	HS	0	0	3	2	3	8	100	0	100	1.5
CIV328	Fluid Mechanics Lab-II	PC	0	0	3	0	1	4	50	50	100	1.5
CIV329	Technical Seminar[**]	PR	0	0	3	0	1	4	50	-	50	1.5
Total			**10**	**5**	**12**	**10**	**19**	**56**	**450**	**400**	**850**	**21**

 # Open Electives can be either interdisciplinary subjects/emerging subject/MOOCs as decided by the Department.

*** Summer Intership** *to be conducted after III year-II semester and evaluated in IV year-I semester*

***To be evaluated continuously through III year -I semester and III year –II semester and results reported with III year –II semester*

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III Year B.Tech

I Semester Syllabus

FLUID MECHANICS - II

CIV 312 **Credits: 3**

Instruction: 2 Lectures & 1 Tutorials / week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Prerequisites:

Engineering Mechanics; Fluid Mechanics - I

Course objectives:

The objective of the course is to enable the student

1. To understand the design philosophy of turbines and pumps
2. To understand the fundamental concept for methods of dimensional analysis
3. To know the design used for supplying water and generating power

Course outcomes:

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

1. Apply the principles of dimensional analysis and explain the boundary layer theory.
2. Apply the impulse momentum equation to determine the impact of a jet and analyze the forces acting on submerged bodies.
3. Analyze various types of Turbines and their performance characteristics.
4. Analyze various types of Pumps and their performance characteristics.
5. Apply analysis to determine discharge and design the most economical channel section for uniform flow in open channels, while also analyzing non-uniform flow.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3													2
	2	3	3													2
	3	3	3													2
	4	3	3													2
	5	3	3													2

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UNIT – I 12 Periods

Dimensional Analysis and Similitude: Dimensional Homogeneity - Methods of Dimensional Analysis – Rayleigh's Method – Buckingham's π theorem – Superfluous and Omitted Variables - Similitude – Model Analysis – Dimensionless numbers – Similarity Laws – Model testing of partially submerged bodies – Types of models.

Boundary Layer Theory: Introduction – characteristics of laminar boundary layer – boundary layer growth over a flat plate (without pressure gradient) –Boundary thicknesses – Stability parameter – Turbulent boundary layer – boundary layer separation – Boundary layer on rough surfaces – laminar sublayer.

Learning Outcomes:

1) Define Dimensional Homogeneity, Dimensional Analysis, Dimensionless numbers.
2) Analyse models with prototypes or vice-versa using Model Laws. 3) Identify conditions under which flows are turbulent and derive equations that approximate its properties.

UNIT – II 12 Periods

Flow past submerged bodies: Introduction **–** Types of Drag – Drag on a sphere – Drag on a cylinder – Von Karman Vortex Trail – Drag on a flat plate – Development of Lift on immersed circular cylinder – Magnus effect.

Impact of Jets: Impulse momentum equation – Momentum Correction factor, Force on Stationary flat plate – moving flat plate - Force on Stationary curved vanes – moving curved vanes.

Learning Outcomes:

1) Identify the type of force acting on a submerged body and determine their intensity.
2) Study the jet forces impacting against stationary and moving deflectors of curved and flat cross-sections and determine the reaction forces.

UNIT – III 12 Periods

Hydraulic Turbines: Introduction -Classification based on Head, Discharge, Hydraulic Action – Impulse and Reaction Turbines, Differences between Impulse and Reaction Turbine, Choice of Type of Turbine, Component Parts & Working principle of a Pelton Turbine, Francis Turbine - Velocity Triangles - Hydraulic and Overall efficiencies.

Performance of turbines: Performance under Unit head, power and speed – Performance under specific conditions - Specific Speed and its importance. Performance Characteristic Curves – Operating Characteristic Curves – Cavitation - Draft Tube.

Learning Outcomes:

1) Familiarize with the application of momentum principle in hydraulic machinery – turbines.
2) Study the performance of turbines and suggest suitable turbines for the specific need.

UNIT – IV 12 Periods

Centrifugal Pumps: Types of Pumps – Selection Criterion – Comparison between Centrifugal & Reciprocating Pumps - Centrifugal Pumps – Component Parts & Working Principle – Classification of Centrifugal pumps - Cavitation – Maximum Suction lift – NPSH. Specific Speed of pumps – Performance Characteristics of Centrifugal Pumps – Dimensionless characteristics – Constant efficiency curves of Centrifugal Pumps

Reciprocating Pumps: Component Parts – Working Principle of single acting and double acting reciprocating pumps – Discharge Co-efficient, Volumetric efficiency and Slip. Work done and Power Input – Indicator Diagram, Effect of acceleration and friction on Indicator Diagram - Air Vessels.

Learning Outcomes:

1) Familiarize with the application of momentum principle in hydraulic machinery – Centrifugal and Reciprocating Pumps.2) Study the performance of pumps and Suggest suitable pumps for a specific type of fluid and head.

UNIT – V 12 Periods

Flow through Open Channels: Classification of open channels, Uniform Flow: Chezy's and Manning's formula, Hydraulic mean depth, hydraulic radius. Most economical trapezoidal and rectangular channel section – Specific energy, Critical Flow.

Steady Rapidly Varied Flow: Hydraulic Jump in a horizontal rectangular channel, Specific force Computation of energy loss

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Learning Outcomes:
1) Classify open channels and design the most economical trapezoidal and rectangular channel sections.2) Study the concepts of Specific energy and Specific force, Apply the same to varied flow.

TEXT BOOKS

1. Modi P.N. & Seth S.M. (2017), "Hydraulics & Fluid Mechanics including Hydraulics Machines", Standard Book House, New Delhi, 22nd Edition.
2. Jain A.K. (1998), "Fluid Mechanics including Hydraulic Machines", Khanna Publishers, New Delhi, 12th Edition.

REFERENCES

1. Kumar K.L. (2016), "Engineering Fluid Mechanics", S. Chand & Company Publishers, New Delhi, 8th Revised Edition.
2. Bansal R.K. (2018), "A Textbook of Fluid Mechanics and Hydraulic Machines", Laxmi Publications, New Delhi., 10th Edition.
3. Frank M. White (2011), "Fluid Mechanics (In SI Units)", Tata McGraw Hill Education, 7th Edition.
4. Schaum's Outline Series (2011), "Fluid Mechanics and Hydraulics", McGraw Hill Education, 3rd Edition.
5. Relevant NPTEL Courses.

GEOTECHNICAL ENGINEERING – II

CIV 313 **Credits: 3**

Instruction: 2 Lectures & 1 Tutorials / week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Prerequisite:

Engineering Mechanics; Geotechnical Engineering – I.

Course Objectives:

This course will enable the students

1. To analyse the soil conditions to develop required data for design of shallow foundation.
2. To analyse the soil conditions to estimate the load capacity of pile foundations.
3. To apply the relevant theories to estimate lateral earth pressure on retaining walls and analyse slope stability for embankments and earth dams.

