Scheme and Syllabus of
B.E.(Civil Engineering)

3rd TO 8TH Semester 2017 -2018

PANJAB UNIVERSITY, CHANDIGARH

Vision

To establish an outstanding centre of excellence for providing a quality engineering education to the students and services to the professional and the community; to produce highly competent Civil Engineers and to employ principles of continual quality improvement to enhance its programme and faculty.

Mission

a) To serve the people of the Society by providing a broad and high quality education to its student for a successful professional career.

b) To conduct strong base and knowledge for innovation.

c) To serve the Construction Industry; Civil Engineering Profession through dissemination of knowledge and technical services.

Program Education Objectives (PEO)

1. To train the students so that they can work and contribute to the infrastructure development projects being undertaken by Govt. and Private or any other sector companies.
2. To train students in such a way that they can pursue higher studies and contributes to the teaching profession/ research and development of Civil Engineering and other allied fields.
3. To train students in a manner that they should function effectively in the multicultural and multidisciplinary groups for the sustainable development and growth of civil engineering projects and profession.

Program Outcomes (PO)

A. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
B. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
C. **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.
D. **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.
E. **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.
F. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
G. **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.
H. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
I. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
J. **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.
K. **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.
L. 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.

Scheme of Examination in B.E. Civil Engineering

Second Year –Third semester

Sr. No	Paper Code	Subject Title	Scheme of Teaching					University External Marks	Internal Sessional Marks	Total
			L	T	P	Hrs	Credit			
1	CIV 301	Surveying I	4	0	0	4	4	50	50	100
2	CIV 302	Solid Mechanics	4	0	0	4	4	50	50	100
3	CIV 303	Structural Analysis I	4	0	0	4	4	50	50	100
4	CIV 304	Transportation Engg. I	4	0	0	4	4	50	50	100
5	CIV 305	Engineering Geology	3	0	0	3	3	50	50	100
6	CIV 306	Fluid Mechanics II	4	0	0	4	4	50	50	100
7	CIV 351	Surveying I Lab	0	0	3	3	2	-	50	50
8	CIV 354	Transportation Engg. I Lab	0	0	2	2	1	-	50	50
9	CIV 352	Solid Mechanics Lab	0	0	2	2	1	-	50	50
TOTAL			**23**	**0**	**7**	**30**	**27**	**300**	**450**	**750**

Second Year –Fourth semester

Sr. No	Paper Code	Subject Title	Scheme of Teaching					University External Marks	Internal Sessional Marks	Total
			L	T	P	Hrs	Credit			
1	CIV 401	Reinforced Concrete Design - I	4	0	0	4	4	50	50	100
2	CIV 402	Structural Analysis II	4	0	0	4	4	50	50	100
3	CIV 403	Surveying -II	4	0	0	4	4	50	50	100
4	CIV 404	Transportation Engg. II	4	0	0	4	4	50	50	100
5	CIV 405	Concrete Technology	3	0	0	3	4	50	50	100
6	CIV 406	Disaster Management	4	0	0	4	4	50	50	100
7	CIV 451	Reinforced Concrete Design - I Lab	0	0	2	2	2	-	50	50
8	CIV 453	Surveying II Lab	0	0	2	2	2	-	50	50
9	CIV 457	RCC Drawing – I	0	0	2	2	2	-	50	50
TOTAL			**23**	**0**	**6**	**29**	**30**	**300**	**450**	**750**

Third Year –Fifth semester

Sr. No	Paper Code	Subject Title	Scheme of Teaching					University External Marks	Internal Sessional Marks	Total
			L	T	P	Hrs	Credit			
1	CIV 501	Steel Structures Design-I	4	0	0	4	4	50	50	100
2	CIV 502	Irrigation Engg.-I	4	0	0	4	4	50	50	100
3	CIV 503	Geotechnical Engg.	4	0	0	4	4	50	50	100
4	CIV 504	Environmental Engg. I	4	0	0	4	4	50	50	100
5	CIV 505	Estimating and Costing	4	0	0	4	4	50	50	100
6	CIV 551	Steel Drawing-I	0	0	2	2	2	-	50	50
7	CIV 553	Geotechnical Engg Lab	0	0	2	2	2	-	50	50
8	CIV 554	Environmental Engg. I Lab	0	0	2	2	2	-	50	50
9	CIV 555	Survey Practical Training	-	-	-	-	2	-	50	50
TOTAL			**20**	**0**	**6**	**26**	**28**	**250**	**450**	**700**

Third Year –Sixth semester

Sr. No	Paper Code	Subject Title	Scheme of Teaching					University External Marks	Internal Sessional Marks	Total
			L	T	P	Hrs	Credit			
1	CIV 601	Reinforced Concrete Design - II	4	0	0	4	4	50	50	100
2	CIV 602	Construction planning & Management	3	0	0	3	3	50	50	100
3	CIV 603	Advanced Structural Analysis	4	0	0	4	4	50	50	100
4	CIV 604	Environmental Engg. II	4	0	0	4	4	50	50	100
5	CIV 605	Foundation Engg.	4	0	0	4	4	50	50	100
6	CIV 651	RCC Drawing –II	0	0	2	2	1	-	50	50
7	CIV 654	Environmental Engg. II Lab	0	0	2	2	1	-	50	50
8	CIV 655	Foundation Engg. Lab	0	0	2	2	1	-	50	50
9	CIV 656	Software Lab	0	0	2	2	1	-	50	50
TOTAL			**19**	**0**	**8**	**27**	**23**	**250**	**450**	**700**

Four weeks Industrial training after 6th semester.

Fourth Year –Seventh semester

Sr. No	Paper Code	Subject Title	Scheme of Teaching					University External Marks	Internal Sessional Marks	Total
			L	T	P	Hrs	Credit			
1	CIV 701	Steel Structures Design-II	4	0	0	4	4	50	50	100
2	CIV 702	Irrigation Engg.-II	4	0	0	4	4	50	50	100
3	CIV 703	Advanced Transporation Engg	4	0	0	4	4	50	50	100
4	CIV- 704	**Elective-I** Bridge engineering	3	0	0	3	3	50	50	100
5	CIV - 705	Hydropower Engg	3	0	0	3	3	50	50	100
6	CIV 751	Steel Drawing-II	0	0	2	2	1	-	50	50
7	CIV 752	Irrigation Engg-II Dwg	0	0	2	2	1	-	50	50
8	CIV 753	Project-I	0	0	4	4	2	-	50	50
9	CIV 754	Industrial Practical Training	-	-	-	-	4	-	100	100
TOTAL			**15**	**0**	**8**	**23**	**23**	**200**	**450**	**650**

Fourth Year –Eigth semester

OPTION 1

Sr. No	Paper Code	Subject Title	Scheme of Teaching					University External Marks	Internal Sessional Marks	Total
			L	T	P	Hrs	Credit			
1	CIV 801	Advanced Environmental Engg	4	0	0	4	4	50	50	100
2	CIV 802	Computational methods	4	0	0	4	4	50	50	100
3	CIV- 803	Maintenance of Buildings	3	0	0	3	3	50	50	100
4	CIV 804	Hydrology and Dams	4	0	0	4	4	50	50	100
5	CIV 805	**Elective-II** Prestressed Concrete design	3	0	0	3	3	50	50	100
6	CIV 806	Town planning and Architecture	3	0	0	3	3	50	50	100
7	CIV 853	Concrete Technology Lab	0	0	2	2	1	-	50	50
8	CIV 854	Project-II	0	0	6	6	3	-	100	100
TOTAL			**18**	**0**	**8**	**26**	**22**	**250**	**400**	**700**

OPTION 2			**CREDITS =22**	
			University External Marks	**Internal assessment marks**
1	CIV 808	Industrial Training	300	350

OPTIONAL: INDUSTRIAL TRAINING IN EIGHTH SEMESTER

THIRD SEMESTER

Course Title	**Surveying-I**			**Credits**	**04**
Course Code	**CIV-301**			**L T P**	**4 0 3**
Contact Hours	**45**	**Max Marks: 50**	**Internal Assessment-50**	**Elective**	**N**
Pre-Requisite	**Knowledge about various surveys needed for any type of construction**				
Course Objectives	The objective of the subject is to study the maps and plans and also to learns the techniques for drawing maps in plane areas and in hilly areas using different instruments.				
Course Outcomes	Students will be able to understand the concept behind surveying and learn the use of various instruments related to surveying.				

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

PART– A

1.INTRODUCTION

Basic principles of Surveying, Plans, Scales, Maps, Different types of surveys, various steps involved in chain surveying. (4-hours)

2.COMPASS SURVEY

Principle, Traverses, Meridians, Bearings, Included angles from bearing and vice versa, Prismatic Compass, Surveyor's compass, Magnetic declination, local attraction, Field work for compass traverse, Plotting and adjustment errors. (6-hours)

3.LEVELLING

Basic definitions, Dumpy level, Levelling staffs, Simple Levelling, Terms in Levelling, Precautions, Differential Levelling. Field Book for Levelling, Profile leveling & Cross-sectioning (6-hours)

4.CONTOURING

Contour characteristics, direct and indirect methods of contouring, Contour gradients and automatic levels. (6-hours)

PART – B

5.PLANE TABLING

Plane Table and its accessories, Telescopic alidade, Principle, Basic definitions, setting and orienting the plane table, methods of plane tabling, Three point problem, Two point problem. (6-hours)

***6.*THEODOLITE TRAVERSING**

Vernier Theodolite, Basic definitions, Temporary and permanent adjustments, Measuring horizontal and vertical angle, Optical Theodolites, Electronic Digital Theodolites, Selection and marking of stations for traversing, Angular measurements. (6-hours)

7. TRAVERSE ADJUSTMENTS

Balancing angles of the traverse, computation of latitudes & departures, consecutive & independent coordinates, Checks for open and closed traverses, Adjustment methods for a traverse, Gales traverse table, Omitted measurements. (6-hours)

8.TACHEOMETRIC SURVEY

Introduction, Tacheometer and stadia rods, Determination of constants, Purpose of using Anallatic lens without derivation. Tacheometric equations for inclined sights. Tangential Methods. Auto Reduction Tacheometers. (7-hours)

TEXT BOOKS RECOMMENDED:

1.Dr. K.R. Arora, Surveying Vol. I & II Standard Book House, New Delhi.
2.Dr. B.C. Punmia, Surveying Vol. I & II Luxmi Publications, New Delhi.
3.Dr. S.K. Duggal: Surveying Vol. I & II Tata McGraw Hill, New Delhi.
4.Y. R. Nagraga & A.
Veeraragavan; Surveying Vol. I, Nem Chand Bros., New Delhi

5.C. Venkatramaish Text Book of Surveying, University Press (India) Limited, Hydrabad
6.G.L. Hasmer, Geodesy John Wiley & Sons, New York.

Course Title	**Surveying-I**		**Credits**	**02**
Course Code	**CIV351**	**Max marks 50**	**P**	**03**

1. Measurement of distance, ranging a line, plotting of details in chain survey.
2. Measurement of bearing and angles with compass, adjustment of traverse by graphical method.
3. Different methods of levelling, height of instrument, rise & fall methods.
4. Plane table survey, different methods of plotting two point & three point problem.
5. Setting up temporary and permanent adjustment of a theodolite. Measurement of horizontal angles by repetition and reiteration methods using a theodolite.

Course Title	**Solid Mechanics**			**Credits**	**04**
Course Code	**CIV- 302**			**L T P**	**4 0 2**
Contact Hours	**45**	**Max Marks-50**	**Internal Assessment-50**	**`Elective**	**N**
Pre-requisites	Knowledge of general principles of stresses and strains				
Course Objectives	1. To expand the knowledge in the field of mechanics of solid and its application to structural analysis. 2. To introduce the various theories, this will be helpful for the students in their upcoming subjects. 3. This is the basic subject of structures to learn the fundaments and utility of concepts in the upcoming subjects related to structures.				
Course Outcome (s)	1. Students will learn the basic Properties of Solids like stress, strain, Elongation, Elasticity, deflection etc. 2. Students will be competent to find the strain energy, bending and shear stresses in the structural members. 3. Student will be able to draw bending moment and Shear force diagrams that will be used for designing of structural members				

Note for Examiner: The examiner shall set total seven questions. First Question is compulsory covering whole syllabus (ten questions carrying one mark each). Three questions will be set from Part A and three questions from Part B (carrying 10 marks each) and students are required to attempt 2 questions from each part.

PART- A

1. CONCEPT OF EQUILIBRIUM

Load, reaction; General equilibrium equations; Equilibrium of a point in space; Equilibrium of a member; Concept of free body diagrams; Important mechanical properties- Elasticity, Plasticity, Ductility, Brittleness, Malleability, Toughness, Hardness, Strength. (4 hours)

2. SIMPLE STRESS AND STRAINS

Introduction, Concept of stress and strain, Stress-strain curves for ductile, brittle materials, Generalized Hooke's law, Stress-strain diagram of ductile and brittle material, statically determinate and indeterminate problems, compound and composite bars, thermal stresses. Elastic constants, relations between various elastic constants and its use, Lateral strain, volumetric strain, poisons ratio. (7 Hours)

3. COMPLEX STRESS AND STRAINS

Introduction, Normal stress, tangential stress, Rectangular block subjected to normal stress along and across two planes, combination of normal and tangential stress, Concept of principal stress and its computation, Mohr circle, Principal strains, computation of principal stresses from the principal strains. (6 Hours)

4. SHEAR FORCE AND BENDING MOMENT DIAGRAMS

Introduction to the concept of reaction diagrams—shear force and bending moment, Role of sign conventions, Types of load, beams, supports, Shear force and bending moment diagrams: simply supported, overhang and cantilever beams subjected to any combination of point loads, uniformly distributed and varying load, and moment, Relationship between load, shear force and bending moment, Different methods for plotting a bending moment and shear force diagrams. (8 Hours)

PART- B

5. STRAIN ENERGY

Introduction, Load deflection curve, Resilience and Impact Loading, Strain energy for gradually applied, Strain energy for suddenly applied, Strain energy for impact loading and shear stress. (4 Hours)

6. BENDING AND SHEAR STRESSES

Introduction, Assumptions and derivation of flexural formula for straight beams, Centroid of simple and built up section, second moment of area, Bending stress calculation for beams of simple and built up section, composite sections (flitched sections), Shear stress, Variation of bending and shear stress along the depth of section. Combined direct and bending stresses, Middle third rule, Analysis for various sections. (8 Hours)

7. TORSION OF CIRCULAR SHAFTS

Torsion, basic assumptions, derivation of torsion equation, Power transmitted by shafts, analysis and design of solid and Hollow shafts based on strength and stiffness, Sections under combined bending and torsion, equivalent bending and torsion. (6 Hours)

8. FAILURE THEORIES

Maximum principal stress theory, Maximum shear stress theory, Distortion Energy theory, Strain Energy theory. (2 Hours)

TEXT BOOKS RECOMMENDED

1. Strength of Material : S. Ramamrutham by TMH
2. Mechanics of Material : B.C.Punmia, Luxmi Publications
3. Strength of Material : R.K. Rajput, S. Chand Publications
4. Strength of Materials : Sadhu Singh, Khanna Publisher

OTHER RECOMMENDED BOOKS

1. Mechanics of Material : E .Popov, Pearson Education

2. Strength of Materials : Gere, Cengage Learning

Course Title	**Solid Mechanics Lab**		**Credits**	**01**
Course Code	**CIV- 352**	**Max. Marks-50**	**P**	**02**

Note: All the Experiments are to be performed in the Lab.