Course outcomes:

By the end of the course, student will be able to:

1. Analyse the Strength test data to calculate the shear parameters of soil under any drainage conditions.
2. Analyse and interpret the soil and ground water conditions of a soil mass through Soil exploration and in-situ test data.
3. Apply Earth pressure theories (Rankine and Coulomb) to calculate the Active and Passive earth pressure on a gravity retaining wall.
4. Analyse the soil and ground conditions of a soil mass to calculate the bearing capacity of a shallow foundation.
5. Apply principles of mechanics and calculate the load capacity of piles and Analyse the stability of slope of an earth structure.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	2	3												2	
	2	2	2		3										3	
	3	3													2	
	4	2	3												3	
	5	3	3												3	

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UNIT – I 12 Periods

Shear Strength: Introduction- Mohr-Coulomb's failure theory – Laboratory shear tests: Direct shear test – Triaxial compression test– Types of shear tests based on drainage conditions – Unconfined compression test – Vane shear test – Shear strength characteristics of Saturated sands during drained and undrained shear – Critical void ratio and liquefaction – Factors affecting shear strength of sands – Shear strength characteristics of saturated cohesive soils – Sensitivity.

Learning Outcomes: 1) Determine the shear strength of soil on a horizontal plane by applying Coulomb's theory 2) Determine the shear strength parameters from the test data of direct shear test, triaxial compression test, unconfined compression test and vane shear test 3) Distinguish between different types of shear tests based on drainage condition and identify their practical application 4) Explain the phenomenon of liquefaction and suggest measures to prevent the same

UNIT – II 12 Periods

Subsurface Exploration: Introduction – Need and objectives of soil exploration – Planning of Soil exploration: Depth of Exploration; Number and spacing of Test pits or Borings – Stages in Soil exploration: Site Reconnaissance – Preliminary Exploration – Detailed Exploration: Test pits – Boring: Auger boring, Wash boring and Rotary drilling – In-situ tests: Standard penetration test – Static and dynamic cone penetration test – Types of soil samples: disturbed and undisturbed soil samples – Design Features of soil sampler – Geophysical methods: Seismic refraction and Electrical resistivity method – Geotechnical Investigation report

Learning Outcomes: 1) Explain the objectives of and stages in soil exploration and the planning of soil exploration including depth and spacing of exploration points 2) Explain methods of soil exploration and bring out their advantages and limitations 3) Determine the corrected SPT N value for overburden pressure and dilatancy 4) Determine the design features of the given soil sampler and comment on its suitability 5) Explain the salient features of a standard geotechnical investigation report

UNIT - III 12 Periods

Lateral Earth Pressure – Types of Lateral earth pressure– Active and Passive Earth Pressure – Earth pressure at rest – Rankine's theory – Active earth pressure for cohesion less soils – Active earth pressure for cohesive soils with and without Tension crack – Critical depth – Passive Earth Pressure by Rankine's theory – Coulomb's wedge theory – Rebhan's and Culmann's graphical solutions.

Learning Outcomes: 1) Determine the active and passive earth pressure for the given back conditions by Rankine's theory 2) Determine the active and passive earth pressure for the given back conditions by Coulomb's theory 3) Determine the active earth pressure by Rebhan's and Culmann's graphical methods

UNIT – IV 12 Periods

Bearing capacity of Shallow footings- Design criteria of shallow foundations – Ultimate and safe bearing capacity – Bearing capacity of shallow foundation – Terzaghi's theory – types of shear failure – Effect of water table, shape of footing, eccentricity of load on bearing capacity- Meyerhof's theory – I.S.Code method – Bearing capacity from SPT & SCPT – Plate load test – Types of settlement – Permissible Settlements – Criteria for deciding Depth of foundation.

Learning Outcomes: 1) Determine the Bearing capacity of the given foundation by Terzaghi's theory and I.S.Code method for the given soil conditions 2) Determine the Bearing capacity from SPT and SCPT data based I.S.Code 3) Determine the Bearing capacity

and settlement of the foundation from the Plate load test data 4) Explain the criteria for deciding depth of foundation

UNIT – V 12 Periods

Pile Foundations: Necessity of Pile foundations – Classification of pile foundations – Load Transfer mechanism – Estimation of load carrying capacity of pile – Static formula – dynamic formulae: Engineering News Formula – Hiley's formula – Pile load test – Group Action in piles – Pile groups in sand and gravel – Pile groups in clay – Negative skin friction.

Stability of Slopes: Types of Earth Slopes – types of slope failure – Factor of safety – Stability analysis using Swedish circle method – Bishop's Simplified method of slices – Friction circle method – Taylor's stability number.

Learning Outcomes: 1) Explain the necessity of pile foundations and also explain their classification 2) Estimate the load capacity of pile by static and dynamic formulae 3) Explain negative skin friction and estimate the reduction in load capacity due to it 4) Explain the stability analysis of earth slopes by Swedish circle method, Bishop's method of slices, friction circle method and using Taylor's stability number

TEXT BOOKS

1. Narasinga Rao, B.N.D. (2015), Soil Mechanics and Foundation Engineering, Wiley Publishers, New Delhi
2. Arora, K.R. (2008), "Soil Mechanics and Foundation Engineering", Standard Publishers, Delhi.

REFERENCES

1. Gopal Ranjan and Rao, A.S.R. (2007), "Basic and Applied Soil Mechanics", New age International (P) Ltd.
2. Murthy, V.N.S. (2009), "A text book of Soil Mechanics and Foundation Engineering", UBS Publishers & Distributors Pvt. Ltd., New Delhi.
3. Swami Saran (1998), "Analysis and Design of sub structures", Limit State Design, Oxford & IBH Publishing Co. Pvt Ltd., New Delhi.
4. Braja M. Das, (2005), "Principles of Foundation Engineering", Thomson Asia Pvt. Ltd., Singapore.
5. Shashi K Gulhati and Manoj Dutta (2005), Geotechnical Engineering, Tata McGraw Hill, New Delhi
6. Craig, R.F. (2014), "Soil Mechanics", McGraw hill, New Delhi
7. I.S. SP 36 Part – I &Part – II - 1988 Compendium of Indian standards on soil engineering, Part 2: Field testing, Bureau of Indian Standards, New Delhi.
8. Relevant NPTEL Courses.

REINFORCED CONCRETE STRUCTURES - I

CIV 314 **Credits: 3**

Instruction: 2 Lectures & 1 Tutorials / week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Prerequisites:

Engineering Mechanics; Strength of materials; Structural Analysis - I.

Course Objectives:

From this course students will learn the following

1. To understand the recommendations of IS: 456-2000
2. To master the concepts of limit state design
3. To learn how to design beams, columns, slabs and footings

Course Outcomes:

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

1. Design singly and doubly reinforced beams by explaining the principles of limit state method.
2. Design flanged sections and design beams for shear and torsion.
3. Design one way, two way and continuous slabs.
4. Design columns subjected to axial loads.
5. Design isolated square and rectangular footings.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	2	3	3										3		
	2	2	3	3										3		
	3	2	3	3										3		
	4	2	3	3										3		
	5	2	3	3										3		

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UNIT – I 12 Periods

Design Philosophies – Working Stress Method, Ultimate Load Method and Limit State Method

Introduction to Limit State Design: Concepts of limit state design- Characteristic loads- Characteristic strength -Partial loads and Material Safety factors- Representative stress-Strain curves- Assumptions in limit state design – Stress block parameters – Limiting moment of resistance.

Singly and Doubly Reinforced Beams: Limit state analysis and design of singly reinforced, doubly reinforced beams.

Learning outcomes:

1) Fix up the cross-sectional dimensions of the beam and calculate the steel required in the beam2) Satisfy the conditions related to limit state of collapse and limit state of serviceability3) Draw the reinforcement detailing for the beam.

UNIT – II 12 Periods

Flanged Sections: Design of T and L beam sections.

Shear, Torsion and Bond: Limit state analysis and design of sections for shear and torsion – Concept of bond, anchorage and development length, I.S Code provisions. Design examples in simply supported and continuous beams.

Learning outcomes:

1) Understand the concept's related to shear, torsion and bond in beams2) Design reinforcement to resist shear and torsion in a beam3) Draw the shear and torsional reinforcement detailing for the beam

UNIT – III 12 Periods

Slabs: Design of one-way slabs – two-way slabs –Continuous slabs using IS coefficients.

Learning outcomes:

1) Understand the bending behaviour in one way, two way and continuous slabs.2)Fix up the thickness of slab based on codal provisions and calculate the steel required in slabs
3) Draw the reinforcement detailing in one way, two way and continuous slabs

UNIT – IV 12 Periods

Columns: Short and Long columns, Minimum eccentricity, short column under axial compression, column with helical and tie reinforcement. Short columns subjected to uniaxial bending

Only for Internal Assessment - (Short columns subjected to biaxial bending and P-M interaction diagrams)

Learning outcomes:

1) Fix up the dimensions of the column and find the area of steel required in columns
2) Learn how to design a column subjected to biaxial loading3) Draw the reinforcement detailing in columns

UNIT – V 12 Periods

Footings: Introduction: Different types of footings–Design of isolated square and rectangular footings.

Learning outcomes:

1) Fix up the dimensions of the footing 2) Check the safety of footing against one way shear, two-way shear and bearing pressure3) Draw the reinforcement detailing in footings

TEXT BOOKS

1. B.C.Punmia, Ashok Kumar Jain, Arun Kmar Jain (2016) "Limit State Design of Reinforced Concrete", Laxmi Publications, Revised edition, India.
2. Varghese P.C.(2008) **"**Limit State Design of Reinforced Concrete", Prentice Hall India Learning Private Limited", 2nd edition, India.

REFERENCES

1. S Unnikrishna, Devdas Menon (2017)"Reinforced concrete design", McGraw Hill Education, Third edition, India.

2. Ashok K Jain (2012)“Reinforced Concrete”, New Chand & Brothers-Roorkee, Seventh edition, India
3. S Ramamrutham (2016)“Design of Reinforced Concrete Structures”, Dhanpat Rai Publishing Company (P) Ltd.-New Delhi, 17th edition, India.
4. Indian Standard-456-2000, “Plain and Reinforced Concrete – Code of Practice”, Fourth Revision.
5. Other Relevant B.I.S. Codes
6. Relevant NPTEL Courses.

STRUCTURAL ANALYSIS - II

CIV 315 **Credits: 3**

Instruction: 2 Lectures & 1 Tutorials / week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Prerequisites:

Strength of Materials; Structural Analysis-I.

Course Objectives:

1. Apply suitable methods for analyzing statically indeterminate frames.
2. Apply suitable methods for analyzing Trusses.
3. Apply suitable methods for analyzing Arches and suspension bridges.

Course Outcomes:

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

1. Analyse the Statically Indeteminate Trusses
2. Analyse the Statically Indeteminate Frames using SDM & MDM
3. Analyse the Statically Indeteminate Frames using Kanis Method & Coloumn Analogy Method
4. Analyse the Two & Three Hinged Arches & Suspension Bridges
5. Analyse the ILD in beams due to moving Loads.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3											3		
	2	3	3											3		
	3	3	3											3		
	4	3	3											3		
	5	3	3											3		

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UNIT – I 12 Periods

Analysis of statically indeterminate frames (single storey, single bay portal frames only) using (I) Slope-deflection method (ii) Moment distribution method.

Learning outcomes:

At the end of this unit the student will be able to

- Analyse statically indeterminate frames by using Slope Deflection Method
- Analyse statically indeterminate frames by using Moment Distribution Method

UNIT - II 12 Periods

Analysis of statically indeterminate frames (portal frames with single storey and single bay) using (i) Kani‟s method, (ii) Column Analogy method.

Analysis of structures for lateral load using portal method and cantilever method. (Only for Internal Assessment)

Learning outcomes:
At the end of this unit the student will be able to

- Analyse statically indeterminate frames by using Kani's Method
- Analyse statically indeterminate frames by using Column Analogy Method

UNIT – III 12 Periods

Analysis of statically indeterminate trusses (having not more than 7 members and 3 supports) containing (a) External redundant supports (b) internal redundant members using (i) Method of consistent deformation (ii) Castigliano's theorem – II.

Learning outcomes:
At the end of this unit the student will be able to

- Analyse statically indeterminate Trusses by using Method of Consistent deformation
- Analyse statically indeterminate Trusses by using Castigliano's theorem-II

UNIT – IV 12 Periods

Arches: Normal thrust, radial shear and bending moment in three hinged and two hinged parabolic and segmental arches.
Suspension bridges: Stresses in loaded cables with supports at the same and different levels. Length of cable; Two and Three hinged stiffening girders.

Learning outcomes:
At the end of this unit the student will be able to

- Differentiate statically determinate and indeterminate arch
- Analyse three and two hinged parabolic and segmental arches
- Analyse suspension bridges with Three and Two hinged stiffening girders

UNIT - V 12 Periods

Moving loads and Influence lines: Maximum Shear force and Bending moment diagrams for different types of loads. Maximum Bending moment at a section under a wheel load and absolute maximum Bending moment in the case of several wheel loads. Equivalent uniformly distributed live load for Shear force and Bending moment.

Learning outcomes:
At the end of this unit the student will be able to

- Draw Influence lines diagram for different types of loads
- Calculate absolute maximum in the case of several wheel loads
- Calculate Equivalent uniformly distributed live load for Shear force and Bending moment

TEXT BOOKS

1. Vazirani V.N., M.M Ratwani and S.K Duggal (1999), "Analysis of Structures – Vol-I & II", Khanna Publishers, 17th Edition.
2. C.S. Reddy (2017) "Basic Structural Analysis", McGraw Hill Education, 3rd Edition

REFERENCES

1. C.K.Wang (2017), "Intermediate Structural Analysis" , McGraw Hill International 1st Edition.
2. Devdas Menon (2017) "Structural Analysis", Alpha Science International Ltd, 2nd Edition.
3. Thandavamoorthy (2011), "Structural analysis", Oxford University Press.
4. S.S.Bhavakatti (2010), "Structural analysis Vol I & II", Vikas Publishing House Pvt Ltd, 4th Edition
5. D S Prakash Rao (1996), "Structural Analysis A Unified Approach", Universities Press
6. Relevant NPTEL Courses.

FLUID MECHANICS LAB - I

CIV 316 **Credits:1.5**

Instruction: 3 Practicalss / week

Sessional Marks:40

End Exam: 3 Hours **End Exam Marks:60**

Course Objectives:

The objective of the course is to enable the student

The objective of the course is to enable the student to calibrate different types of flowmeasuring devices to measure flow in tanks, pipes and open channels.

Course Outcomes:

At the end of this course student will be able to

1. Apply Continuity and Bernoulli's equation to determine the coefficient of discharge for various flow measuring devices used in pipes, channels, and tanks.
2. Prove Bernoulli's and Reynolds equations using apparatus and Determine time of emptying tank through Mouthpiece and orifices..

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	2	2		3					3	3					2
	2	2	2		3					3	3					2

LIST OF EXPERIMENTS:

1) Calibration of a small orifice by constant head method and falling head method
2) Time required for emptying the tank through the small orifice.
3) Calibration of a cylindrical mouth piece by constant head method and falling head method.
4) Time required for emptying the tank through the mouth piece.
5) Calibration of Venturi meter
6) Calibration of Orifice meter.
7) Calibration of Flow nozzle meter.
8) Calibration of a triangular V Notch
9) Calibration of a rectangular notch.
10) Calibration of a trapezoidal notch.
11) Experimental verification of laminar, transition and turbulent flows using Reynold's apparatus.
12) Verification of Bernoulli's Equation.