1. To determine the Hardness of the given Specimen using Rockwell hardness test.
2. To determine the Hardness of the given specimen using Brinell hardness test.
3. To determine the Impact strength through Izod test and Charpy test
4. Draw Stress Strain curve for Ductile and Brittle material in tension.
5. Draw Stress Strain curve for Ductile and Brittle material in compression.
6. Draw shear stress, shear strain curve for ductile and brittle material in torsion strength testing
7. Draw load deflection curve for spring in loading and unloading conditions.
8. To determine the load carrying capacity of the leaf spring.

Course Title	**Structural Analysis-I**			**Credits**	**04**
Course Code	**CIV-303**			**L T P**	**4 0 0**
Contact hrs	**45**	**Max Marks-50**	**Internal Assesment-50**	**Elective**	**N**
Pre-requisites	**Analysis of Statically Determinate structures**				
Course Objectives	1. Equations of static equilibrium. 2. Bending of columns under different conditions. 3. Deflection of statically determinate structures 4. Stresses and strains in spherical and cylindrical shell 5. Analysis of determinate trusses 6. Influence lines and rolling Loads **7.** Analysis of arches and suspension bridges				
Course Outcome (s)	1. Explaining the Equations of static equilibrium. 2. Explaining the Euler's theory of columns buckling. 3. Equating the deflection in statically determinate structures. 4. Equating the Stresses and strains in spherical and cylindrical shell				

	5. Determination of forces in member of trusses by method of joints and section 6. Analysis of moving load by influence lines **7.** Analysis of 3 hinged arches and suspension bridges.

Note: The examiner shall set total seven questions. First Question is compulsory covering whole syllabus(ten questions carrying one mark each). Three questions will be set from Part A and three questions from Part B(carrying 10 marks each) and students are required to attempt2 questions from each part .

PART A

1. INTRODUCTION

Classification of structures, equations of static equilibrium, Free body diagrams, static determinacy and stability of structure, Principal of superposition. (03 hours)

2. COLUMN & BUCKLING

Definitions and examples of instability of columns; criteria for stability of columns, Euler's theory of columns buckling, Euler's equation for various end restraints, Rankine formula.. (03 hours)

3. DEFLECTION OF STATICALLY DETERMINATE BEAMS

Double Integration Method and Macaulay's Method, moment area method, conjugate beam method, unit method and strain energy method. Maxwel's reciprocal theorem. (05 hours)

4. THIN CYLINDERS AND SPHERES

Introduction, stresses and strains in thin cylinders and spherical shell, volumetric change, thin essels subjected to internal pressure. (04 hours)

5. ANALYSIS OF DETERMINATE TRUSSES

Introduction, Determination of forces in member of trusses by method of joints, method of sections (05 hours)

PART B

6. ANALYSIS OF DAMS AND RETAINING WALLS

Introduction, limit of eccentricity for no tension in the section, core of the section, middle third rule. (04 hours)

7. ROLLING LOADS

Introduction to rolling loads and influence lines, Determination of shear force, bending moment at a section and absolute shear force and bending moment due to single point load, uniformly distributed load, several point loads etc. (05 hours)

8. INFLUENCE LINES

Construction of Influence lines for reaction, shear forces and bending moment for simply supported beams, Influence lines for forces in members of frames. (06 hours)

9. ARCHES

Introduction, Analysis of three hinged arches, Influence lines for horizontal thrust, shear force, bending moment, radial shear and normal thrust for three hinged arch. (05 hours)

10. CABLES AND SUSPENSION BRIDGES

Introduction, shape of a loaded cable, cable carrying point loads and UDL, cables with ends at different level, cable subjected to temperature stresses, suspension bridge with two hinged and three hinged stiffening girders. (05 hours)

BOOKS:

1. Strength of Materials (Volume 1) :B. C. Punmia and Jain, Luxmi Publications
2. Strength of Materials (Volume 2) :B. C. Punmia, Luxmi Publications
3. Strength of Materials :R. S. Khurmi, S. Chand
4. Mechanics of Structures :R. S. Khurmi,, S. Chand

Course Title	**Transportation Engg.-I**			**Credits**	**04**
Course Code	**CIV-304**			**L T P**	**4 0 2**
Contact Hours	**45**	**Max Marks:50**	**Internal Assessment-50**	**Elective**	**N**
Pre-Requisite	**Knowledge about various surveys needed for any type of construction**				
Course Objectives	The objective of the subject is to study highway project planning and to design various elements of roads.				
Course Outcomes	Students will be able to understand the basic concepts of various fields of transportation engineering.				

Note for Examiner- Examiner will set 7 questions of equal marks. First question will coverwhole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of thepaper will be divided into two parts having three questions each and the candidate is requiredto attempt at least two questions from each part.

PART– A

1.HIGHWAY PLANNING

Principles of Highway Planning, Classification of Roads, Highway Alignment, Basic requirements of an ideal alignment, Factors controlling alignment in plain & Hill Roads, Engineering Surveys for highway alignment. (4 Hours)

2.HIGHWAY GEOMETRIC DESIGN

Cross Section Elements, Carriageway, Camber, Sight Distances, Horizontal Curves, Extra-widening, Super-elevation, Vertical Curves. (4 Hours)

3.HIGHWAY MATERIALS

Properties of Sub-grade and Pavement Component Materials, Tests on Sub-grade Soil, Aggregates and Bituminous Materials. (4 Hours)

4.HIGHWAY CONSTRUCTION

Earthen/Gravel Road, Water Bound Macadam, Wet Mix Macadam, Bituminous Pavements, Cement Concrete Pavements. (4 Hours)

5.HIGHWAY DRAINAGE

Importance, Surface Drainage and Subsoil Drainage, Construction in Water-logged areas. (4 Hours)

PART- B

6.HIGHWAY MAINTENANCE

Pavement Failures, Pavement Evaluation, Maintenance and Strengthening Measures. (4 Hours)

7.HIGHWAY ECONOMICS & FINANCING

Total Transportation Cost, Economic Analysis, Sources of Highway Financing. (4 Hours)

8.TRAFFIC CHARACTERISTICS

Road User Characteristics, Driver Characteristics, Vehicular Characteristics (3 Hours)

9.TRAFFIC STUDIES

Volume and Speed Studies, O-D Survey, Parking Study (3 Hours)

10.TRAFFIC SAFETY

Cause and Type of Accidents, Use of Intelligent Transport System (4 Hours)

11.TRAFFIC CONTROL MEASURES

Signs, Markings, Islands, Signals (7 Hours)

TEXT BOOKS RECOMMENDED :

1. Khanna S.K., and Justo, C.E.G. "Highway Engineering", Nem Chand and Brothers, Roorkee, 1998.
2. Kadiyali, L.R. "Principles and Practice of Highway Engineering", Khanna Publishers, New Delhi, 1997.
3. Flaherty, C.A.O. "Highway Engineering", Volume 2, Edward Arnold, London, 1986.
4. Sharma, S.K. "Principles, Practice & Design of Highway Engineering", S. Chand & Company Ltd., New Delhi, 1985.
5. Khanna S.K., and Justo, C.E.G. "Highway Material Testing Laboratory Manual", Nem Chand and Brothers, Roorkee, 1997.

Course Title	**Transportation Engg.-I**		**Credits**	**01**
Course Code	**CIV 354**	**Max marks 50**	**P**	**02**

AGGREGATE TESTS

1. Sieve Analysis of fine and coarse aggregates
2. Aggregate Crushing Value Test.
3. Aggregate Impact Value Test.
4. Los Angles Abrasion Value Test.
5. Aggregate Soundness Test.
6. Flakiness Index and Elongation Index Test.
7. Specific Gravity and Water Absorption Test.

BITUMEN TESTS

1. Penetration Test.
2. Ductility Test.
3. Softening Point Test.
4. Viscosity Test.
5. Flash Point and Fire Point Test.

TEXT BOOKS RECOMMENDED :

1. Highway Materials Testing : Khanna & Justo
2. Relevant IS Standards
3. Laboratory Testing in Highway Engineering (Instruction Manual) : AK Duggal, NITTTR, 2006.

Course Title	**Engineering Geology**			**Credit**	**3**
Course Code	**CIV. 305**			**L T P**	**3 0 0**
Contact Hours	**30**	**Max. Marks-50**	**Internal Assessment-50**	**Elective**	**N**
Pre-requisites	**Knowledge of geological features of Earth**				
Course Objectives	The course content should be taught and learning imparted with the aim to develop theoretical knowledge and skills so that they are able to:- 1. study the geological features of Earth 2. study the Engineering properties of different rocks 3. study about application of Geology in planning and designing of different Civil Engineering Projects.				
Course Outcome (s)	The theory should be taught along with examples in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes: 1. Understand the geological features based upon the available documents. 2. Understand the engineering properties of the rocks 3. Understand the application of knowledge of Geology in planning and designing of different Civil Engineering Projects				

Note: The examiner shall set total seven questions. First Question is compulsory covering whole syllabus(ten questions carrying one mark each). Three questions will be set from Part A and three questions from Part B (carrying 10 marks each) and students are required to attempt 2 questions from each part .

PART A

1. GENERAL GEOLOGY

Importance of Engg. Geology applied to Civil Engg. Practices. Weathering, definition, types and effect. Geological works of rivers, wind, glaciers as agents of erosion, transportation and deposition. (4 Hours)

2. ROCKS & MINERALS

Minerals, their identification, igneous, sedimentary & metamorphic rocks. Classification of rocks for engineering purposes. Rock quality designation (RQD). (4 Hours)

3. STRUCTURAL GEOLOGY

Brief idea about stratification, apparent dip, true dip, strike and in conformities. Folds, faults & joints : definition, classification relation to engineering operations. (4 Hours)

4. ENGINEERING GEOLOGY

Geological considerations in the Engg. Projects like tunnels, highways, foundation, dams, reservoirs. (2 Hours)

5. EARTHQUAKE

Definition, terminology, earthquake waves, intensity, recording of earthquake. (2 Hours)

PART B

6. ENGINEERING PROPERTIES OF ROCKS AND LABORATORY MEASUREMENT

Uniaxial compression test, tensile tests, permeability test, shear tests, size and shape of specimen rate of testing. Confining pressure, stress strain curves of typical rocks. Strength of intact and fissured rocks, effect of anisotropy, effect of saturation and temperature (5 Hours)

7. IN-SITU DETERMINATION OF ENGG. PROPERTIES OF ROCK MASSES

Necessity of in-situ tests, uniaxial load tests in tunnels and open excavations, cable tests, flat jack test, shear test, pressure tunnel test. Simple methods of determining in situ stresses, bore hole test. (5 Hours)

8. IMPROVEMENT IN PROPERTIES OF ROCK MASSES

Pressure grouting for dams and tunnels, rock reinforcement rock bolting. (4 Hours)

BOOKS:

1. Introduction to Rock Mechanics : Richard E. Goodman.
2. Engg. Behaviour of rocks : Farmar, I.W.
3. Rock Mechanics and Engg. : Jaager C.
4. Fundamentals of Rock Mechanics : Jaager and Cook
5. Engineering Geology : D.S.Arora
6. Engineering Geology : Parbin Singh
7. Rock Mechanics for Engineering : B.P. Verma.
8. Engineering Geology : Parbin Singh
9. Rock Mechanics for Engineering : B.P. Verma.

Course Title	**Fluid Mechanics II**			**Credits**	**04**
Course Code	**CIV 306**			**L T P**	**4 0 0**
Contact Hours	**45**	**Max marks- 50**	**Internal Assessment- 50**	**Elective**	**N**
Pre-requisites	**Fluid Mechanics I**				
Course Objectives	1. The objective of the course is to give information about the application of different types of flows studied in Fluid Mechanics-I and also to study how the hydraulic energy can be used in hydraulic machines. 2. The course will detail about the variations in the design of the channels based on the type of flow and obstructions carried by them such as contractions and humps etc. The various designs of irrigation structures to be learnt are based on the basics studied in this class.				
Course Outcomes	1. The student would be able to learn the basic equations and concepts related to their application for designing various types of open channels. 2. Apart from study of channels, the students will also learn about the impact of free jets on various types of plates and apply this information on the topics of turbines and pumps and hence the hydroelectric generation plant. 3. Overall, this course will give a general overview of fluid processes taking place within channels and will be helpful to apply in other courses of Civil engineering.				

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

PART –A

1. UNIFORM FLOW IN OPEN CHANNELS

Flow classifications, Basic resistance Equation for open channel flow. Chezy, Manning, Bazin and Kutter formulae. Variation of roughness coefficient, Conveyance and normaldepth, Velocity Distribution. Most efficient flow sections; rectangular, trapezoidal and circular. (5-hours)

2. ENERGY AND MOMENTUM PRINCIPLES AND CRITICAL FLOW

Energy and specific Energy in an open channel; Critical depth for rectangular and trapezoidal channels. Momentum and specific force in open channel flow, Alternate depths and Sequent depths, Applications of specific energy to transitions and Broads crested weirs. (5-hours)

3. GRADUALLY VARIED FLOW

Different Equation of water surface profile; limitation, properties and classification of water and surface profiles with examples, Computation of water surface profile by graphical, numerical and analytical approaches. (5-hours)

4. GRADUALLY VARIED FLOW

Theory of Jump, Elements of jump in a rectangular Channel, length and height of jump, location of jump, Energy dissipation and other uses, Surge as a moving hydraulic jump. Positive and negative surges. (5-hours)

PART –B

5. FLOW PAST IMMERSED BODIES

Drag and lift: deformation Drag and pressure drag. Drag on a sphere, cylinder and Airfoil: Lift-Magnus Effect and circulation, lift on a circular cylinder. (5-hours)

6. IMPACT OF FREE JETS

Force exerted by fluid jet on stationary flat plate, Force exerted by fluid jet on moving flat plate, Force exerted by fluid jet on stationary curved vane, Force exerted by fluid jet on moving curved vane. (5-hours)

7. HYDRAULIC TURBINES

Head and efficiencies of hydraulic turbines, Work done and efficiencies of Pelton Wheel, Francis and Kaplan turbines, Surge tanks. (5-hours)

8. RECIPROCATING PUMPS

Main components and working of reciprocating pumps, Work done by single and double acting pumps, Coefficients of discharge, slip, percentage slip and negative slip of reciprocating pumps. (5-hours)

9. CENTRIFUGAL PUMPS

Main components and working of centrifugal pumps, Work done by impeller Head of Pump, Losses and efficiencies, Specific speed, NPSH, Cavitation in centrifugal pumps. (5-hours)

TEXT BOOKS RECOMMENDED :

1. Hydraulic and Fluid Mechanics : Modi and Seth, Standard Book House, Delhi
2. Fluid Mechanics : R. J. Garde and A. Z. Mirjaguaker,
3. Flow in open channel : Subramanya K. McGraw Hill.
4. Fluid Mechanics : Streeter, McGraw Hill.
5. Fluid Mechanics & Hydraulic Power Engineering : D.S Kumar, Kataria & Sons

FOURTH SEMESTER

Course Title	**Reinforced Concrete Design-I**			**Credit**	**4**
Course Code	**CIV-401**			**L T P**	**4 0 2**
Contact Hours	**45**	**Max. Marks-50**	**Internal Assessment-50**	**Elective**	**N**
Pre-requisites	Knowledge of Basic Constituents of Reinforced Concrete				
Course Objectives	The course content should be taught and learning imparted with the aim to develop theoretical knowledge and skills so that they are able to:- 1. To learn about properties of materials used in RCC structures various methods of design RCC structures. 2. To study about Limit State Method of design of RCC structures. 3. To learn how to design various components of buildings such as beams, slabs, columns, isolated footings and staircases. 4. To study concepts of earthquake engg. and various IS codes of earthquake resistant design of structures.				

Note for Examiner- The examiner shall set total seven questions. First Question is compulsory covering whole syllabus (ten questions carrying one mark each). Three questions will be set from Part A and three questions from Part B (carrying 10 marks each) and students are required to attempt 2 questions from each part.
Use of IS 456-2000, SP–16(Charts only), IS 1893:2002 is allowed.