REFERENCES

1. Modi P.N. & Seth S.M. (2017), "Hydraulics & Fluid Mechanics including Hydraulics Machines", Standard Book House, New Delhi, 22nd Edition.
2. Relevant NPTEL Courses.

QUANTITATIVE & VERBAL APTITUDE – I

Course Code – Category: CIV 317 - HS **Credits: 1.5**

L	T	P	E	O
0	0	3	1	3

Sessional Marks: 100

End Exam : 3 Hours End Exam Marks: --

Course objectives:

Quantitative Aptitude -I

1. To prepare the students on various principles related to numerical computations.
2. To explain concepts related to numerical estimation.
3. To illustrate and explain the fundamentals related to geometry and mensuration.

Verbal Aptitude-I:

1. To categorize and explain principles of grammar in order to minimize errors in English.
2. To list and quote high frequency words by giving relevant examples.
3. To categorize, apply and use data as per the requirement.
4. To construct and make use of idioms, phrasal verbs and other expressions used in professional contexts.
5. To critically evaluate reading material for better comprehension

Course Outcomes:

Quantitative Aptitude –I

The student will be able to

1. Solve problems related to numerical computations in company specific and other competitive tests.
2. Able to recall and use the concepts to solve problems numerical estimation with respect to company specific and competitive tests.
3. Apply basic principles related to geometry and mensuration & solve questions in company specific and competitive tests.

Verbal Aptitude-I

The student will be able to

1. Detect grammatical errors in the text/sentences and rectify them while answering their competitive/ company specific tests and frame grammatically correct sentences while writing.
2. Answer questions on synonyms, antonyms, hyponyms, hypernyms and other vocabulary-based exercises while attempting company specific and other competitive tests.
3. Use their logical thinking ability and solve questions related to reasoning based exercises.
4. Choose the appropriate word/s/phrases suitable to the given context in order to make the sentence/paragraph coherent.
5. Analyse the given data/text and find out the correct responses to the questions asked based on the reading exercises; identify relationships or patterns within groups of words or sentences.

Mapping of Course Outcomes with Program outcomes:

CO		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
QA	1	3	2							1	1					
	2	3	2							1	1					
	3	3	2							1	1					
VA	1	2	1							2	3					
	2	1								2	3					
	3	1	2							2	3					
	4	1								2	3					
	5	1	2							2	3					

SYLLABUS
Section –A (Quantitative Aptitude –I)

UNIT I **6 Periods**

Numerical computation:

Applications based on Numbers, Chain Rule, Ratio Proportion

UNIT II **6 Periods**

Numerical estimation - I

Applications Based on Time and work, Time and Distance

UNIT III **4 Periods**

Numerical estimation – II

Applications based on Percentages, Profit Loss and Discount, Simple interest and Compound Interest

Partnerships, Shares and dividends

UNIT IV **4 Periods**

Data interpretation

Data interpretation related to Averages, Mixtures and allegations, Bar charts, Pie charts, Venn diagrams

UNIT V **4 Periods**

Application to industry in Geometry and Mensuration

Books for practice

1. Quantitative aptitude by RS Agarwal, S Chand Publications
2. Verbal and non verbalReasoning by RS Agarwal from S Chand publications

References

1. Barron’s by Sharon Welner Green and Ira K Wolf (Galgotia Publications pvt. Ltd.)
2. Quantitative Aptitude by U Mohan Rao Scitech publications
3. Quantitative Aptitude by Arun Sharma McGrawhill publications
4. Quantitative Aptitude by Ananta AsishaArihant publications
5. Quantitative Aptitude by Abhijit Guha
6. Quantitative Aptitude by Pearson publications
7. Material from ‘IMS, Career Launcher and Time’ institutes for competitive exams.
8. Elementary and Higher algebra by HS Hall and SR knight.

Websites:

1. www.m4maths.com
2. www.Indiabix.com
3. 800score
4. Official GRE site
5. Official GMAT site

Section –B (Verbal Aptitude –I)

UNIT I **7 Periods**

Grammar:

Parts of speech(with emphasis on appropriate prepositions, co-relative conjunctions, pronouns-number and person, relative pronouns), articles(nuances while using definite and indefinite articles), tenses(with emphasis on appropriate usage according to the situation), subject – verb agreement (to differentiate between number and person) , clauses (use of the appropriate clause , conditional clauses), phrases(use of the phrases, phrasal verbs), degrees of comparison(comparing apples and oranges, comparison and number), modifiers(misplaced and dangling modifiers, absence of modifiers), determiners, parallelism in structure(symmetry in two part sentences), word order, subjunctive mood, redundancy, special types of sentences, miscellaneous types, identifying errors in a given sentence, correcting errors in sentences.

UNIT II **4 Periods**

Vocabulary:

Synonyms and synonym variants (with emphasis on high frequency words), antonyms and antonym variants (with emphasis on high frequency words), homonyms, hyponyms, hypernyms and General idioms.

UNIT III **5 Periods**

Reasoning:

Critical reasoning (understanding the terminology used in CR- premise, assumption, inference, conclusion), Sequencing of sentences (to form a coherent paragraph, to construct a meaningful and grammatically correct sentence using the jumbled text), to use logical reasoning and eliminate the unrelated word from a group.

UNIT IV **4 Periods**

Usage:

Sentence completion (with emphasis on signpost words and structure of a sentence), contextual meanings (to use the appropriate word according to the situation), supplying a suitable beginning/ending/middle sentence to make the paragraph coherent, idiomatic language (with emphasis on business communication), punctuation depending on the meaning of the sentence, run on errors, sentence fragments, coma splices.

UNIT V **4 Periods**

Reading Comprehension:

Types of passages (to understand the nature of the passage), types of questions (with emphasis on inferential and analytical questions), style and tone (to comprehend the author's intention of writing a passage), strategies for quick and active reading(importance given to skimming, scanning), summarizing ,reading between the lines, reading beyond the lines, techniques for answering questions related to vocabulary (with emphasis on the context), supplying suitable titles to the passage, identifying the theme and central idea of the given passages.

Books for Practice

1. Practical English Grammar A. J. Thomson, A. V. Martinet by Oxford University press
2. Remedial English Grammar for Foreign Students by FT wood published by Macmillan *Publishers*
3. Objective English-Edgar Torpe, Showick Thorpe-Pearson Education
4. Cambridge and Oxford Dictionaries

Reference Books and websites:

1. Barron's by Sharon Welner Green and Ira K Wolf (Galgotia Publications Pvt.Ltd.)
2. Websites: Indiabix, 800 score, official CAT, GRE and GMAT sites
3. Material from 'IMS, Career Launcher and Time' institutes for competitive exams.
4. Collins Cobuild English Grammar by Goyal Publishers
5. Word Power Made Easy by Norman Lewis-Goyal Publishers

GEOTECHNICAL ENGINEERING LAB - II

CIV 318 **Credits:1.5**

Instruction: 3 Practicalss / week

Sessional Marks:40

End Exam: 3 Hours **End Exam Marks:60**

Prerequisites:

Geotechnical Engineering - I

Course Objectives:

The objective of the course is

1. To impart the skills related to the Strength and Swelling characteristics of soil.
2. To introduce SPT and DCPT

Course outcomes:

By the end of the course, student will be able to:

1. Conduct tests on strength characteristics of soil, analyze and interpret the data, comprehend and write reports.
2. Conduct tests on shear strength and swell characteristics of soil, analyze and interpret the data, comprehend and write reports

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	2	3		3					3	3				3	
	2	2	3		3					3	3				3	

SYLLABUS

LIST OF EXPERIMENTS

1. Field identification of soils
2. Relative density – Sand
3. Unconfined compression test for fine grained soils
4. California Bearing Ratio (CBR) Test
5. Direct shear test
6. Swell pressure test
7. Free swell Index
8. Vane shear test

Demonstration Experiments (Subject to availability)

9. Triaxial Compression Test
10. S.P.T
11. D.C.P.T

REFERENCES

1. Narasinga Rao, B.N.D. (2015), “Soil Mechanics and Foundation Engineering”, Wiley Publishers
2. Arora, K.R. (2008), “Soil Mechanics and Foundation Engineering”, Standard Publishers, Delhi – 110 006.
3. Punmia, B.C. (1995), “Soil Mechanics and Foundation Engineering”, Laxmi Publications Pvt. Ltd., New Delhi.
4. SP 36: Part 1 : 1987 Compendium of Indian standards on soil engineering, Part 1: Laboratory testing of soils for civil engineering purposes, Bureau of Indian Standards, New Delhi
5. SP 36: Part 2 : 1988 Compendium of Indian standards on soil engineering, Part 2: Field testing of soils for civil engineering purposes, Bureau of Indian Standards, New Delhi

TECHNICAL SEMINAR

CIV 319 **Credits:-**

Instruction: 3 Practicalss / week **Sessional Marks:-**

End Exam: 3 Hours **End Exam Marks:-**

Course Objectives:

The objective of this course is

1. To enhance the communication skills of the students through participation and giving seminars.
2. To develop an overview of civil engineering and its applications in the students.
3. To promote teamwork and lifelong learning among the students.

Course Outcomes:

At the end of the course the students will be able to

1. Construct detailed presentations by analyzing and synthesizing information.
2. Deliver compelling oral presentations to evaluation committees.
3. Demonstrate effective teamwork and individual problem-solving skills.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3		3	3			3				3			
	2								3		3		3			
	3	3							3	3	3		3			

OUTLINE OF SYLLABUS

Students have to prepare a Report on a case study, design or practical application in civil engineering and make a presentation in teams of maximum 2 students. Duration of each seminar shall be 20 minutes per team including discussion. Evaluation to be done by a Panel of Examiners nominated by HoD with at least one faculty member of specialization related to the seminar topic.

REFERENCES

1. National & International Journals / Standard Magazines / Reports / Case Studies in civil engineering.
2. NPTEL courses in civil engineering.

R 19

III Year B.Tech

II Semester Detailed Syllabus

ESTIMATION & COSTING

CIV 322 **Credits: 3**

Instruction: 2 Lectures & 1 Tutorials / week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Prerequisites:

Civil Engineering Materials, Building Technology, Building Planning and Design.

Course Objectives:

1. To understand the types of estimates
2. To understand rate analysis and process of preparation of bills
3. To study about the specification writing

Course outcomes:

By the end of the course, student will be able to:

1. Apply the types and methods of estimation through basic terminology.
2. Apply the types and methods of specifications of framed buildings.
3. Analyze the abstract estimate of a building utilizing the standard schedule of rates and developing the estimation of various items of work.
4. Analyze the detailed estimate of load bearing and framed buildings by applying the different methods of estimation
5. Analyze the detailed estimate of RCC buildings and prefabricated buildings by identifying the various components of the building.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3												3		
	2	3												3		
	3	3	3				2							3		
	4	3	3				2							3		
	5	3	3				2							3		

SYLLABUS

UNIT – I 12 Periods

Introduction: Standard units, Units of measurement of different items of work. Meaning of estimating. Errors in estimation, Different types of estimates. Contingencies and related terms in the estimate, different types of approvals. Plinth area and related terms used in the estimation of various structures, rules and methods of measurements of different works.

Learning Outcomes:

1. Understand the basic concepts of estimation
2. Know the methods of measurements of different works

UNIT – II 12 Periods

Specifications: Specifications for framed buildings: Meaning, purpose, types of specifications, Method of preparation of specification, general specification, detailed specifications of different items of framed buildings and other structures.

Learning Outcomes:

1. Prepare specifications for different items of buildings.
2. Able to identify the quality of different items of buildings.

UNIT – III 12 Periods

Rate analysis: Data sheet for materials and various items of work in buildings and other structures, schedule of rates, abstract estimate of buildings.

Learning Outcomes:

1. Analyze the rates of various items of work in building.
2. Prepare abstract estimate of building.

UNIT – IV 12 Periods

Estimation: Estimation of load bearing structures by Long wall - short wall method and Centre line method.

Detailed estimate of framed buildings - Estimation of Different items of works in substructure, Earthwork, P.C.C, Foundation Concrete, D.P.C in R.C.C building- Single Bedroom, Double Bed Room and Triple bedroom with partition walls and verandah.

Learning Outcomes:

1. Learn how to estimate the different items of works in substructure and superstructure.
2. Prepare a detailed estimate of building.

UNIT – V 12 Periods

Estimation of Superstructure: Estimation of various items of R.C.C building works in superstructure: Super structure walls and columns, slab beams, plinth beam, columns, Deductions, Plastering and White Washing and Color Washing, Sloped Roof Buildings; G.I. and A.C. Sheet, Electricity and water supply. Sanitation works etc

Estimation of Prefabricated structures.

Learning Outcomes:

1. Learn how to estimate the different items of R.C.C building works.
2. Prepare a bar bending schedule.

TEXT BOOKS

1. Datta, B.N. (2002), "Estimating and costing", Charator Publishing House, 27th Edition, Gujarat
2. Chakraborti, M. (2006), "Estimating, Costing, Specification and Valuation in Civil Engineering, 28th Edition,

REFERENCES

1. Birdie .G.S. (2000), "A Text Book on Estimating and Costing", Dhanpat Rai and Sons, New Delhi.
2. Bhasin, P.L. (2000), "Quantity Surveying", S. Chand & Co., 2nd Edition, New Delhi.
3. Relevant NPTEL Courses.

REINFORCED CONCRETE STRUCTURES - II

CIV 323 **Credits: 3**

Instruction: 2 Lectures & 1 Tutorials / week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Prerequisites:

Reinforced Concrete Structures – I

Course Objectives:

From this course students will learn the following

1. To learn how to design various types of staircases.
2. To learn design of retaining walls.
3. To learn design of piles and pile caps
4. To learn the basic concepts of prestressed concrete.

Course Outcomes:

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

1. Design staircase.
2. Design cantilever retaining wall.
3. Design counterfort retaining wall.
4. Design pile and pile caps.
5. Analyse the prestressed concrete members and their losses in prestressing.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	2	3	3										3		
	2	2	3	3										3		
	3	2	3	3										3		
	4	2	3	3										3		
	5	2	3											3		

SYLLABUS

UNIT-I **12 Periods**

Staircase: Introduction - Classification of staircase - Design of dog-legged staircase – designof open well staircase with quarter span landing

Learning outcomes:

1) Learn how to proportion a doglegged and open well staircase2) Design doglegged and open well staircase.3) Draw the reinforcement detailing in staircase.

UNIT-II **12 Periods**

Retaining Walls: Types of retaining walls - forces on retaining walls - active and passiveearth pressure, stability requirements.