PART– A

1. INTRODUCTION TO RCC

Reinforced concrete, definition, properties of materials, grades of concrete and reinforcing steel, stress-strain curves for concrete & steel , permissible stresses, design philosophies working stress design, ultimate strength and limit state design method. (06-hours)

2. LIMIT STATE DESIGN METHOD

Introduction, Limit States, Characteristic values, characteristic strength, characteristic loads, design values for materials and loads, factored loads. (04-hours)

3.DESIGN OF BEAMS

Design of singly reinforced & doubly reinforced rectangular beam sections in Flexure, Shear , Bond & Torsion using Limit State method, Development length & continuation of reinforcement beyond cut off points. Design of Flanged Sections (T-sections & L-sections), Check for Limit state of serviceability- deflection, Effective span to effective depth ratios, modification factors for singly reinforced, doubly reinforced and flanged beams. (08-hours)

4.DESIGN OF COLUMNS

Limit State of Collapse (Compression) Columns and their classification, reinforcement in columns, assumptions, short and long (both tied and helical) columns subjected to axial load, short columns subject to axial, uniaxial and biaxial bending (using SP:16). (06-hours)

PART– B

5.DESIGN & DETAILING OF SLABS

Design of one-way slab and two-way rectangular slab for various boundary conditions. (06-hours)

6.FOOTINGS

Design of Isolated Footings under Axial Loads. (04-hours)

7.STAIRCASES

Introduction to various types of stairs, Terminology, design of Single flight and dog legged stair. (06-hours)

8.EARTHQUAKE RESISTANT DESIGN

Concepts of seismic design, Lateral force analysis of buildings using IS: 1893-2002, ductility, Provisions of IS: 4326, Provisions of IS: 13920, Detailing as per SP:34 (05-hours)

TEXT BOOKS RECOMMENDED

1. A.K. Jain , “Limit State Design”, Nem Chand & Bros. Roorkee
2. M.L. Gambhir, “Concrete Technology” McGraw Hill

3. Punmia & Jain, "Reinforced Concrete Structures", Luxmi Publications.
4. Jai Krishna & Chander Shekran, "Elementary Earthquake Engg.", South Asian Publishers Delhi.
5. IS: 1893-2002, Indian Standard Criteria for Earthquake Resistant
6. Design of Structures, Part I, General Provisions, BIS, New Delhi
7. Pankaj Aggarwal & Manish Srikhande, "Earthquake Resistant Design of Structures ", Prentice Hall of India.

Course Title	**Reinforced Concrete Design-I (Practical)**		**Credit**	**1**
Course Code	**CIV-451**	**Max. Marks-50**	**P**	**2**

1. To determine the Specific Gravity of cement.
2. To determine the Standard Consistency.
3. To determine Initial and Final Setting time of Cement.
4. To determine Soundness of Cement.
5. To determine the Compressive Strength of Cement.
6. To determine the Compressive Strength of Bricks.
7. To determine the Transverse Strength of Tiles.
8. To determine the Compressive Strength of Concrete.
9. To determine the Slump of Concrete.
10. Non Destructive testing.

TEXT BOOKS RECOMMENDED

1. V. V. Shastri and M. L. Gambhir, Laboratory Manual on Concrete Testing (Part-I).
2. C. B. Kukreja, Laboratory Manual on Concrete Testing (Part-I).
3. PD Kulkarni, LN Mittal & Hemant Sood,Laboratory Manual on Concrete Technology

Course Title	**Structural analysis-II**			**Credits**	**04**
Course Code	**CIV.402**			**L T P**	**4 0 0**
Contact hrs	**45**	**Max Marks-50**	**Internal Assesment-50**	**Elective**	**N**
Pre-requisites	**Analysis of Statically Determinate structures**				
Course Objectives	1. Technical competence in the fundamental concepts of analysis of indeterminate structures. 2. Application of displacement methods and force methods of statically indeterminate structures.				
Course Outcome (s)	1. To understand the technical competence in the fundamental concepts of analysis of indeterminate structures. 2. Application of displacement methods and force methods of statically indeterminate structures by the slope deflection moment, moment distribution method and method of strain energy.				

Note: The examiner shall set total seven questions. First Question is compulsory covering whole syllabus (ten questions carrying one mark each). Three questions will be set from Part A and three questions from Part B (carrying 10 marks each) and students are required to attempt 2 questions from each part .

PART –A

1.STATICALLY INDETERMINATE STRUCTURES

Introduction to statically indeterminate structures, Static and Kinematic indeterminacy, Equation of Equilibrium, Compatibility Equations, Principle of Superposition, Influence lines for indeterminate structures using Muller Breslau's Principle. Methods of analysis (04 hours)

2.FORCE METHOD OF ANALYSIS

Method of Consistent Deformation, Three moment theorem, Analysis of Fixed and Continuous beams subjected to different loading conditions, sinking and rotation of support. (04 hours)

3.DISPLACEMENT METHOD OF ANALYSIS - SLOPE-DEFLECTION METHOD

Introduction, slope-deflection equations, analysis of statically indeterminate beams and rigid frames (sway and non-sway type) due to applied loads and uneven support settlements. (06 hours)

4.DISPLACEMENT METHOD OF ANALYSIS -MOMENT-DISTRIBUTION METHOD

Introduction, absolute and relative stiffness of members, stiffness and carry-over factors, distribution factors, analysis of statically indeterminate beams and rigid frames (sway and non-sway type) due to applied loads and uneven support settlements. (06 hours)

PART- B

5.APPROXIMATE METHODS OF STRUCTURAL ANALYSIS

Lateral load analysis of multistory frames, portal method and cantilever method. (06 hours)

6.METHOD OF STRAIN ENERGY

Strain energy for linear elastic system, Castigliano's first theorem and its application for deflection calculation in beams and rigid frames, minimum strain energy theorem, Castgliano's second theorem and its application for analysis of beams and rigid frames, unit load methodand its application for analysis of beams and frames. (08 hours)

7.REDUNDANT FRAMES

Analysis and deflection calculation using Minimum Strain Energy Theorem, Castigliano's theorems and Unit load Method, Lack of fit of member, temperature stresses. (04 hours)

8.TWO HINGED ARCHES

Types of Arches, Analysis of two Hinged Arches, Shear Force and Normal Thrust, Effect of Rib Shortening, Parabolic Arch subjected to concentrated load and UDL, Temperature Stresses, Circular Arches, Reaction Locus, Influence lines. (05 hours)

BOOKS :

1. Indeterminate Structures :R. L. Jindal, S. Chand
2. Theory of Structures Volume II :Punmia and Jain, Luxmi Publications
3. Indeterminate Structural Analysis :Kinney, Edison Wesley
4. Indeterminate Structures : C.K Wang, TMH
5. Basic Structural Analysis : C.S. Reddy, TMH
6. Indeterminate Structures : A.K. Jain, TMH
7. Structural Analusis (I&II) : S.S. Bhavikatti, Vikas Publishing House

Course Title	**Surveying-II**			**Credits**	**04**
Course Code	**CIV-403**			**L T P**	**4 0 3**
Contact Hours	**45**	**Max Marks :50**	**Internal Assessment-50**	**Elective**	**N**
Pre-Requisite	**Knowledge about various surveys needed for any type of construction**				
Course Objectives	The objective of the subject is to study surveying with latest softwares and equipments.				
Course Outcomes	Students will be able to understand the concept behind surveying and learn the use of various instruments related to surveying.				

NOTE: The examiner shall set total seven questions. First Question is compulsory covering whole syllabus(ten questions carrying one mark each). Three questions will be set from Part A and three questions from Part B (carrying 10 marks each) and students are required to attempt 2 questions from each part .

PART– A

1.CURVES

Types of horizontal curves, Basic definitions, Degree of curve, elements of a curve, Peg interval, setting out curves with and without theodolite, Obstacles in curve setting. (6 Hours)

2.TRANSITION CURVES

Combined circular and Transition Curves and their setting out in field. Vertical curves, Setting out vertical curves by chord gradient and tangent correction methods . (6 Hours)

3.SURVEY ADJUSTMENTS

Definitions, Law of Weights, Theory of least squares, normal equations, Most probable values by normal equations, by method of differences and by method of correlates, Triangulation Adjustments by least square method. (4 Hours)

4.ELEMENTS OF PHOTOGRAMMETRY

Introduction, types of photographs, types and geometry of aerial photograph, flying height and scale, relief (elevation) displacement in vertical photographs. Stereoscopy, measurement of parallax and height determination, flight planning. (6 Hours)

PART– B

5.GIS

Definition of GIS, Components of GIS, Application areas & advantages of GIS ,Uses of GIS (6 Hours)

6.DIGITAL REPRESENTATION OF GEOGRAPHIC DATA

Raster & Vector data representation, acquiring & handling Raster geographic data, Raster based GIS data analysis, Characteristics of vector based GIS data processing. (5 Hours)

7.GPS

Introduction, working principle, various application of GPS related to Civil Engg., components of GPS – point positioning and differential positioning. (6 Hours)

8.REMOTE SENSING

Introduction, principles of electromagnetic remote sensing, remote sensing system classifications, imaging characteristics, extraction of metric information from remotely sensed images, integration of remote sensing & GIS, Introduction of Total station instrument. (6 Hours)

TEXT BOOKS RECOMMENDED:

1. Surveying Volume II and III : B. C. Punmia, Luxmi Publications
2. Surveying Volume II and III : K. R. Arora, Standard Book House.
3. Remote Sensing & GIS : B.Bhatta, Oxford Higher Education
4. Introduction to Remote Sensing : Campbell, J.B, Taylor & Francis,CBS Publishers & Distributers,New Delhi,2003
5. Understanding GPS, Principles & Applications : Kaplan, E.D, Taylor & Francis
6. Advanced surveying Education : Satheesh Gopi, R. Sathikumar, N. Madhu. Pearson

Course Title	**Surveying-II**		**Credits**	**02**
Course Code	**CIV 453**	**Max marks 50**	**P**	**03**

1. Remote Sensing: Pocket and Mirror Stereoscopes, Stereo Vision test for3-D studies, Study of aerial photograph under stereoscopes
2. Triangulation using total station: Plotting of Traverse
3. Use of GIS softwares: Vectorizing the scanned files and layering, Editing and projection systems of the data, analyzing the geographical data
4. Use of GPS softwares: To determine the coordinates of a station by point positioning , To determine
5. the area of a triangulation figure,to locate the alignment of a road
6. Setting out a simple circular curve by offsets from long chord,
7. Setting out a simple circular curve by offsets from tangents,
8. Setting out a simple circular curve by Rankine's method,
9. Setting out a simple circular curve by Two theodolite method

BOOKS:

1. Surveying Vol. I & II : Dr. K.R. Arora
2. Surveying Vol. II : Dr. B.C. Punmia

Course Title	**Transportation Engg.-II**			**Credits**	**04**
Course Code	**CIV-404**			**L T P**	**4 0 0**
Contact Hours	**45**	**Max Marks :50**	**Internal Assessment-50**	**Elective**	**N**
Pre-Requisite	**Basic knowledge about railways and airports.**				
Course Objectives	The objective of the subject is to provide knowledge about basics and design aspects of Railway tracks and Airports .				
Course Outcomes	Students will be able to learn the railway track and its components as well as airport and its different parts.				

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

PART– A

1.INTRODUCTION TO RAILWAY ENGINEERING

Development of Indian Railway, Organization of Indian Railway (2 Hours)

2.**RAILWAY GAUGES**

Definition, Gauges on World Railways, Choice of Gauge, Uniformity of Gauge, Loading Gauge, Construction Gauge. (2 Hours)

3.RAILWAY TRACK

Requirements of a Good Track, Track Specifications on Indian Railways, Detailed Cross-Section of Single/Double Track on Indian Railways. (3 Hours)

4.COMPONENTS OF RAILWAY TRACKS

Rails: functions, composition of rail steel, requirement, types of rail sections, selection of rails & buckling of rails, Sleepers; functions, requirement, classification, Ballast; functions, requirement & types, Track Fixtures & Fastenings; purpose and types, Coning of Wheels, Tilting of Rails, Rail Joints; an ideal rail joint, types of rail joints, Creep of Rails. (3 Hours)

5.GEOMETRIC DESIGN OF RAILWAY TRACK

Alignment, Gradients, Horizontal Curve, Super-elevation, Equilibrium Cant, Cant Deficiency, Transition Curves. (4 Hours)

6.POINTS AND CROSSINGS

Functions, Various structures provided in a turnout and its working, Various types of Track Junctions and their layouts. (3 Hours)

7.RAILWAY STATIONS & YARDS

Site Selection, Classification & Layout of Stations, Marshalling Yard, Locomotive Yard, Equipment at Railway Stations. (3 Hours)

8.SIGNALLING AND INTERLOCKING

Objectives, Classification of Signals, Types of Signals in Stations and Yards, Automatic Signalling, Principal of Interlocking. (4 Hours)

9.MODERNIZATION OF RAILWAY TRACKS

Development of High Speed Tracks, Ballastless Track, MAGLEV Track. (3 Hours)

PART– B

10.AIRPORT PLANNING

Aircraft Characteristics, Factors for Site Selection, Airport Classification, General Layout of an Airport .(3 Hours)

11.OBSTRUCTIONS AND ZONING LAWS

Imaginary Surfaces, Approach Zones and Turning Zones. (3 Hours)

12.RUNWAY ORIENTATION AND DESIGN

Wind Rose Diagram, Basic Runway Length, Corrections, Geometric Design Elements, Runway Configuration. (5 Hours)

13.TAXIWAY DESIGN

Main Taxiway, Exit Taxiway, Separation Clearance, Holding Aprons. (3 Hours)

14.VISUAL AIDS

Marking and Lighting of Runway, Taxiway, Landing Direction Indicator, and Wind Direction Indicator, IFR/VFR. (4 Hours)

TEXT BOOKS RECOMMENDED:

1. Aggarwal, M.M. “Railway Engineering”, Prabha and Company, New Delhi, 1997.
2. Saxena, S.C., and Arora, S.P. “A Text Book of Railway Engineering”, Dhanpat Rai and Sons, Delhi, 1997.
3. Khanna, S.K., Arora, M.G., and Jain, S.S. “Airport Planning and Design”, Nem Chand & Bros. Roorkee, 1999.
4. Horenjeff, R. and McKelvey, F. “Planning and Design of Airports”, McGraw Hill Company, New York, 1994.

Course Title	**Concrete Technology**			**Credit**	**4**
Course Code	**CIV-405**			**L T P**	**4 0 0**
Contact Hours	**45**	**Max Marks-50**	**Internal Assessment-50**	**Elective**	**N**
Pre-requisites	**This course requires the student to know about the basic of civil engineering, fundamentals of chemistry, building materials.**				
Course Objectives	1. To prepare the graduates as best civil engineers with an excellent comprehension of fundamentals of concrete structure at micro and macro levels and applications of different types of cement and concretes, besides keeping them abreast with latest developments in concrete technology at the National and International levels. 2. To give them all inputs required to help them attain professional expertise and establish themselves as renowned concrete technologists. 3. To enable them develop interest in concrete technology area and pursue academic / research assignments by providing information regarding innovative developments on special concretes, eco-friendly and smart concretes, sustainable development and special concretes in concrete technology.				
Course Outcome (s)	1. To identify the functional role of ingredients of concrete and apply this knowledge to mix design philosophy. 2. To acquire and apply fundamental knowledge in the fresh and hardened properties of concrete. 3. To evaluate the effect of the environment on service life performance, properties and failure modes of structural concrete and demonstrate techniques of measuring the Non Destructive Testing of concrete structure. 4. To develop an awareness of the utilization of waste materials as novel innovative materials for use in concrete. 5. To design a concrete mix which fulfills the required properties for fresh and hardened concrete				

Note For Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

PART – A

1.PROPERTIES OF CONCRETE

Workability, strength, shrinkage and temperature effects, creep, permeability, fire resistance, thermal properties and durability of concrete, stress strain characteristics of concrete, sulphate attack, acid attack. Rheology of concrete, factors effecting rheological properties. (8 hours)

2.CHEMICAL AND MINERAL ADMIXTURES

Accelerators, retarders, plasticizers, super plasticizers, waterproofing admixtures, silica fumes, high volume fly ash concrete, rice husk ash, surkhi, gas forming agents, workability agents. Grouting agents, corrosion inhibiting agents, coloring agents. (6 hours)

3. QUALITY CONTROL OF CONCRETE

Need of quality control, factors causing variation in quality of concrete, field control, advantages of quality control, statistical quality control, acceptance criteria, quality management in concrete construction, tools for quality management (6 hours)

4.CONCRETING UNDER SPECIAL CIRCUMSTANCES

Hot weather concreting, cold weather concreting, under ground concreting, under water construction.