Cantilever Retaining Wall: Preliminary proportioning of cantilever retaining walls. Designof cantilever retaining wall - with horizontal back fill – with horizontal back fill and traffic load – with sloping back fill.

Learning outcomes:

1) Learn how to proportion the components of a cantilever retaining wall2) Check the stability conditions of a retaining wall3) Design various components of a retaining wall4) Draw the reinforcement detailing of the various components of a retaining wall

UNIT- III **12 Periods**

Counterfort Retaining Wall: Preliminary proportioning of counter fort retaining walls. Design of counterfort retaining wall.

Learning outcomes:

1) Learn how to proportion the components of a cantilever retaining wall2) Check the stability conditions of a retaining wall3) Design various components of a retaining wall4) Draw the reinforcement detailing of the various components of a retaining wall

UNIT-IV **12 Periods**

Piles and Pile caps: Classification of piles - Design of bored cast in situ piles, Pile Cap design for three or four piles.

Learning outcomes:

1) Analyze various types of pile caps 2) Fix the dimensions of pile cap and calculate the reinforcement required in pile caps.3) Draw the reinforcement detailing in pile caps.

UNIT-V **12 Periods**

Prestressed Concrete: Introduction - Reinforced Concrete versus Prestressed Concrete -Use of high strength concrete and high tensile steel - Prestressing Systems (Freyssinet, Gifford Udall, MagnelBlaton) - Analysis of simple prestressed rectangular sections (Concentric tendon, Eccentric tendon, Parabolic tendon, Bent tendon) - Prestressing Losses

Learning outcomes:

1) Understand the basic concepts of pre-stressed concrete2) Know the different prestressing systems,3) Analyze the prestressed concrete members and evaluate the losses in prestressing.

TEXT BOOKS

1. B.C.Punmia, Ashok Kumar Jain, Arun Kmar Jain (2016) "Limit State Design of Reinforced Concrete", Laxmi Publications, Revised edition, India.
2. Varghese P.C.(2008) **"**Limit State Design of Reinforced Concrete", Prentice Hall India Learning Private Limited", 2nd edition, India.

REFERENCES

1. S Unnikrishna, Devdas Menon (2017)"Reinforced concrete design", McGraw Hill Education, Third edition, India.
2. Ashok K Jain (2012)"Reinforced Concrete", New Chand & Brothers-Roorkee, Seventh edition, India

3. S Ramamrutham (2016)“Design of Reinforced Concrete Structures”, Dhanpat Rai Publishing Company (P) Ltd.-New Delhi, 17th edition, India.
4. Indian Standard-456-2000, “Plain and Reinforced Concrete – Code of Practice”, Fourth Revision, Tenth reprint April 2007
5. Other Relevant B.I.S. Codes
6. Relevant NPTEL Courses.

TRANSPORTATION ENGINEERING - I

CIV 324 **Credits: 3**

Instruction: 2 Lectures & 1 Tutorials / week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Prerequisites:

Surveying – I & II.

Course Objectives:

The objective of the course is to prepare the student to

1. To know about the history of highway development, surveys and classification of roads.
2. To studyabout the pavement materials and design the geometric elements of highways.
3. To know about the construction procedure of various types of pavements and study the pavement maintenance.
4. To study about the traffic characteristics and design of intersections.

Course Outcomes:

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

1. Analyse the maximum utility road system by applying the highway planning surveys
2. Design cross section elements, sight distance, horizontal and vertical alignment of a highway
3. Design flexible and rigid pavements as per IRC
4. Identify various highway constructions techniques and highway maintenance
5. Design signal time and rotary intersection by analyzing traffic studies.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3												2	
	2	3	2	3					3						3	
	3	3	3	3					3						3	
	4	3							3						2	
	5	3	3	3					3						3	

SYLLABUS

UNIT – I 12 Periods

Highway development and planning – History of Roads - Classification of roads, necessity of highway planning surveys preparation of master plan highway planning in India. Classification of roads, Highway alignment - Factors controlling alignment, Engineering surveys, Drawing & report.

Learning outcomes: 1) Analyze different road patterns and types of roads 2) Identify the surveys required 3) Estimate the length of road network

UNIT – II 12 Periods

Highway Geometric Design – Design of cross-sectional elements, Sight distance – Stopping Sight Distance & Overtaking Sight Distance, horizontal alignment – Super elevation & Transition Curves, vertical alignment – Summit Curves and Valley Curves.

Learning outcomes: 1) Design Geometric elements 2) Estimate length of transition curve and vertical curves

UNIT – III 12 Periods

Pavement Design: Design of Highway Pavements Design factors; Design of flexible pavements – IRC method, Design of Rigid pavements - Westergaard's stress equation for wheel loads and temperatures stress.

Learning outcomes: 1) Identify factors affecting flexible and rigid pavement design 2) Analyse different stresses on to the pavement

UNIT – IV 12 Periods

Highway construction and maintenance: Highway materials and their properties and tests - Construction of water bound macadam roads, Bituminous pavements and cement concrete pavements; Construction of joints in cement concrete pavements; Maintenance of highways; Importance of highway drainage; Requirements; Surface drainage; Sub–surface drainage.

Learning outcomes: 1) Identify the test required for soil and bitumen 2) Understand the importance of drainage

UNIT – V 12 Periods

Traffic engineering: Introduction - Traffic characteristics- Road user, vehicular & travel pattern; Traffic studies (Surveys); Traffic Control devices; Traffic operation- signal design; Types of intersections; Design of rotary intersection; Street lighting.

Learning outcomes: 1) Identify road user and vehicular characteristics 2) Estimate the travel time 3) Design of intersection and signal times

TEXT BOOKS

1. Khanna, S.K. and Justo C.E.G. (2018), "Highway Engineering", Nem Chand & Bros, ISBN-13: 978-8185240770, 10th Edition.
2. Kadiyali, L.R., (2011), "Traffic engineering and Transport planning", Khanna Publishers, ISBN-13: 978-8174092205.

REFERENCES

1. Chakroborty, P. and Das, A. (2003), "Principles of Transportation Engineering" Prentice Hall of India, New Delhi, 6th Edition.
2. Sharma, R.C. and Sharma, R.K. (2012), "Principles, Practice and Design of Highway Engineering" S Chand & Company, ISBN-10: 8121901316.
3. Relevant NPTEL Courses

WATER RESOURCES ENGINEERING - I

CIV 325 **Credits: 3**

Instruction: 2 Lectures & 1 Tutorials / week Sessional Marks: 40

End Exam: 3 Hours End Exam Marks: 60

Prerequisites:

Engineering Geology; Fluid Mechanics – II

Course Objective:

The objective of the course is to enable the student

To provide the necessary background for understanding the occurrence and movement of water in the hydrosphere and to enable the student to understand Irrigation Engineering Principles and practices.

Course Outcomes:

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

1. Evaluate the various hydrologic parameters by analysing the factors affecting them and applying these principles to develop unit hydrograph.
2. Identify the hydraulic properties of an aquifer & solve for specific capacity, efficiency and yield of a well
3. Analyze the reservoir conditions and design the capacity of the reservoir and its operating schedules
4. Analyze the conditions of crops and design the canal capacities for different crop patterns by calculating the quantity of water required
5. Design of Canal by using Lacey's and Kennedy's theory.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3		3											2
	2	3	3													2
	3	3	3	3			2									3
	4	3	3	3			3					2				3
	5	3	3	3			3									3

SYLLABUS

UNIT – I 12 Periods

Surface Water Hydrology: Water Resources in India, Hydrology in water Resources Planning– Precipitation – Types, Measurement of rainfall, Average depth of rainfall over an area, Mean annual rainfall, consistency of rainfall record – Double mass curve, Infiltration – Factors affecting and its determination, Evaporation and Evapotranspiration. Runoff – factors affecting runoff, methods of determination of runoff, stream gauging, hydrograph analysis, base flow separation, unit hydrograph – Hydrograph of different durations, applications of unit hydrograph, S-hydrograph.