(5 hours)

PART –B

5.DETEORATION OF CONCRETE AND ITS PREVENTION

Corrosion of reinforcement in concrete, factors influencing corrosion, damages caused by corrosion, preventive measures in construction, tests for existing structures, remedial measures. (4 hours)

***6.*SPECIAL CONCRETES**

Light weight concrete, ultra light weight concrete, vacuum concrete, waste material based concrete, mass concrete, shotrcrete, ferrocement, fibre reinforced concrete, polymer concrete composites, sulphur concrete, jet cement concrete, gap graded concrete, no fines concrete, ready mix concrete. (8 hours)

7.SELF COMPACTING CONCRETE

Materials for SCC, requirements for SCC, workability requirements for fresh SCC, production and placing, slump flow test, J-ring test, V-funnel test, L box test, U box tests, full box test, oriment test, SCC mix design. (5 hours)

8.MIX DESIGN

Design of concrete mixes as per IS:10262:2009. (5 hours)

TEXT BOOKS RECOMMENDED:

1. M.L.Gambhir, "Concrete technology",Tata McGraw-Hill publishing Company Ltd, New Delhi
2. A.R. Santhakumar, "Concrete Technolgy", Oxford University press, New Delhi, 2009.
3. M.S. Shetty, "Concrete Technlogy", S. Chand & Company Ltd., New Delhi, 2013.

OTHER RECOMMENDED BOOKS:

1. A.M.Neville,"Properties of Concrete", English Language Book Society/Longman Pub, 1988
2. P.K.Mehta and J.M.M.Paulo, "Concrete – Microstructure – Properties and Material", ICI, Indian First Edition, Reprint 1999.
3. Zonghjin Li, "Advanced Concrete Technology", John Wiley & Sons, INC, Newjersy, 2011".
4. N.Krishna Raju, "Design of Concrete Mix", CBS Pub., 1985.

Course Title	**Disaster Management**			**Credit**	**4**
Course Code	**CIV-406**			**L T P**	**4 0 0**
Contact Hours	**45**	**Max Marks-50**	**Internal Assessment-50**	**Elective**	**N**
Pre-requisites	**Knowledge of Advance Surveying and Buildings Construction**				
Course Objectives	1. To create awareness amongst students to basic issues of natural and manmade disasters. 2. To ensure the understanding of the disaster management cycle and relationship amongst vulnerability, preparedness, prevention and mitigation. 3. To invoke minimum ability and sensitivity amongst students to respond to disasters in their area of living and working. 4. To develop technical prowess and to mitigate the effects of disasters by capacity building amongst engineering fraternity towards formulation and implementation of disaster management strategies. 5. To relate amongst the basic approaches adopted in disaster risk reduction and institutional mechanism adopted in country towards creating resilient society				
Course Outcome (s)	1. Understand genesis and causes of natural and manmade disaster within the framework of fundamental concepts of basic sciences and engineering. 2. Perceive the vulnerability of their living and working places and level of preparedness within the existing setup of disaster management. 3. Analyze and critically examine the vulnerability of a region and to employ adequate strategy and tools of intervention. 4. Build capacity to use specialized problem solving skills, methodologies and technology. 5. Setup priorities to develop coherent and adaptable disaster management plan.				

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

PART– A

1. INTRODUCTION, DISASTER MITIGATION, RISK ASSESSMENT, MANAGEMENT SYSTEM

Define and describe disaster, hazard, emergency, vulnerability, risk and disaster management, Identify and describe the types of natural and non-natural disasters, Important phases of Disaster Management Cycle. Natural Hazards: causes, distribution pattern, consequences and mitigation measures for earth quake, tsunami, cyclone, flood, landslide drought etc. Man-made hazards: causes, consequences mitigation measures for various industrial hazards/disasters, Preparedness for natural disasters in urban areas. Assessment of capacity, vulnerability and risk, vulnerability and risk mapping, stages in disaster recovery and associated problems. Emergency medical and

essential public health services, response and recovery operations, reconstruction and rehabilitation.

(15 hours)

2.CAPACITY BUILDING

Gender sensitive disaster management approach and inculcate new skills and sharpen existing skills of government officials, voluntary activists, development of professional and elected representative for effective disaster management, role of media in effective disaster management, overview of disaster management in India, role of agencies like NDMA, SDMA and other International agencies, organizational structure, role of insurance sector, DM act and NDMA guidelines. (7 hours)

PART -B

3.EARTHQUAKE ENGG. NATURAL DISASTERS AND MITIGATION

Performance of Buildings and Structures : Main causes of damage : Intensity of earthquake forces, lack of strength and integrity in buildings, quasi- resonance, lack of ductility, lack of detailing. Earthquake Effects: On ground and soil liquefaction, buildings, structures, power plants, switch yards, equipments and other lifeline structures, release of poisonous gases and radiation. Lessons Learnt from the Past Earthquakes.

(10 hours)

4.APPLICATION OF GEO-INFORMATICS AND ADVANCED TECHNIQUE

Use of Remote Sensing Systems (RSS) and GIS in disaster Management, role of knowledge based expert systems in hazard scenario, using risks-time charts to plan for the future, early warning systems. (7 hours)

5. INTEGRATION OF PUBLIC POLICY

Planning and design of infrastructure for disaster management, Community based approach in disaster management, methods for effective dissemination of information, ecological and sustainable development models for disaster management. (6 hours)

TEXT BOOKS RECOMMENDED :

1. Iyengar, "Natural Hazards in the Urban Habitat",C.B.R.I, Tata McGraw Hill Publications.
2. R.B.Singh, "Disaster Management", Rawat Publications.
3. G.K.Ghosh, "Disaster Management", A.P.H Publishing Corporation.
4. Amita Sinyhal, "Understanding Earthquake Disasters", Tata McGraw Hill, New Delhi.

OTHER RECOMMENDED BOOKS:

1. Sachindra Narayan, "Anthropology of Disaster Management", Gyan Publishing House
2. B C Bose, "Modern Encyclopaedia of Disaster and Hazard Management", Rajat publications.

Course Title	**RCC Drawing-I (Practical)**		**Credit**	**1**
Course Code	**CIV-457**	**Max. Marks-50**	**P**	**2**

Design and detailing of following structural components designed in RCC- I through AUTOCAD:

1. Design and detailing of Singly reinforced beams and doubly reinforced beams along with the detailing of stirrups.
2. Design and detailing of columns with different types of reinforcements.
3. Cross sectional view and plan for one way slabs along with the detailing of reinforcement bars showing the clear distance between the bars, bent up bars and extra bars used for negative reinforcement.
4. Design and detailing of single flight and dog legged stair case along with the reinforcement details for the stair case inclined slab.
5. Ductile Detailing of beams & columns as per IS 13920:1993

FIFTH SEMESTER

Course Title	**Steel Structures Design - I**			**Credit**	**4**
Course Code	**CIV. 501**			**L T P**	**4 0 2**
Contact Hours	**45**	**Max. Marks-50**	**Internal Assessment-50**	**Elective**	**N**
Pre-requisites	**Knowledge of Project Planning and its Management**				
Course Objectives	The course content should be taught and learning imparted with the aim to develop theoretical knowledge and skills so that they are able to:- 1. make the students well acquainted with the basics of Steel structural elements 2. Study design procedures of various components used in fabrication of Steel structures. 3. Introducing the students with IS 800:2007 & steel tables.				
Course Outcome (s)	The theory should be taught along with examples in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes: 1. Understanding the designs of joints in bolted connections and welded connection. 2. Understanding the design of tension, compression and flexural members using application of bolted and welded connections. 3. Understanding the different types of columns bases and foundations. 4. Understanding the design of trusses using all the concepts learnt in this subject.				

Note: The examiner shall set total seven questions. First Question is compulsory covering whole syllabus(ten questions carrying one mark each). Three questions will be set from Part A and three questions from Part B (carrying 10 marks each) and students are required to attempt 2 questions from each part.Use of IS-800-2007 & Steel Tables is allowed.

PART A

1. BOLTED & WELDED JOINTS

Terminology, Specifications for bolted & welded connections, Types of joints, Efficiency of bolted joint, Framed Connections (Beam to Beam & Beam to Column, Types of welds & welded joints, stresses in welds, design of welds. (08-hours)

2. TENSION MEMBERS

Types of tension members, net & gross areas, permissible stresses. Design of members subjected to axial loads, tension member splice. (08-hours)

3. COMPRESSION MEMBERS

Failure modes of columns, end conditions & effective length of columns, various empirical formulae. IS code formula, General codal provisions for design of compression members. Built up compression members, lacing and battening of compression members, splicing of compression members. (08-hours)

PART B

4. COLUMN BASES AND FOUNDATIONS:

Types of column bases, design of slab base, Gusseted base & grillage foundations. (08-hours)

5. DESIGN OF FLEXURAL MEMBERS

Failure modes permissible stresses, design of laterally supported and unsupported beams. (05-hours)

6.DESIGN OF ROOF TRUSS

Design and Drawing details of a steel roof truss bolted/welded with given forces in various members. (08-hours)

BOOKS:

1. Design of steel structures by Limit State Method as per IS 800-2007 — S.S Bhavikatti ,I .K.International Publishing House Pvt. Ltd.
2. Design of steel structures — S.K.Duggal, McGraw Hills Publication
3. Design of steel structures — N. Subramanian, Oxford University Press
4. Design of steel structures — K.S.Sai Ram, Pearson Education
5. Limit State Design of steel structures — Karuna Roy Ghosh, PHI learning Pvt. Ltd.,New Delhi
6. General construction in Steel- Code of practice(Third Revision)—IS 800-2007
7. Steel Tables

Course Title	SSD Drawing-I		Credits	01
Course Code	CIV 551	Max marks- 50	P	02

Detailed working drawing for using AUTOCAD

1. Steel roof truss.
2. Plate girder (welded)
3. Stanchion beam connections.
4. Grillage foundation.
5. Composite column with lacings

Course Title	Irrigation Engineering I			Credits	04
Course Code	CIV 502			L T P	4 0 0
Contact Hours	45	Max marks- 50	Internal Assessment- 50	Elective	N
Pre-requisites	Fluid Mechanics I				
Course Objectives	1. The objective of this course is to introduce the students with various methods of Irrigation, regarding canal losses, tube wells, Irrigation projects & investigations and important concept of River training works.				
Course Outcomes	1. The student would be able to learn the basics about necessity of irrigation, its importance, various methods of surface and sub-surface irrigation, equations and theories in design of canals, methods to reduce losses and deal with current issues to improve efficiency of irrigation. 2. The course will also teach the students about taking up the irrigation projects, their design and execution process. 3. The students will also learn basics of river training works and tube well irrigation which will increase their knowledge related to concepts of groundwater engineering.				

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

PART –A

1. METHODS OF IRRIGATION

Advantages and disadvantages of irrigation, Water requirements of crops, Factors affecting water requirement, Consumptive use of water, water depth or delta and crop relation, Duty of water, relation between delta, duty and base period, Soil crop relation-ship and soil fertility, Sprinkler irrigation advantages & limitations. Planning and design of sprinkler irrigation, Drip irrigation advantages & limitations, suitability. (8-hours)

2. CANAL IRRIGATION

Classifications of canals, canal alignment, Inundation canals, Bandhara irrigation, advantages and disadvantages, Silt theories-Kennedy's theory, Lacey's theory, Drawbacks in Kennedy's & Lacey's theories, comparison of Lacey's and Kennedy's theories, Design of unlined canals based on Kennedy & Lacey's theories, suspended and bed loads. (5-hours)

3. LINED CANALS

Types of lining, selection of type of lining, Economics of lining, Maintenance of lined canals, Silt removal, Strengthening of channel banks, Measurement of discharge in channels, Design of lined canals, Methods of providing drainage behind lining. (6-hours)

4. LOSSES IN CANALS, WATER LOGGING AND DRAINAGE

Losses in canals-Evaporation and seepage, Water logging, causes and ill effects of water logging-anti water logging measures. Drainage of land Classification of drains - surface and subsurface drains Design considerations for surface drains, Advantages and maintenance of tile drains. (6-hours)

PART –B

5. INVESTIGATION AND PREPRRATION OF IRRIGATION PROJECTS

Classification of project, Project preparation-investigations, Design of works and drawings, concept of multi - purpose projects, Major, Medium and miner projects, Planning of an irrigation project, Economics & financing of irrigation works. Documentation of project report. (6-hours)

6. TUBE-WELL IRRIGATION

Force exerted by fluid jet on stationary flat plate, Force exerted by fluid jet on moving flat plate, Force exerted by fluid jet on stationary curved vane, Force exerted by fluid jet on moving curved vane. Types of tube - wells - strainer type, cavity type and slotted type. Type of strainers, Aquifer, porosity, uniformity coefficient, specific yield & specific retention, coefficients of permeability, transmissibility and storage. Yield or discharge of a tube well, Assumptions, Theim & Duputi's formulae. Interference of tube wells with canal or adjoining tube-wells, optimum capacity, Duty and delta of a tube well. Rehabilitation of tube well. (7-hours)

7. RIVER TRAINING WORK

Objectives, classification of river-training works, Design of Guide Banks. Groynes or spurs - Their design and classification ISI. Recommendations of Approach embankments and afflux embankments, pitched Islands, Artificial cut-off objects and Design Considerations River control - objectives and methods.

(5-hours)

TEXT BOOKS RECOMMENDED :

1. Principles & practice of Irrigation Engg. S.K..Sharma, S. Chand.
2. Irrigation & Water Power Engg. B.C. Punmia, Pande B.B.Lal,, Laxmi Publications.
3. Irrigation Engg. & Hydrauloc Structure Varshney, Gupta & Gupta
4. Irrigation Engg. & Hydraulic Structure Santosh Kumar Garg, Khanna Publishers.

Course Title	**Geotechnical Engineering**			**Credits**	**04**
Course Code	**CIV. 503**			**L T P**	**4 0 0**
Contact hrs	**45**	**Max Marks-50**	**Internal Assesment-50**	**Elective**	**N**
Pre-requisites	**Learning the properties of soil**				
Course Objectives	1. Classification and characteristics of soils 2. Compaction 3. Consolidation 4. Effective stress principle 5. Permeability and seepage 6. Shear strength 7. Earth pressure				
Course Outcome (s)	1. Introduction to the classification and characteristics of soils 2. Understanding the Compaction and Consolidation 3. Principles of effective stress principle 4. Description of permeability and seepage 5. Concept of shear strength and earth pressure				

Note: The examiner shall set total seven questions. First Question is compulsory covering whole syllabus (ten questions carrying one mark each). Three questions will be set from Part A and three questions from Part B (carrying 10 marks each) and students are required to attempt 2 questions from each part.

PART- A

1. **BASIC CONCEPTS**

Basic definitions in soil mechanics. Weight volume relationship ,phase diagrams, Particle Size Analysis, Types of soil water ,capillary action, Frost heave, frost boil, Prevention of frost action, Shrinkage & swelling of soils, Slaking of clay, Bulking of sand (04 hours)

2. CLASSIFICATION AND CHARACTERISTICS OF SOILS

Indian Standard classification System, Consistency limits & their use and determination, various indices, shrinkage parameters, sensitivity, thixotropy & activity of soils. (06 hours)

***3.* COMPACTION**

Definition and object of compaction Standard proctor test & Modified proctor test, Compaction curve. Factors affecting compaction , Effect of compaction on soil properties. Field compaction methods their comparison of performance and relative suitability. Field compactive effort. Field control of compaction by proctor needle. (06 hours)

4. CONSOLIDATION

Definition and object of consolidation difference between compaction and consolidation. Concept of various consolidation characteristics i.e. av, mv and Cv primary and secondary consolidation. Terzaghi's method for one-dimensional consolidation. Consolidation test. Normally consolidated and over consolidated clays importance of consolidation settlement in the design of structures.

(07 hours)

PART- B

5. EFFECTIVE STRESS PRINCIPLE

Concept of effective stress principle, effect of water table fluctuations on effective stress, Seepage pressure, critical hydraulic gradient and quick sand condition. (04 hours)

6. PERMEABILITY AND SEEPAGE

Darcy's law and its validity seepage velocity. Co-efficient of permeability and its determination, Factors affecting 'K' and brief discussion average permeability of stratified soil deposits.

(06 hours)

7. SHEAR STRENGTH

Stress analysis of a two - dimensional stress system by Mohr circle, Coulomb - Mohr strength theory, Revised Mohr-Coulomb's Equation, Relations between principle stresses at failure, Shear strength tests- Direct shear Test, Triaxial test, Unconfined Compression test, Different types of soils, Liqefaction of sands, Shear characteristics of Cohesive & Cohesionless soils. (05 hours)

8. EARTH PRESSURE

Terms and symbols used for a retaining wall. Movement of wall and the lateral earth pressure. Rankine's and Coulomb's theory for lateral earth pressure. Culmann's graphical construction and Rehbann's graphical construction. (06 hours)

BOOKS :

1. Terzaghi K and Peck R B "Soil mechanics in Engineering Practice" John Wiley and Sons, New York, 1995.
2. Terzaghi K "Theoretical Soil Mechanics", John Wiley and Sons, New York, 1943
3. Ranjan G and Rao ASR "Basic and Applied Soil Mechanics" New Age International Pvt. Ltd., Publishers, New Delhi, 2000
4. Murthy V N S Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering (Civil Engineering) ", 2002.
5. Donald P. Coduto "Foundation Design: Principles and Practices", Pearson Education,Eastern Economy Edition, 2000.

Course Title	**Geotechnical Engineering Lab**		**Credits**	**01**
Course Code	**CIV 553**	**Max marks- 50**	**P**	**02**

1 Determination of water content.
2 Determination of field density by Core cutter method
3 Determination of field density by Sand replacement method
4 Grain size Analysis by Mechanical Method.
5 Grain size Analysis by Hydrometer Method.
6 Determination of Specific Gravity by Pycnometer.
7 Determination of Liquid Limit, Plastic limit.
8 Determination of Permeability of soils.
9 Determination of In-Situ California Bearing Ratio of soil.
10 Determination of optimum moisture content & maximum dry density of soil by Standard Proctor Compaction Test (SPCT).

Course Title	**Environmental Engineering - I**			**Credits**	**4**
Course Code	**CIV. 504**			**L T P**	**4 0 2**
Contact Hours	**45**	**Max Marks- 50**	**Internal Assesment- 50**	**Elective**	**N**
Pre-requisites	**Knowledge Of Sources Of Water Supply , Quality Of Water, Water Supply Systems, Pumps And Pumping, Water Treatment, Tools For Clean Productions**				
Course Objectives	To aware the students about science and engineering principles to study & improve the sources, quality, supply and treatment of water.				
Course Outcome	1. To learn the concepts of water supply systems. 2. To learn sources of water supply. 3. To learn water treatment & how clean water by using different tools. 4. To learn how pumps are used for pumping water.				

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

PART – A

1. SOURCES OF WATER SUPPLY

Measurement of rainfall and runoff variations; mass diagram; Definition and Design factors, Groundwater and springs Definition - various types of wells - well construction and development - specific yield and various tests - Infiltration wells and galleries; choice of source of water supply.

(07 hours)

2. QUALITY OF WATER

Testing of various physical-chemical and biological characteristics and their significance; standards of quality for different uses of water (07 hours)

3. WATER SUPPLY SYSTEMS

Municipal water demands and demand variations, Population forecasting and water demand estimations; Intakes and transmission systems, pipes for transporting water and their design, water distribution systems and appurtenances; Data and background information for the design of water supply system; Water supply network design and design of balancing and service reservoirs; operation and maintenance of water supply systems. (08 hours)

PART – B

4. PUMPS AND PUMPING

Necessity of pumping, classification of different type of pumps and their characteristics and selection criteria, economical diameter of the rising main, pumping stations. (08 hours)

5. WATER TREATMENT

Water treatment schemes; Basic principles of water treatment; Design of plain sedimentation, coagulation and flocculation, filtration: slow, rapid and pressure; Disinfection units; Fundamentals of water softening, fluoridation and deflouridation, and water desalinization and demineralization.

(08 hours)

6. TOOLS FOR CLEAN PRODUCTIONS

Reuse, recycle, recovery, source reduction life cycle analysis; environmental cost accounting, EIA. Air and Noise pollution (source, effects and control), noise level standards. Small scale and household level water purification system and water fixtures (05 hours)

7. MISCELLANEOUS:

Urban rain water disposal/rain water harvesting; Control of Water-borne diseases Indoor Pollution

(02 hours)

BOOKS:

1. Environmental Engineering : Baljeet S. Kapoor, New Age Publishers
2. Water Supply and Sewerage : E. W. Steel, McGraw Hill.
3. Water Supply Engineering : S. K. Garg, Khanna Publishers
4. Water Supply & Sanitation Engineering : Gurcharan Singh, Std. Publishers
5. Water Supply Engineering : B.C. Punmia, Luxmi Publictaions
6. Environmental Engineering : P. Venugopala Rao, PHI
7. Waste water Engineering : S.N. Paul & Arvind Kumar, APH Publishing House

.

Course Title	Environmental Engineering – I Lab		Credits	1
Course Code	CIV. 554	Max Marks-50	P	2

Note: At least seven experiments are to be performed.

1) Determination of Color & Turbidity.
2) Determination of Solids: Total, Dissolved and Suspendedsolids.
3) Determination of Alkalinity and its species.
4) Determination of pH, and Acidity and its species.
5) Determination of Hardness (different types)
6) Determination of Chlorides.
7) Determination of Fluorides.
8) Jar test for optimum coagulant dose estimation.
9) Determination of residual chlorine and chlorine dose.

Course Title	Estimating And Costing			Credit	4
Course Code	CIV-505			L T P	4 0 0
Contact Hours	45	Max. Marks-50	Internal Assessment-50	Elective	N
Pre-requisites	Knowledge of Building Materials & Construction Techniques				
Course Objectives	4. The course content should be taught and learning imparted with the aim to develop theoretical knowledge and skills so that they are able to:- 5. To learn about methods of preparing preliminary estimate for buildings, RCC works and Roads from the available plans. 6. To analyze the rates of various items of work from the quantity of various materials in a building and its probable cost. 7. To study about the specifications for the various items of work. 8. To develop an awareness of those factors that affect the cost of construction work and to analyze the influences that effect change in these factors. 9. To learn about P.W.D accounts and procedures of work.				
Course Outcome (s)	The theory should be taught and practical should be carried out in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes: 1. Estimating the cost of and assisting with determining the feasibility of projects. 2. Preparing documentation for competitive tendering. 3. Tendering and negotiating for contracts. 4. Managing and exercising financial control over contracts to ensure cash flow and the profitability of projects. 5. Controlling and managing sub-contractors and suppliers. 6. Finalising financial aspects of contracts upon completion of projects.				

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

PART– A

1.ESTIMATES

Method of building estimates, types, site plan index plan, layout plan, plinth area, floor area, Technical sanction, administrative approval, estimate of buildings, roads, earthwork, R.C.C. works, sloped roof, roof truss, masonry platform, masonary water tank, sanitary and water supply work, complete set of estimate. (16 hours)

2.SPECIFICATIONS

For different classes of building and Civil engineering works. (6 hours)

PART- B

3.ANALYSIS OF RATES

For earthwork, brickwork, concrete work, D.P.C., stone masonry, plastering, pointing, roadwork, Door and windows, whitewashing, painting, Varnishing, Centering and shuttering. (12 hours)

4.CONTRACTS, WORKS AND TENDER

Tenders, tender form, submission and opening of tenders, Classification of contracts, Classification of works, Different type and methods of work types of measurement book, muster roll , piecework agreement and work order. (4 hours)

5.ACCOUNTS

P.W.D. accounts, cash, receipt of money, cash book, temporary advance, imprest, accounting procedure, arbitration, arbitration act. (3 hours)

6.BUILDING BYE LAWS

Building Byelaws, Definitions, Procedure for submission of building application and execution of works, Siting Planning and Architectural control. (4 hours)

TEXT BOOKS RECOMMENDED:

1. B.N. Dutta , “Estimating and Costing”, UBS Publishers & Distributors Ltd.
2. D.C. Mahajan , “Estimating and Costing in Civil Engg.”, Rainbow Book Company.
3. Rangwala SC , “Estimating &Costing”, Charotar Publishing House, Anand
4. Kohli & Kohli , “Atext book on estimating &costing (Civil) with drawings”, Ramesh Publications.
5. P.W.D. Accounts,Chief Engineer, B & R, Punjab.

SIXTH SEMESTER

Course Title	**Reinforced Concrete Design-II**			**Credit**	**4**
Course Code	**CIV-601**			**L T P**	**4 0 2**
Contact Hours	**45**	**Max. Marks-50**	**Internal Assessment-50**	**Elective**	**N**
Pre-requisites	**Knowledge of Basic Constituents of Reinforced Concrete Design-I**				
Course Objectives	The course content should be taught and learning imparted with the aim to develop theoretical knowledge and skills so that they are able to:- 1. To learn about design of continuous beams. 2. To study about design of RCC structures subjected to torsion. 3. To learn about types and design of various types of footings. 4. To study the ultimate load theory for design of RCC slabs. 5. To study retaining walls, domes and water tanks.				
Course Outcome (s)	Upon successful completion of this course, it is expected that students will be able to: 1. To access the suitability of footing for the structure. 2. To calculate the ultimate load for the different type of slabs. 3. To design complex structures like members subjected to torsion, retaining walls, domes and water tanks.				

Note for Examiner- The examiner shall set total seven questions. First Question is compulsory covering whole syllabus (ten questions carrying one mark each). Three questions will be set from Part A and three questions from Part B (carrying 10 marks each) and students are required to attempt 2 questions from each part.Use of IS 456-2000 is allowed.

PART– A

1.CONTINUOUS BEAMS

Design of continuous beams using I.S. Code method. (06-hours)

***2.*BEAMS CURVED IN PLAN**

Introduction, Design of circular and semicircular beams. (06-hours)

***3.*DESIGN OF FOUNDATIONS**

Design of isolated footing under eccentric loading, Design of Combined footings (rectangular and trapezoidal), strap footings, raft footing. (08-hours)

PART– B

4. YIELD LINE ANALYSIS OF SLABS

Introduction, Assumption, Locations of Yield lines, Method of Analysis, Analysis of one way slabs and two way slabs. (06-hours)

***5.*RETAINING WALLS**

Types, behaviour, stability requirements, design of cantilever and counterfort type retaining walls. (06-hours)

***6.*DOMES**

Design of Spherical and conical domes. (07hours)

***7.*WATER TANKS**

Design of water tanks on no crack basis, circular and rectangular tanks resting on ground, underground water tanks. (07-hours)

TEXT BOOKS RECOMMENDED

1. A.K. Jain , “Limit State Design” , Nem Chand & Bros. Roorkee.
2. Punmia, “Limit State Design”, Luxmi Publications.
3. Punmia & Jain, “Reinforced Concrete Structures” , Luxmi Publications.
4. S. Ramamurtham, “Design of Reinforced Concrete Structure”, Dhanpat Rai Publishing Company.
5. Syal & Goel, “Reinforced Concrete Structures”, Wheeler Publisher Allahabad.

Course Title	RCC Drawing-II (Practical)		Credit	1
Course Code	CIV651	Max. Marks-50	P	2

1. Detailed Working Drawings of Following (Using AUTOCAD)
2. Drawing and detailing of reinforcement in combined (rectangular and trapezoidal) and strap footing.
3. Drawing and detailing of reinforcement in continuous beam with typical Sections.
4. Drawing and detailing of reinforcement in curved beam with typical Sections.
5. Drawing and detailing of retaining walls (cantilever and counter fort type).
6. Drawing and detailing of reinforcement in Rectangular and Circular water tanks resting on ground.
7. Drawing and detailing of Spherical and conical domes with a typical cross section.

Course Title	Construction Planning And Management			Credit	4
Course Code	CIV. 602			L T P	4 0 0
Contact Hours	30	Max. Marks-50	Internal Assessment-50	Elective	N
Pre-requisites	Knowledge of Project Planning and its Management				
Course Objectives	The course content should be taught and learning imparted with the aim to develop theoretical knowledge and skills so that they are able to:- 1. to apprise the students about planning the project 2. to get the knowledge about works management 3. to know about various types of construction equipments and their applications.				
Course Outcome (s)	The theory should be taught along with examples in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes: 1. Employ appropriate practices to organize and manage personnel, materials, equipment, costs, time, and quality of a construction project 2. Understand construction project control processes 3. Understand construction quality assurance and control 4. Apply scheduling techniques to project planning activities 5. Analyze methods, materials, and equipment used to construction projects				

Note: The examiner shall set total seven questions. First Question is compulsory covering whole syllabus (ten questions carrying one mark each). Three questions will be set from Part A and three questions from Part B (carrying 10 marks each) and students are required to attempt 2 questions from each part .