Learning Outcomes:

1) Depict hydrological cycle and calculate the rainfall intensity selecting appropriate method
2) Interpret hydrological data and develop/draw necessary results

UNIT – II 12 Periods

Ground Water Hydrology: Definitions, subsurface distribution of water, ground water movement, Darcy's law–permeability. Well hydraulics – steady flow in different types of aquifers and wells – determination of hydraulic properties of aquifer, well losses, specific capacity of well, and well efficiency, pumping test and recovery test methods for determination of well yield, Data acquisition by using piezometers.

Learning Outcomes:

1) Define various types of water bearing and non-water bearing strata.
2) Study well hydraulics and determine the hydraulic properties of aquifers

UNIT – III 12 Periods

Reservoir Planning: Types of reservoir investigations for reservoir planning, selection of site for a reservoir, zones of storage in a reservoir, purpose of reservoir, reservoir yield, mass curve and demand curve, determination of reservoir capacity, yield from a reservoir of given capacity, operating schedules, guide curve for reservoir operation, apportionment of total cost of a multipurpose project. Reservoir sedimentation, control of reservoir sedimentation, life of reservoir.

Learning Outcomes:

1) Exhibit knowledge of different types of reservoirs investigations and recommend required conditions for a good reservoir.
2) Interpret data and develop/draw conclusions/results.

UNIT – IV 12 Periods

Irrigation: Definition of irrigation, types of irrigation systems – direct and indirect, lift and inundation irrigation system, methods of irrigation – surface and sprinkler methods, drip irrigation, Soil moisture constants, depth of water held by soil in root – zone. Water requirements of crops, duty, delta and base period, their relationship, crops – seasons, factors affecting duty and methods of improving duty, consumptive use of water – determination of canal capacities for cropping patterns.

Learning Outcomes:

1) Define various types of irrigation and suggest a particular type based on the conditions.
2) Determine duty, delta and other irrigation parameters necessary for effective irrigation.

UNIT – V 12 Periods

Canal Systems: Classification of irrigation canals – canal alignment, design of unlined canals, regime theories – Kennedy's and Lacey's theories, tractive force method, design problems –balancing depth.

Learning Outcomes:

1) Classify canals and suggest suitable settings for the conditions.
2) Design canals for irrigation using Kennedy's and Lacey's theories.

TEXT BOOKS

1. Punmia B.C. and Lal Pande B.B. (2021), "Irrigation and Water Power Engineering", Laxmi Publications Pvt. Ltd., New Delhi, 17th Edition.

2. Garg S.K. (2006), “Irrigation Engineering and Hydrology Structures”, Khanna Publishers, New Delhi, 35th Edition.

REFERENCES

1. Modi P.N. (2020), “Irrigation, Water Resources and Water Power Engineering”, Standard Book House, New Delhi, 11th Edition.
2. Jayarami Reddy P. (2011), “A Textbook of Hydrology”, Laxmi Publication, New Delhi, 3rd Edition.
3. Subramanya K. (2008), Engineering Hydrology, Tata-Mc Graw Hill Publishing, New Delhi, 3rdEdition.
4. Relevant NPTEL Courses.

COMPUTER APPLICATIONS IN CIVIL ENGINEERING LAB – I

CIV 326 **Credits:1.5**

Instruction: 3 Practicals / week **Sessional Marks:50**

End Exam: 3 Hours **End Exam Marks:50**

Prerequisites:

Remote Sensing & GIS (Basics)

Course Objective:

The objective of this course is to

1. Maximize the efficiency of planning and decision making
2. Integrate information from multiple sources
3. Eliminate surplus data and minimizing repetition

Course Outcomes:

1. Interpret remote sensing and GIS data for spatial analysis.
2. Design and execute remote sensing and GIS projects like creation of thematic maps, digital elevation modeling etc.,
3. Apply GIS techniques to solve simple civil engineering problems

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3		3	3				3	3		3		2	2
	2	3	3	3		3	3	3		3	3		3		2	2
	3	3	3	3	3	3	3			3	3		3		2	2

SYLLABUS

LIST OF EXPERIMENTS

Exercises in GIS:

1. Digitization of Map/Toposheet
2. Creation of thematic maps
3. Estimation of features and interpretation
4. Developing digital elevation model
5. Simple applications of GIS in civil engineering

REFERENCES

1. Basudeb Bhatta (2011), “Remote sensing and GIS”, Oxford Higher Education, New Delhi, 2nd Edition.
2. Anji Reddy M (2011), “Remote sensing and Geographical information system”, B.S Publications, Hyderabad.
3. P.A.Burrough (1998), “Principles of Geographical information systems for land resource assessment”, Clarendon Press, Oxford,2nd edition.
4. Relevant NPTEL Courses.

QUANTITATIVE – II & SOFT SKILLS

Course Code – Category: CIV 327 - HS **Credits: 1.5**

L	T	P	E	O
0	0	3	2	3

Sessional Marks: 100

End Exam : 3 Hours End Exam Marks: --

Course Objectives:

Quantitative aptitude-II

1. To categorize, apply and use thought process to distinguish between concepts of reasoning
2. To prepare and explain the fundamentals related to various possibilities and probabilities related to quantitative aptitude.
3. To critically evaluate numerous possibilities related to puzzles.

Soft Skills

1. To inculcate effective communication skills with appropriate body language.
2. To produce potent leaders, productive team players and effective individuals with proper professional ethics.
3. To enable students to make successful oral presentations using relevant content.
4. To train students for Group discussions and job Interviews which improves their employability skills.
5. To facilitate students the importance of setting realistic goals and achieving them using time management techniques.

Course Outcomes:

Quantitative Aptitude-II

The student will be able to

1. Use their logical thinking and analytical abilities to solve reasoning questions from company specific and other competitive tests.
2. Solve questions related to permutation & combinations and probabilities from company specific and other competitive tests.
3. Understand and solve puzzle related questions from specific and other competitive tests.

Soft Skills

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

1. Comprehend the core engineering subjects using effective communication skills.
2. Present accurate and relevant information efficiently, using suitable material aids.
3. Work effectively as an individual as well in teams and emerge as responsible leaders.
4. Participate in group discussions and interviews using analytical and problem solving abilities, which enhance their employability skills.
5. Set time bound goals and realize them through strategic plans for successful career.

Mapping of Course Outcomes with Program outcomes:

CO		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
QA	1	2	1							2	2					
	2	3	1							2	2					
	3	2	2							2	2					
Soft Skills	1										3		3			
	2				2	2					3		2			
	3				3				3	3	3		2			
	4				3					3	3		2			
	5				2								2			

SYLLABUS

Section –A (Quantitative Aptitude –II)

UNIT I **8 Periods**

Numerical Reasoning:

Problems related to Number series, Analogy of numbers, Classification of numbers, Letter series, Seating arrangements, Directions, blood relations and puzzle test.