PART A

WORKS MANAGEMENT

1 INTRODUCTION

Need for project planning and management, Three phases of project planning, Bar Chart, Milestone Chart, Uses and Drawbacks, Evolution of networks, Terminology. (2 Hours)

2.PERT PROGRAMME (EVOLUTION AND REVIEW TECHNIQUE

Brief History of Evolution of PERT Salient features, construction of PERT network, multiple time estimates and network analysis, earlier events time, latest even time, forward pass and backward pass, event slack, concept of critical path and its identification, data reduction, Application of statistics to probability of achieving a target data, suitability of PERT for research projects. (4 Hours)

3.CPM (CRITICAL PATH METHOD)

Definitions, network construction. Fundamental rules, assignment of duration of activities, determination of project schedule, activity time estimates earliest start and earliest finish, latest start and latest finish time-float types-free float, independent float, Interfering float -0 their significance in project control, identification of critical path, Updating. (4 Hours)

4.PROJECT COST ANALYSIS

Types of project costs direct and indirect cost-time relationships, cost slopes straight-line and segmented approximations, optimum cost and optimum duration, examples on crashing, Comparison of CPM and PERT. (4 Hours)

PART- B

5.CONSTRUCTION ENGINEERING

FACTORS AFFECTING SELECTION OF CONSTRUCTION EQUIPMENT

Types of equipment; cost of owing and operating equipment depreciation cost; obsolescence cost; investment cost; operating cost; economic life of equipment; maintenance and repair cost. (4 Hours)

6.EARTH MOVING MACHINERY

Tractor and related equipment; bulldozers; angle dozers; rippers; scrappers; power shovels; dragline; slack line; clamshells hoes; trenching machines. (4 Hours)

7.CONSTRUCTION EQUIPMENTS

Cement concrete plants for grading, batching, mixing, types of mixers, handling and transporting concrete, concrete pumps, placing concrete, compacting concrete, bituminous mix plants, pavers and finishers. (4 Hours)

8. HOISTING AND TRANSPORTING EQUIPMENT

Hoists winches, cranes, belt conveyors, ropeways trucks and wagons, balancing the capacity of hauling units with the size of excavator. (4 Hours)

BOOKS:

1. PERT AND CPM (Principles and Applications) 2nd Edition :L.S. Srinath. McGraw Hill.
2. Construction Planning, Equipment and Methods (4th Edition) :R. L. Peurifoy, TMH.
3. Construction Equipment, Planning and Application :Mahesh Verma

Course Title	**Advanced Structural Analysis**			**Credits**	**04**
Course Code	**CE- 603**			**L T P**	**4 00**
Contact Hours	**45**	**Max Marks- 50**	**Internal Assessment-50**	**`Elective**	**N**
Pre-requisites	**Knowledge of subjects of structural analysis**				
Course Objectives	1. To expand the knowledge in the field of structures 2. To introduce the various methods for analysis of multi storey buildings. 3. To relate the numerical theories with the designing software.				
Course Outcome (s)	1. Students will learn the basic concepts of equilibrium, compatibility and principle of superposition etc. 2. Students will be able to analyze the beams and frame with the help of flexibility and Stiffness matrices. 3. Student will be competent to analyze the beams with the element approach.				

Note for Examiner: The examiner shall set total seven questions. First Question is compulsory covering whole syllabus (ten questions carrying one mark each). Three questions will be set from Part A and three questions from Part B (carrying 10 marks each) and students are required to attempt 2 questions from each part.

PART- A

1. BASIC CONCEPTS

Equations of static Equilibrium, Degree of static Indeterminacy, Degree of kinematic Indeterminacy ,Actions and Displacements, equilibrium, compatibility, principle of superposition, Equivalent joint loads (5 Hours)

2. FLEXIBILITY AND STIFFNESS MATRICES

Flexibility and stiffness, Flexibility matrix, Stiffness Matrix, Relationship between Flexibility matrix and Stiffness Matrix, Force and displacement Methods (6 Hours)

3. CONTINUOUS BEAMS

Force method, Displacement Method, Comparison of Methods (6 Hours)

PART- B

4. RIGID JOINTED PLANE FRAMES

Force method, Displacement Method, Comparison of Methods (8 Hours)

5. PIN JOINTED PLANE FRAMES

Displacement of a Pin jointed Plane frame, Stiffness of a Pin joint , Member forces ,Force method, Displacement Method, Comparison of Methods (8 Hours)

6. TRANSFORMATION MATRICES-ELEMENT APPROACH

Force Method, Displacement Method, Analysis of Continuous Beams, Portal Frame and Pin Jointed Frames Effect of axial deformation of Members (5 Hours)

TEXT BOOKS RECOMMENDED

1. Matrix Methods in structure analysis: Pandit & Gupta, TMH

OTHER RECOMMENDED BOOKS

1. Matrix Analysis of framed Structures: Weaver & Gere, CBS Publishers

Course Title	**Environmental Engg.- II**			**Credits**	**4**
Course Code	**CIV. 604**			**L T P**	**4 0 2**
Contact Hours	**45**	**Max Marks-50**	**Internal Assesment-50**	**Elective**	**N**
Pre-requisites	Knowledge Of Treatment Of Sewage, Industrial Waste, Solid Waste & Landfill Technologies**.**				
Course Objectives	To teach the students about the sewerage system and its construction.				
Course Outcomes	1. To be able to design various unit of waste water & industrial waste treatment plant. 2. To be able to select and design various types of solid waste management & disposal techniques.				

Note for Examiner- Examiner will set 7 questions of equal marks. First question will coverwhole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of thepaper will be divided into two parts having three questions each and the candidate is requiredto attempt at least two questions from each part.

PART – A

1. INTRODUCTION

Terms & definitions, systems of sanitation and their merits and demerits, system of sewerage, choice of sewerage system and suitability to Indian conditions. (03 hours)

2. DESIGN OF SEWER

Quantity of sanitary and storm sewage flow, forms of sewers. Conditions of flow in Sewers, sewers of equivalent PART, self cleansing and limiting velocity, hydraulic formula for flow of sewerage in sewers and their design. (04 hours)

3. CONSTRUCTION & MAINTENANCE OF SEWERS

Sewer appurtenances, Materials for sewers. Laying of sewers, joints in sewers, testing of sewers pipes. Maintenance, operation and precaution before entering a sewer. (04 hours)

4. HOUSE DRAINAGE

Principles of House drainage, traps, Inspection chamber Indian and European type W.C. Flushing cisterns, soilwaste and anti-syphorage pipes, plumbing system. (03 hours)

5. CHARACTERISTICS & TESTING OF SEWAGE

Composition of sewage, sampling, physical & chemical analysis of sewerage, biological decomposition of sewage, kinetics of organic waste stabilization. (03 hours)

PART - B

6. TREATMENT OF SEWAGE

Unit processes o waste water treatment, screens, grit-chambers, detritus tank, skimming tank, grease traps, sedimentation, chemical treatment, aerobic biological treatment, trickling filter (LRTF & HRTF),

activated sludge processes, anaerobic treatment, units-sludge digesters and biogas plant.

(04 hours)

7. **INDUSTRIAL WASTE TREATMENT**

Nature and characteristics of industrial wastes; Control and removal of specific pollutants in industrial wastewaters, i.e., oil and grease, cyanide. fluoride, toxic organics, heavy metals. (03 hours)

8. GROUND WATER CONTAMINATION

Design and Management of landfills, environmental control through liners, covers, leachate management and gas management, control and remedial measures for contaminated sites; pollution control regulations.

(03 hours)

Course Title	**Environmental Engineering – II Lab**		**Credits**	**1**
Course Code	**CIV. 654**	**Max Marks-50**	**P**	**2**

Note: At least seven experiments are to be performed.

1. Determination of DO.
2. Determination of BOD.
3. Determination of COD.
4. Determination of Sulphates.
5. Determination of Nitrite and Nitrate nitrogen.
6. Determination of Ammonical and Total Kjeldhal Nitrogen.
7. Determination of phosphorus (total and available).
8. Determination of SVI (including MLSS and MLVSS estimations).

Course Title	**Foundation Engineering**			**Credits**	**04**
Course Code	**CIV. 605**			**L T P**	**4 0 2**
Contact Hours	**45**	**Max marks-50**	**Internal Assessment -50**	**Elective**	**N**
Pre-requisites	**Geotechnical Engineering**				
Course Objectives	The course will strengthen the basics learnt by students in the field of geotechnical engineering and will guide them to apply them in field.				
Course Outcomes	The student would be able to learn types of slope failures, design and types of foundations, distribution of stress in horizontal and vertical directions under the ground surface and about site investigation required to be done before taking decisions about the foundation and its related arrangements.				

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

PART –A

1.STABILITY OF SLOPES

Necessity, causes of failure of slopes. Stability analysis of infinite and finite slopes in sand and clay. Taylor's stability number and its utility. (4-hours)

2.SHALLOW FOUNDATION

Introduction to the type of shallow foundations, Factors causing failure of foundation, Definitions of bearing capacities, Factors affecting bearing capacity. Terzaghis analysis for bearing capacity of soil, Skemptions equation, B. I. S. recommendations for shape, depth and inclination factors. Plate Load Test and Standard Penetration Test. Contact pressure distribution. Causes of settlement of structures, comparison of immediate and consolidation settlement, Calculation of settlement by plate load test and Static Cone Penetration Test data, Allowable settlement of various structures according to IS Code. Situation most suitable for provision of rafts foundation, Proportioning of rafts in sand and clays, Various methods of designing raft, Floating foundation.

(6-hours)

3.MACHINE FOUNDATIONS

Basic definition of theory of vibration terms, Analysis of theory of single degree system for :- Free vibrations, Damped Free vibrations,Forced vibrations with constant Harmonic Excitation (Frequency response curves) Dynamic soil properties (Equivalent spring constants) Determination of Cu by cyclic plate load test and Block vibration test. Natural frequency of foundation-soil system by Barkans Method, Co-relation between Cu and other dynamic properties of soil. Type of machine Foundations - Neat sketches and brief description.

(7-hours)

4.STRESS DISTRIBUTION

Boussinesq's equation for a point load, uniformly loaded circular and rectangular area, Pressure distribution diagrams. New marks chart and its construction. Two- to – one method of load distribution Comparison of Boussinesq and Westergaard analysis for a point load. Limitations of elastic formula. (7-hours)

PART –B

5.SOIL INVESTIGATION

Objective of soil investigation for new and existing structures, Depth of exploration for different structures, Spacing of bore holes, Methods of soil exploration and relative merits and demerits. (4-hours)

6.PILE FOUNDATION-I

Necessity and uses of piles, classification of piles, Types of pile driving hammers & their comparison, Effect of pile driving on adjacent ground. Use of Engineering news formula and Hiley's formula for determination of allowable load, Pile Load Test, separation of skin friction and point resistance using cyclic pile load test data. Related Numerical problems. (6-hours)

7.PILE FOUNDATION-II

Determination of point resistance and frictional resistance of a single pile by static formula, Piles in clay, safe load on a friction and point bearing pile. Pile in sand spacing of piles in a group, factors affecting capacity of a pile group. Efficiency of pile group bearing capacity of a pile group in clay, Settlement of pile groups in clay and sand Negative skin friction. (6-hours)

8.CAISSONS AND WELLS

Major area of use of caissons, Advantages and disadvantages of open box and pneumatic caissons. Essential part of a pneumatic caisson. Components of a well. Calculation of allowable bearing pressure. Conditions for stability of a well. Terzaghi's analysis for Lateral stability of a well, embedded in sand. Forces acting on a well foundation. Computation of scour depth, Tilts & Shifts. (6-hours)

TEXT BOOKS RECOMMENDED :

1. Peck R B, Hanson W B and Thorn burn T H "Foundation Engineering" Jonh Wiley and Sons Inc, New York. 1974
2. Teng W C "Foundation Design" Prentice Hall of India, New Delhi, 1988.
3. Bowles J E "Foundation Analysis and Design" McGraw Hill, New York, 1988.
4. Ranjan G and Rao A S R "Basic and Applied Soil Mechanics" New Age International, New Delhi, 2000
5. Murthy V N S "A Text Book of Soil Mechanics of Foundation Engineering" Sai Kripa Technical Consultants, Bangalore, 1993

Course Title	**Foundation Engineering Lab**		**Credits**	**01**
Course Code	**CIV 655**	**Max marks- 50**	**P**	**02**

1. Determination of Unconfined Compressive Strength of soil.
2. Determination of shear parameters by Direct Shear Test.
3. Determination of shear parameters by Triaxial Test.
4. Determination of undrained shear strength of cohesive soils by Vane Shear Test.
5. Determination of void ratio of cohesionless soil in loosest & densest state by Relative Density apparatus.
6. Determination of bearing capacity of soil by Standard Penetration Test.
7. To collect data about bearing capacity and frictional resistance of soil by Static Cone Penetration Test.
8. Determination of Consolidation parameters.

TEXT BOOKS RECOMMENDED:

1. Laboratory Manual in soil engineering by A.K.Duggal, NITTTR, Chandigarh
2. Engineering soil testing by Shamsher Prakash & P.K.Jain ,Nem Chand & Bros, Roorkee

Course Title	Software lab		Credits	02
Course Code	CIV 656	Max marks- 50	P	03

Civil Engineering Softwares like STAAD PRO, Auto Civil 3D, ANSYS, ATENA, MX –ROADS, ArchView, GIS etc.

1. Analysis of Beams with different support conditions and loading conditions.
2. Analysis of 2- D Portal Frame for vertical and horizontal loading (Multi storeyed and Multi Bay)
3. Design of foundations using STAAD Foundation.
4. Analysis and Design of Roof Truss for wind load.
5. Analysis and Design of Dam using ANSYS
6. Testing of Cylindrical & flexural Members using ATENA.
7. Design of flexible Pavement using MX-Roads
8. Introduction to Arch View and GIS softwares.

SVENTH SEMESTER

Course Title	**Steel Structures Design -II**			**Credit**	**4**
Course Code	**CIV. 701**			**L T P**	**4 0 2**
Contact Hours	**30**	**Max. Marks-50**	**Internal Assessment-50**	**Elective**	**N**
Pre-requisites	**Knowledge of Project Planning and its Management**				
Course Objectives	The course content should be taught and learning imparted with the aim to develop theoretical knowledge and skills so that they are able to:- 1. Make the students well acquainted with the advancement in the design of Steel structural elements 2. Study design procedures of various components used in fabrication of Steel bridges. 3. Use of concepts learnt in Design of steel structures –I.				
Course Outcome (s)	The theory should be taught along with examples in such a manner that students are able to acquire required learning out comes in cognitive, psychomotor and affective domain to demonstrate following course outcomes: 1. Understanding the advanced structures in steel design. 2. Understanding the design of tubular structures and steel foot bridges. 3. Understanding the complete design of an industrial building. 4. Understanding the analysis and design of various components of single track through type Railway Bridge.				

Note: The examiner shall set total seven questions. First Question is compulsory covering whole syllabus (ten questions carrying one mark each). Three questions will be set from Part A and three questions from Part B (carrying 10 marks each) and students are required to attempt 2 questions from each part .I.S. 800-2007, Suitable tables are allowed.

PART A

1. DESIGN OF ROUND TUBULAR STRUCTURES

Introduction, round tubular sections, permissible stresses, tube columns and compression members, tube tension members, tubular roof trusses, Design of tubular beams, Design of tubular purlins.

(08 hours)

2. DESIGN OF STEEL FOOT BRIDGE

Introduction, design of flooring, cross girders, analysis of N- type truss, design of various members of truss, design of joints, design of bearings. (07 hours)

3. DESIGN OF COMPLETE INDUSTRIAL BUILDING WITH DESIGN OF

Gantry Girder
Column bracket.
Mill bent with constant moment of inertia
Lateral and longitudinal bracing for column bent etc. (15 hours)

PART B

4. DESIGN OF A SINGLE TRACK THROUGH TYPE RAILWAY BRIDGE WITH LATTICE GIRDERS HAVING PARALLEL CHORDS

Design of stringers
Design of cross girders
Design of connection between stringer and cross girder
Design of main girders
Design of bottom lateral bracing and top lateral bracing
Design of portal bracing and sway bracing
Design of bearings
Design of welded plate girder with static load u.d.l. over whole span and concentrated load at fixed points. (15 hours)

BOOKS:

1.Arya A S and Ajmani J L “Design of Steel Structures” Nem Chand & Bros, Roorkee,1996.

2. Chandra R "Design of Steel Structures" Vol. I & II Standard Book House, Delhi,1991
3. Raz S A "Structural Design in Steel" New Age International (P) Ltd., New Delhi, 2002
4. Raghupathi M "Design of Steel Structures" Tata McGraw-Hill Publishing Company ltd., New Delhi, 1999.
5. Dayaratnam P "Design of Steel Structures" Wheeler Publishers, New Delhi, 2000.

Course Title	**Steel Drawing-II**		**Credits**	**01**
Course Code	**CIV 751**	**Max marks- 50**	**P**	**02**

Detailed working drawings FOR (USING AUTOCAD)

(i) Industrial Building
(ii) Railway Bridge
(iii) Foot Bridge

Course Title	**Irrigation Engineering II**			**Credits**	**04**
Course Code	**CIV.702**			**L T P**	**4 0 2**
Contact Hours	**45**	**Max marks- 50**	**Internal Assessment -50**	**Elective**	**N**
Pre-requisites	**Irrigation Engineering I**				
Course Objectives	The objective of this course is to introduce the students with various theories of seepage and design of various important irrigation based structures.				
Course Outcomes	1. The student would be able to learn various theories of seepage, requirements of various structures at various locations within the overall layout of irrigation system and their differences and importance in irrigation engineering. 2. The course will also teach the design of various important irrigation based structures such as distributary regulators, weirs, barrages, sloping glacis weir, canal falls, aqueducts etc.				

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

PART - A

1. THEORIES OF SEEPAGE

Seepage force and exit gradient, Salient features of Bligh's Creep theory, Lane's weighted Creep theory and Khosla's theory, Determination of uplift. Pressures and floor thickness.

(5-hours)

2. DESIGN OF WEIRS

Weirs versus barrage, Design considerations with respect to surface flow, hydraulic jump and seepage flow. Design of barrage or weir.

(3-hours)

3. ENERGY DISSIPATION DEVICES

Use of hydraulic jump in energy dissipation, Factors affecting design, Types of energy dissipators and their hydraulic design.

(6-hours)

4. DIVERSION HEAD WORKS

Functions and investigations: component parts of a diversion head work and their design considerations, Silt control devices.

(7-hours)

PART- B

5. DISTRIBUTORY REGULATORS

Offtake alignment, Cross-regulators – their functions and design, Distributory head regulators, their design, Canal escape. (7-hours)

6. CANAL FALLS

Necessity and location, types of falls and their description, selection of type of falls, Principles of design, Design of Sarda type, straight glacis and Inglis or baffle wall falls.

(5-hours)

7. **CROSS-DRAINAGEWORKS**

Definitions, choice of type, Hydraulic design consideration, Aqueducts their types and design, siphon aqueducts their types and design considerations, super passages, canal siphons and level crossing.

(6-hours)

8. CANAL OUTLETS

Essential requirements, classifications, criteria for outlet behaviours, flexibility, proportionality, sensitivity, sensitiveness, etc. Details and design of non-modular, semi-modular and modular outlets.

(6-hours)

TEXT BOOKS RECOMMENDED:

1. Design of Irrigation Structures by S.K. Sharma. S.Chand.
2. Irrigation and Water Power Engg. By B.C. Punmia & Pande B.B. Lal.,Luxmi Publuications.
3. Irrigation Engg. by S.K. Garg, Khanna Publishers.
4. I.S..Codes.

Course Title	**Irrigation Engineering –II Drawing**		**Credits**	**01**
Course Code	**CIV 752**	**Max marks- 50**	**P**	**02**

DESIGN AND DRAWING OF THE FOLLOWING (USING AUTOCAD)

1. Design and detailing of both lined and unlined canals with typical sections of both types of canals clearly indicating the stone pitching etc.
2. Design and detailing of Guide bank along with the cross sections at the u/s and d/s end of guide banks.
3. Design and detailing of Weir or barrage along with the various cross sections.
4. Design and detailing of any one type of cross head regulator with a typical cross section.
5. Design and detailing of A.P.M. Outlet along with a typical cross section.
6. Design and detailing of siphon aqueduct along with a typical cross section.

Course Title	**Advanced Transportation Engineering**			**Credits**	**4**
Course Code	**CIV- 703**			**L T P**	**4 0 0**
Contact Hours	**30**	**Max Marks- 50**	**Internal Assessment- 50**	**Elective**	**N**
Pre-requisites	**TE-I & TE-II**				
Course Objectives	1. To give knowledge about design of flexible & rigid pavements 2. To givebasic knowledge of docks, harbours & tunnels..				
Course Outcome (s)	1. Students will learn the principles and elements of Design of pavements. 2. Students will learn the bituminous design methods. 3. Student will learn about various water transportation measures and facilities available in them.				

Note for Examiner: The examiner shall set total seven questions. First Question is compulsory covering whole syllabus (ten questions carrying one mark each). Three questions will be set from Part A and three questions from Part B (carrying 10 marks each) and students are required to attempt 2 questions from each part.

PART A

1.INTRODUCTION

Types of pavements, Importance and functions of various components of pavement structures, design factors-design wheel load, Equivalent single wheel load, Repetition of loads, climatic variations.

(04 Hours)

2.DESIGN OF FLEXIBLE PAVEMENTS

Flexible pavement design methods: CBR method, Group Index method, IRC method of design of flexible pavements.

(04 Hours)

3.**DESIGN OF RIGID PAVEMENTS**

General design considerations, Wheel load stresses, Westergaard's stress equation for wheel loads, evaluation of wheel load stresses, temperature stresses, design of joints, design of dowel and tie bars, IRC method of design of rigid pavements.

(05 Hours)

4.BITUMINOUS MIX DESIGN

Requirement of bituminous mixes ,Marshall method of bituminous mix design.

(04 Hours)

PART B

5 HARBOURS

Harbours & Ports, Natural phenomenon; Tides, wind & waves, Classification, Facilities at a major port, Protection facilities: wall type & special breakwater, Planning & layout of ports

(04 Hours)

6.DOCKS

General, Classification of Docks, Docking facilities, Repairing facilities-Fixed Form & Movable Form, Approach facilities, loading and unloading facilities. Guiding facilities-Light house & Signals, Storing Facilities

(05 Hours)

7.TUNNELS

General, Basic definitions, Advantages & Disadvantages of tunnels & open cuts, Selection of alignment of tunnels, Classification of tunnels, Tunnel approaches,.

(02 Hours)

8.PROBLEMS IN TUNNELING

Intoduction to various stages in tunnel construction , Methods of Tunnelling in Soft soils & Rocks, Tunnel Lining-Necessity & Materials used, Drainage in Tunnels, Health protection in tunnels.

(02 Hours)

BOOKS :

1. Bindra, S.P. "Docks & Harbour Engineering", Dhanpat Rai Publications
2. Sharma.S.K."Principles,practice and design of Highway Engineering", S.Chand & company Ltd.,1995
3. Relevant codes: IRC-37:2001(Design of Rigid Pavements),IRC-58:2002(Design of Flexible Pavements)
4. O'Flaherty," Highway Engg. Vol-II" Butterworth – Heinemann, Oxford 2006
5 .Kadiyali.L.R,Lal.N.B,"Principles and Practices of highway Engg." Khanna Publishers,Delhi-6
6.Khanna S.K., and Justo, C.E.G. "Highway Engineering", Nem Chand and Brothers, Roorkee, 1998.

Course Title	**Bridge Engineering**			**Credit**	**3**
Course Code	**CIV-704**			**L T P**	**3 0 0**
Contact Hours	**45**	**Max. Marks-50**	**Internal Assessment-50**	**Elective**	**Y**
Pre-requisites	**Knowledge of Basics of Structural Analysis and RCC**				
Course Objectives	The course content should be taught and learning imparted with the aim to develop theoretical knowledge and skills so that they are able to: 1. To discuss basic definitions, types, and components of bridges. 2. To discuss sub-surface investigations required for bridge construction. 3. To understand standard specification for bridge design. 4. To perform design of slab type reinforced concrete bridge. 5. To perform design of bridges sub-structures, bearings and joints. 6. To have knowledge of quality control and maintenance aspect.				
Course Outcome (s)	Upon successful completion of this course, it is expected that students will be able to: 1. Relate different design philosophies of the bridges. 2. Understand the structural behaviour of different components of a reinforced concrete bridges. 3. Analyze and design different components of a highway bridges, to meet desired needs within realistic constraints such as economy, environment friendly, safety, viable construction and its sustainability under loads standardised by Indian Road Congress (IRC) and submit the designs in complete and concise manner.				

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part. Use of IRC: 21:2014 and IS 456-2000 is allowed.

PART– A

1.INTRODUCTION

Definition, Investigation of Bridges: Need for investigations, selection of bridge site, choice of bridge type, preliminary data to be collected, design discharge and its determination , linear waterway, choice of span ,economical span, vertical clearance above HFL, afflux,. Scour depth.

(08-hours)

2.STANDARD SPECIFICATIONS

I.R.C. loadings for road bridges, Codal provisions on width of carriage way, clearances, loads considered etc.

(08-hours)

3.REINFORCED CONCRETE BRIDGES

Classification of bridges, Pre-stressed concrete bridges, Balanced cantilever bridges, Design of R.C.C. Solid Slab bridge, Courbon's theory for load distribution.

(08-hours)

PART- B

4.SUB STRUCTURE

Types of piers and abutments, design forces, design of piers and abutments.

(09-hours)

5.BEARING AND JOINTS

Various types of expansion bearing and fixed bearings, elastromeric bearings, joints and their types.

(04-hours)

6.LESSONS FROM BRIDGE FAILURES

Major causes, Flood and scour failures, Brittle failures, erection errors, design deficiencies, earthquake effects, failures due to wind, fatigue, corrosion.

(04-hours)

7.RECENT TRENDS IN BRIDGE ENGINEERING

Urban Flyovers and elevated roads, High performance concrete and steel, Durability considerarions.

(04-hours)

TEXT BOOKS RCEOMMENDED

1. Victor D .J, "Essentials of Bridge Engineering", Oxford and IBH Publishers, New Delhi, 2012.
2. Jagadeesh T.R. and Jayaram M.A., "Design of Bridges",PHI, New Delhi , 2012.
3. Krishnaraju N. ''Design of bridges", Oxford and IBH Publishers, New Delhi.
4. Codes: I.R.C 21:2014, IRC 6:2000, IS 456:2000

Course Title	**Hydropower Engineering**			**Credit**	**3**
Course Code	**CIV-705**			**L T P**	**3 0 0**
Contact Hours	**45**	**Max. Marks-50**	**Internal Assessment-50**	**Elective**	**Y**
Pre-requisites	**IE-I & IE-II**				
Course Objectives	The course content should be taught and learning imparted with the aim to develop theoretical knowledge and skills so that they are able to: 1. To discuss basic definitions, types, and components of bridges. 2. To discuss sub-surface investigations required for bridge construction. 3. To understand standard specification for bridge design. 4. To perform design of slab type reinforced concrete bridge. 5. To perform design of bridges sub-structures, bearings and joints. 6. To have knowledge of quality control and maintenance aspect.				
Course Outcome (s)	Upon successful completion of this course, it is expected that students will be able to: 1. Relate different design philosophies of the bridges. 2. Understand the structural behaviour of different components of a reinforced concrete bridges. 3. Analyze and design different components of a highway bridges, to meet desired needs within realistic constraints such as economy, environment friendly, safety,				

	viable construction and its sustainability under loads standardised by Indian Road Congress (IRC) and submit the designs in complete and concise manner.

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

PART A

1.INTRODUCTION

Waterpower Development – its types, distribution and use World's largest hydropower generating plants, Potential of hydropower in India- its development and future prospect.

(4 Hours)

2.ANALYSIS OF STREAM FLOW AND DEMAND

Flow duration curve, firm power, Secondary power, Load factor and Load duration curves, firm capacity, reservoir capacity, capacity factor etc.

(4 Hours)

3.TYPES OF HYDRO POWER PLANTS

Classification of hydro power plants, Run-of-river plants, Valley dam plants, High head diversion plants, Diversion Canal Plants, Pumped storage plants, Tidal power plants

(5 Hours)

4.WATER CONVEYANCE SYSTEM

Power Canals, Alignment, Design of Power canals, Flumes, Covered conduits and Tunnels. Penstocks- Alignment, types of penstocks, Economic Diameter of penstocks, Anchor blocks.

(5 Hours)

5.SPILLWAYS

Selection of site, Preliminary Investigations, Final Investigations, Spillway capacity, classification of Spillways, Design of Ogee Spillway, Stilling Basins, Spillways crest gates.

(5 Hours)

PART B

6.INTAKE STRUCTURES

functions, location, intake type, trash rack, dimension, design, spacing of bars, method of cleaning, shape of inlet, power canal, location, site, forebay, size, capacity, gates and valves.

(5 Hours)

7.TUNNELS.

geometric and hydraulic design, penstock, location, type, Economical diameter of penstock

(5 Hours)

8.SURGE TANK

Functions, type, Design of Surge tank, methods of surge analysis, restricted orifice and differential surge tanks, downstream surge tanks.

(4 Hours)

9.POWER HOUSE DETAILS

Location, site and general arrangements, draft tubes, tail trace and their hydraulic design, turbines, number, make, size, type, characteristics and efficiency, pumps, Generators, exciters, switchboard, transformers and other accessories.

(6 Hours)

10.TRANSMISSION SYSTEMS

General introduction, financial implications of Hydro Power plants

(3 Hours)

BOOKS:

1. Barrows H K "Water Power Engineering" Tata McGraw Hill Publishing Company Ltd. New Delhi, 1999.
2. Varshney R S "Hydro Power Structures" Nem Chand & Bros., Roorkee, 2000.
3. Garg S K "Irrigation Engineering and Hydraulic Structures" Khanna Publishers, New Delhi, 1998.
4. Galce A A "Handbook of Dam Engineering" Van Nostrang Rheinhold Co., New York, 2000.

5. Justin J D and Creager W P “Engineering for Dams” Vols. 1 to 3, John Wiley & Sons, New York, 1998.
6. Hydro Power an Indian Perspective, Author-Cum-Editor Dr. B.S.K. Naidu, Director General, NPTI.

EIGHTH SEMESTER

Course Title	**Advanced Environmental Engg.**			**Credits**	**4**
Course Code	**CIV 801**			**L T P**	**4 0 0**
Contact Hours	**45**	**Max Marks-50**	**Internal Assesment-50**	**Elective**	**N**
Pre-requisites	**Knowledge Of Environmental Issues In India, Biological Environment, Soil & Agricultural Pollution, Global Issues, Eia & Environmental Audit, Industrial Pollution, Waste Water From Industries , Solid Waste Management, Legal Requirements**				
Course Objectives	To make student updated about the recent environmental trends and global environmental issues comes across domestic and industrial life.				
Course Outcome	1. Students will be able to apply the knowledge and understanding gained through the course to the practical projects 2. Students will be able to analyse & audit environmental issue like biological, soil & agricultural etc.				

Note for Examiner- Examiner will set 7 questions of equal marks. First question will coverwhole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of thepaper will be divided into two parts having three questions each and the candidate is requiredto attempt at least two questions from each part.

PART A

1.ENVIRONMENTAL ISSUES IN INDIA

Forest and agricultural degradation of land, resource depletion (water, mineral, forest, sand, rocks etc. environmental degradation, public health, loss of biodiversity, loss of resilience in ecosystems, Land pollution, Greenhouse emissions, Environmental issues and Indian law, Conservation, Specific issues

(04 Hours)

2. BIOLOGICAL ENVIRONMENT

Community health-significance, disease transmission, Health Education, occupational health, hazards, plan prevention and control, Water borne disease.

(05 Hours)

3.SOIL & AGRICULTURAL POLLUTION

Top soil, pollution, parameter of soil analysis, remedial measures, related disease.

Green construction & Eco renovation, CO2 Pollution and Global Warming, Compact Fluorescent Lights (CFLs),radiation /nuclear/radioactive pollution.

(04 Hours)

4.EIA & ENVIRONMENTAL AUDIT

Environmental Impact Assessment, social and economic aspects, Brief study of Environmental audit, audit items, audit procedure, Safety audit.

(04 Hours)

PART B

5.INDUSTRIAL POLLUTION

Paper and pulp, cane sugar and distilleries, dairy plant, petrochemical and refineries, and other industrial units.

(05Hours)

6.WASTE WATER FROM INDUSTRIES

Waste characteristics, harmful effects, Pre treatment of industrial waste, reduction of waste strength and volume equalization and neutralization.