UNIT II **4 Periods**

Combinatorics:

Counting techniques, Permutations, Combinations and Probability

UNIT III **4 Periods**

Data sufficiency

Syllogisms

UNIT IV **4 Periods**

Application of Base system:

Clocks (Base 24), Calendars (Base7), Cutting of Cubes and cuboids

UNIT V **4 Periods**

Puzzle Solving & Time Management using various problems solving tools and techniques:

Selective puzzles from previous year placement papers
Selective puzzles from book Puzzles to puzzle you by shakunataladevi
Selective puzzles from book more puzzles by shakunataladevi
Selective puzzles from book puzzles by George summers

Books for practice

1. Quantitative aptitude by RS Agarwal, S Chand Publications
2. Verbal and non verbalReasoning by RS Agarwal from S Chand publications
3. Puzzles to puzzle you by shakunataladevi orient paper back publication
4. More puzzles by shakunataladevi orient paper back publication
5. Puzzles by George summers orient paper back publication.

References:

1. Barron’s by Sharon Welner Green and Ira K Wolf (Galgotia Publications pvt. Ltd.)
2. Material from ‘IMS, Career Launcher and Time’ institutes for competitive exams.
3. Reasoning by BS SijwaliArihant publications
4. Reasoning Arun Sharma McGrawhill publications

Websites:

1. www.m4maths.com
2. www.Indiabix.com
3. 800score
4. Official GRE site
5. Official GMAT site

Note: The concepts learnt in Semester I will be tested in the Mid-term and Semester end exams during the II Semester as well.

Reading/ Listening material:

1. Newspapers like 'The Hindu', 'Times of India', 'Economic Times'.
2. Magazines like Frontline, Outlook and Business India.
3. News channels NDTV, National News, CNN

References:

1. Books written by Stephen Covey and Dale Carnegie-Seven Habits of Highly Effective People etc-Simon & Schuster, Running Press book publishers
2. Books written by Bertrand Russell-Oxford University Press

Suggested General Reading

1. Who Moved My Cheese? By Spencer Johnson-GP Putnam's Sons
2. The art of War-Sun Tzu by Nabla, Barnes & Noble
3. The Monk Who Sold Ferrari-Robin Sharma by Harper Collins, Jaico Publishers
4. The Hobbit and other books by JRR Tolkein-Harper Collins

Suggested Authors

1. William Dalrymple
2. V.S.Naipaul
3. Kushwanth Singh
4. Ernest Hemingway
5. Charles Dickens
6. Leo Tolstoy
7. R.K. Narayan
8. Amitav Ghosh
9. Vikram Seth
10. Oscar Wilde

SYLLABUS
Section – B (Soft Skills)

UNIT – I 9 Periods

Art of communication

1. Definition of Communication
2. Types of Communication
3. Non-verbal Communication
4. Listening skills
5. Feed back

D.A. - Practice of proper hand shake, practice of different postures and gestures and activity on giving feedback

UNIT – II 6 Periods

Presentation Skills

1. Purpose
2. Effective presentation strategies
3. Analysis of audience
4. Preparing an outline of the presentation,
5. Audio –visual aids
6. Body language**.**

D.A. -Group presentation by each team

UNIT – III 9 Periods

Group Discussions

1. Introduction- as a part of selection process-guidelines for GD
2. Types of GD
3. Nature of topics of G.D
4. Roles to be played by participants in a GD
5. Evaluation process

D.A–Group discussions

UNIT – IV 6 Periods

Team Building and Leadership

1. Importance of team work
2. Different stages of team formation
3. Good team vs. effective team
4. Team player and Team leader
5. Types of leadership
6. Decision making and negotiating skills

D.A-Decision making for a given situation

UNIT – V 3 Periods

Time- Management

1. Importance of time-management
2. Time-Management models
3. Prioritization
4. The art of saying 'No'
5. Identifying Time Wasters

D.A -Time- Bound activities devised by the facilitator

UNIT – VI 3 Periods

Goal-Setting

1. Different type of Goals (Immediate and Short term)
2. 'SMART' Goals

3. Strategies to achieve goals

D.A - Prepare a chart of immediate, short term and long term goals

UNIT – VII 9 Periods

Job- Interviews

1. Preparing Resumes and C.V's
2. Preparing for the interview
3. FAQ's (Integrity, Stress management, Close- Ask questions)

D.A –Mock interviews

REFERENCES

1. Sanjay Kumar and Pushpalata, *Communication Skills* ,Oxford University Press , 2011.
2. Allan Pease, Body Language, Sheldon Press,1997.
3. John A. Kline and BhavnaBhalla, *Speaking Effectively; Achieving Excellence in Presentations*, Pearson publication, 2013.
4. Marc Mancini, *Time Management*, Tata McGraw Hill publishing Comp.Ltd.,2003.
5. Peter Veruki, *The 250 Job Interview Questions,*Adams Media Corporation Avon, Massachusetts,1999.

FLUID MECHANICS LAB - II

CIV 328 **Credits: 1.5**

Instruction: 3 Practicals / week Sessional Marks: 50

End Exam: 3 Hours End Exam Marks: 50

Prerequisites:

Fluid Mechanics – I & II

Course Objectives:

The objective of the course is to enable the student

The objective of the course is to enable the student to calibrate different types of flow measuring devices to measure flow in tanks, pipes and open channels.

Course Outcomes:

At the end of this course student will be able to

1. Determine friction factor using Darcy - weisbach equation and coefficient of impact of jet on vanes.
2. Evaluate performance characteristics of Turbines and Pumps.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	2	2		3					3	3					2
	2	2	2		3					3	3					2

SYLLABUS
LIST OF EXPERIMENTS

1. To Study major losses in pipes – Pipe friction – To compute Darcy- Weisbach friction factor.
2. To Study performance characteristics of centrifugal pump
3. To Study performance characteristics of reciprocating pump
4. To Study constant head characteristic curves of Pelton turbine
5. To Study performance characteristics of Francis turbine
6. To compute coefficient of impact of jet on flat and hemispherical vanes
7. To compute Chezy's Constant and Manning's Coefficient of an open channel.
8. To compute energy loss in a hydraulic jump.

REFERENCES

1. Modi P.N. & Seth S.M. (2017), "Hydraulics & Fluid Mechanics including Hydraulics Machines", Standard Book House, New Delhi, 22nd Edition.
2. Relevant NPTEL Courses.

TECHNICAL SEMINAR

CIV 329 **Credits: 1.5**

Instruction: 3 Practicals / week Sessional Marks: 50

End Exam: 3 Hours End Exam Marks: -

Prerequisites:

Basic Communication Skills; Basics in Civil Engineering.

Course Objectives:

The objective of this course is

1. To enhance the communication skills of the students through participation and giving seminars.
2. To develop an overview of civil engineering and its applications in the students.
3. To promote teamwork and lifelong learning among the students.

Course Outcomes:

At the end of the course the students will be able to

4. Construct detailed presentations by analyzing and synthesizing information.
5. Deliver compelling oral presentations to evaluation committees.
6. Demonstrate effective teamwork and individual problem-solving skills.

Mapping of course outcomes with program outcomes:

		PO												PSO		
		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO	1	3	3		3	3			3				3			
	2								3		3		3			
	3	3							3	3	3		3			

OUTLINE OF SYLLABUS

Students have to prepare a report on a case study, design or practical application in civil engineering and make a presentation in teams of maximum 2 students. Duration of each seminar shall be 20 minutes per team including discussion. Evaluation to be done by a Panel of Examiners nominated by HoD with at least one faculty member of specialization related to the seminar topic.

REFERENCES

1. National & International Journals / Standard Magazines / Reports / Case Studies in civil engineering.
2. NPTEL courses in civil engineering.