(04 Hours)

7.LEGAL REQUIREMENTS

Municipal solid waste rules; Hazardous waste rules; Biomedical waste rules; Rules related to recycled plastics, used batteries, fly ash, etc. function of pollution control board and legal aspects

(04 Hours)

8.SOLID WASTE MANAGEMENT

Properties of solid wastes, management of solid wastes in India, disposal of wastes, sanitary land filling including leachate collection and treatment, recovery of methane from landfill sites for power generation.

(05Hours)

BOOKS:

1. Waste Water Engineering : Metcalf and Eddy Inc. TMH.
2. Elements of Public Health Engg. : K.N. Duggal, S. Chand.
3. Environmental Engineering : Peavy H S and Rowe, McGraw Hill
4. Industrial Wastewater Treatment: A Guidebook : Joseph D. Edwards
5. Environmental Engineering II : S K Garg, Khanna Publishers
6. Solid Wastes Energy Principles & Management by Techno banoglus, : Theisen & Elvasebm, McGraw Hills

Course Title	**Computational Methods**			**Credit**	**4**
Course Code	**CE-802**			**L T P**	**4 0 0**
Contact Hours	**45**	**Max Marks-50**	**Internal Assessment-50**	**Elective**	**N**
Pre-requisites	**Knowledge of Basics of Matrices, Algebra and Differential equations.**				
Course Objectives	The development of fast, efficient and inexpensive computers has significantly increased the range of engineering problems that can be solved reliably. The course aims at: 1. Use computers to solve problems by step-wise, repeated and iterative solution methods, which would otherwise be tedious or unsolvable by hand-calculations. 2. To formulate engineering problems using systems approach and optimization, develop awareness of the shortcomings, approximations and uncertainties associated with numerical methods and modeling. 3. To give an overview of computational techniques of interest to process engineer. The focus being on the techniques themselves, rather than specific applications.				
Course Outcome (s)	1. Students can able to solve problem sets relevant to civil engineering through problem formulation, solution algorithm design and programming application. 2. To improve computational skills and be proficient in programming language required to solve engineering problems and recognize the need for life-long learning, and advancement of computational skills for solving complex civil engineering problems.				

Note for Examiner- Examiner will set 7 questions of equal marks. First question will coverwhole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of thepaper will be divided into two parts having three questions each and the candidate is requiredto attempt at least two questions from each part.

PART A

1.MATRICES & LINEAR SYSTEM OF EQUATIONS

Linear dependence of vectors, relation between rank of a matrix and linear independent vectors of matrix, similar matrices, characteristic vector and characteristic roots of a matrix, Cauley- Hamilton Theorem, Consistency of a linear system of a equations, solution of linear systems, direct method, matrix inversion, Gaussian elimination, method of factorization, iterative methods—Jacobi's method, Gauss- Siedal method, solution of tridiagonal systems.

(15 hours)

2.SEQUENCES & SERIES

Sequences, limits of sequences, infinite series, series of positive terms, integral test, comparison test, ratio test, root test, Alternating series, Absolute and conditional Convergence, Leibnitz test, Power series: radius of convergence of power series, Taylor's and Maclaurin's series, Formulae for remainder term in Taylor and Maclaurin series, Formulae for remainder term in taylor and Maclaurin series, Error estimates.

(12 hours)

PART B

3.NUMERICAL METHOD

Numerical differentiation using finite differences, numerical integration using Trapezoidal rule, Simpson's one third rule, Simpson's Three-eight rule, numerical solution of first order ordinary differential equation using Taylor's series method, Picard's method, Euler's method, Modified Euler's method, Range Kutta method and Predictor-Corrector method,(Adam methods and Milne's method) Simultaneous equations of first order, higher order ordinary differential equations reducible to simultaneous differential equations of first order, ordinary linear differential equations, boundary value problem using finite difference method.

(18 hours)

TEXT BOOKS RECOMMENDED :

1. S.S. Sastry, "Introductory methods of Numerical Analysis",PHI Learning Pvt. Ltd.
2. B.S.Grewal,"Higher Engg. Mathematics",Khanna Publishers, New Delhi.
3. E Balagurusamy, "Numerical Methods",Tata Mc-Graw Hill Education.

Course Title	**Maintenance Of Buildings**			**Credits**	**04**
Course Code	**CIV. 803**			**L T P**	**4 0 0**
Contact hrs	**45**	**Max Marks-50**	**Internal Assesment-50**	**Elective**	**N**
Pre-requisites	**Learning the objectives and methods for maintenance of buildings**				
Course Objectives	1. Importance of maintenance 2. Maintenance management 3. Repair materials 4. Investigation and diagnosis for repair of structures 5. Problems and root causes and remedial measure				
Course Outcome (s)	1. To understand the importance of maintenance 2. Learning the methods for maintenance management 3. Introduction to repair materials 4. Investigation and diagnosis for repair of structures 5. Understanding the problems and root causes and remedial measure To understand the				

Note: The examiner shall set total seven questions. First Question is compulsory covering whole syllabus (ten questions carrying one mark each). Three questions will be set from Part A and three questions from Part B (carrying 10 marks each) and students are required to attempt 2 questions from each part

PART A

1. PRINCIPLES OF MAINTENANCE

Importance of maintenance, deterioration and durability, factors affecting decision to carryout maintenance, maintenance and GNP, agencies causing deterioration, effect of deterioration agencies on materials**.**

(06 hours)

2. DESIGN AND ECONOMIC CONSIDERATION IN MAINTENANCE

Factors to reduce maintenance at design stage, consideration lf maintenance aspects in preparing tender document and specifications, sources of error in design which enhances maintenance and its importance at design stage. Economic consideration in maintenance: physical life, functional life, economic life of different types of buildings, discounting technique for assessment of economic life**.**

(06 hours)

3. MAINTENANCE MANAGEMENT

Definition, organization structure, work force for maintenance, communication needs, building inspections, maintenance budget and estimates, property inspections and reports, specification for maintenance jobs, health and safety in maintenance, quality in maintenance, maintenance manual and their importance**.**

(08 hours)

4. MATERIALS FOR MAINTENANCE

Compatibility of repair materials, durability and maintenance, types of materials, their specification and application, criteria for selection of material, use of commercial available materials in maintenance.

(06 hours)

PART B

5. INVESTIGATION AND DIAGNOSIS FOR REPAIR OF STRUCTURES

Basic approach to investigations, physical inspection, material tests, non-destructive testing for diagnosis, estimation of actual loads and environmental effects, study of design and construction practices used in original construction, retrospective analysis, and confirmation and repair steps**.**

(05 hours)

6. MAINTENANCE PROBLEMS AND ROOT CAUSES

Classification of defects, need for diagnosis, type of defects in building elements and building materials defect location, symptoms and causes.

(06 hours)

7. REMEDIAL MEASURES FOR BUILDING DEFECTS

Preventive maintenance and special precautions – considerations, preventive maintenance for floors, joints, wet areas, water supply and sanitary systems, termite control, common repair techniques, common methods of crack repair.

Repair of existing damp proofing systems in roofs, floors and wet areas.

Protection, repair and maintenance of RCC elements.

Repair of finishes.

Repair of building joints.

Repair of water supply and sanitary systems, under ground and over head tanks.

Common strengthening techniques.

(04 hours)

8. MAINTENANCE OF MULTISTOREY BUILDINGS

Specials features for maintenance of multi-storeyed buildings, including fire protection system, elevators, booster pumps, generator sets.

(02 hours)

9. MAINTENANCE OF SERVICES

Leakage detection techniques in pipes, cleaning of pipes, replacement of pipes, clogging of sewer pipes, cleaning and their repairs, special precaution required in sewer pipe maintenance, maintenance of septic tanks, maintenance of AC and electrical system in buildings.

(02 hours)

BOOKS:

1. Concrete Repairs & Maintenance by Peter H. Emmons & Gajanan M. Subnis.R.S.Means Company.
2. Concrete Repair: Vol. I, II & II published by the Aberdeen Group.
3. Repair and Rehabilitation of Concrete Structures, ACI Compilation 10.
4. Gahlot & Sharma, CBS, Publications
5. A.C. Panchdari, Maintenance of Buildings New Age International (P) Limited Publishers
6. G. Szechy, D.Sc: Foundation Failures, Concrete Publications Limited 14 Dartmouth Street, London.
7. H.J Eidridge, Common Defects in Buildings, Her Majesty's Stationery Office, London
8. W.H. Ransom; Building Failures: Diagnosis and Avoidance, New Age Publications (P) Limited

Course Title	**Hydrology and Dams**			**Credits**	**03**
Course Code	**CIV 804**			**L T P**	**3 0 0**
Contact Hours	**45**	**Max marks-50**	**Internal Assessment -50**	**Elective**	**N**
Pre-requisites	**Fluid Mechanics I and II**				
Course Objectives	The objective of this course is to introduce the students with basics of science of hydrology such as precipitation, runoff, flood control etc. The course will also emphasize on various types of dams and spillways with their design considerations.				
Course Outcomes	1. The student would be able to learn the basic concepts related to hydrology and dams. 2. The course will also detail about the hydrological parameters such as interception, evaporation etc and know their importance in design of various hydraulic structures. The various designs of irrigation structures to be learnt are based on the basics studied in this class. 3. Apart from study of basics of hydrology, the students will also learn about the dams				

	and their types and apply this information on the topics of gravity, arch and buttress dams. 4. Overall, this course will give a general overview of hydrological processes taking place within our environment and will be helpful to apply in other courses of Civil engineering.

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

PART- A

1.PRECIPITATION

Importance of hydrological data in water resources planning. The hydrologic cycle, Mechanics of precipitation, types and causes, Measurement by rain gauges, gauge net works. Hyetograph, averaging depth of precipitation over the basin, mass-rainfall curves, intensity duration frequency curves, depth area-duration curves.

(6-hours)

2.INTERCEPTION, EVAPO-TRANSPIRATION AND INFILTRATION

Factors affecting interception, Evaporation from free water surfaces and from land surfaces. Transpiration, Evapo-transpiration. Factors Affecting infiltration rate, infiltration capacity and its determination.

(4-hours)

3.RUNOFF

Factors affecting runoff, Runoff hydrograph, Unit hydrograph theory, S-curve hydrograph, Synder's Synthetic unit hydrograph, Principles of flood routing through a reservoir by I.S.D. method (description only).

(6-hours)

4.PEAK FLOWS

Estimation of Peak flow-rational formula, Use of unit hydrograph, Frequency analysis, Gumble's method, Design flood and its hydrograph.

(4-hours)

PART- B

5.INTRODUCTION TO DAMS

Choice of type of dam, site selection, investigation, foundation treatment.

(5-hours)

6.GRAVITY DAMS

Non-over flow and over flow section of dams, Forces acting on dams, Stability factors, stresses on the faces of dam. Design of profile by the method of zoning. Elementary profile of a dam, upstream lip and approach ramp. Discharge characteristics of spillways. General principles of design of spillways - Ogee, Chute, side channel and siphon.

(7-hours)

7. EARTHEN DAMS

Components of earthen Dams and their functions; Phreatic line determination by analytical and graphical methods. Seepage determination and control.

(6-hours)

8.ARCH AND BUTTRESS DAMS

Classification of arch dams constant, radius, constant angle and variable radius types, Cylinder theory, Expression relating central angle and cross-sectional area of arch. Types of buttress dams, Advantages of buttress dams.

(7-hours)

TEXT BOOKS RECOMMENDED:

1.Design of Small Dams	:	USBR Publication Oxford and IBH Publishing Company
2.Design of Gravity Dams	:	Varshney, Gupta & Gupta.
3.Earth Dams	:	Bharat Singh, Nem Chand and Bros., Roorkee
4.Hydrology	:	A. J. Randkivi, Pergamon Press Oxford
5.Engineering Hydrology	:	K. Subramanya, Tata Mc Graw Hill and Publishing Company, New Delhi

Course Title	Prestressed Concrete Design			Credit	3
Course Code	CIV-805			L T P	3 0 0
Contact Hours	45	Max. Marks-50	Internal Assessment-50	Elective	Y
Pre-requisites	Knowledge of Basics of Structural Analysis and RCC				
Course Objectives	1. To learn the principles, materials, methods and systems of prestressing. 2. To know the different types of losses and deflection of prestressed members. 3. To learn the design of prestressed concrete beams for flexural, shear and tension. 4. To calculate ultimate flexural strength of beam. 5. To learn the design of anchorage zones.				
Course Outcome (s)	On completion of the course, the students will be able: 1. To differentiate between Reinforced Concrete and Prestressed Concrete. 2. To design a prestressed concrete beam for flexural, shear and torsion after accounting for losses. 3. To design the anchorage zone for post tensioned members.				

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 5 conceptual questions of 2 marks each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

PART- A

1.INTRODUCTION

Basis concepts, Materials used, advantages of prestressed Concrete, Applications of prestressed concrete. (05-hours)

2.MATERIALS FOR PRESTRESSED CONCRETE

High strength concrete, strength requirements permissible stresses in concrete, creep & shrinkage, deformation characteristics, high strength steel, strength requirements, permissible stress in steel. (05-hours)

3.PRESTRESSING SYSTEMS

Introduction, prestensioning systems, post-tensioning systems, chemical prestressing. (05-hours)

4.LOSS OF PRESTRESS

Nature of losses, different types of losses and their assessment. (05-hours)

5.ANALYSIS OF PRESTRESS & BENDING STRESS

Basic assumptions, Resistant stresses at a section, pressure line, and concept of land balancing, stresses in grading moment. (05-hours)

PART-B

6.FLEXURAL SHEAR STRENGTH OF PRESTRESSED CONCRETE SECTIONS

Types of flexural failure, strain compatibility method, code procedures, shear and principal stresses, ultimate shear resistance of pressed concrete members, prestressed concrete members in torsion. (08-hours)

7.TRANSFERS OF PRESTRESS IN PRE-TENSIONED AND POST-TENSIONED MEMBERS

Transmission Length, bond structures, Transverse tensile stress End-zone reinforcement, stress distribution in end block. (06-hours)

8.DESIGN PRESTRESSED CONCRETE SECTIONS

Design of section for flexure, Axial tension compression & bending, shear, bond and torsion. (06-hours)

TEXT BOOKS RECOMMENDED

1. Raju N K, “Prestressed Concrete” Tata McGraw Hill, New Delhi, 2001.
2. Rajagopalan N, “Prestressed Concrete” Narosa, New Delhi, 2001.
3. Dayaratnam P, “Prestressed Concrete” Oxford & IBH, New Delhi, 1999.
4. Lin T Y, “Prestressed Concrete” McGraw Hill, New York, 1985.
5. Edward G. Navy, “Prestressed Concrete-A Fundamental Approach” Prentice Hall Publishers, NY, 2000.

Course Title	Town Planning And Architecture			Credits	03
Course Code	CIV-806			L T P	3 0 0
Contact Hours	30	Max Marks- 50	Internal Assessment-50	Elective	Y
Pre-requisites	Knowledge of basic building services and utilities				
Course Objectives	1. To expand the knowledge of basic principles of Architecture 2. To relate the work of civil engineer and architect				
Course Outcome (s)	1. Students will learn the principles and elements of architecture 2. Students will learn the new concepts of planning. 3. Student will understand the requirement of various services in town planning.				

Note for Examiner: The examiner shall set total seven questions. First Question is compulsory covering whole syllabus (ten questions carrying one mark each). Three questions will be set from Part A and three questions from Part B (carrying 10 marks each) and students are required to attempt 2 questions from each part.

PART- A

1. ELEMENTS OF DESIGN

Line direction. Shape, size, texture, value and colour, balance, scale and proportion. (3 Hours)

2. PRINCIPLES OF DESIGN

Repetition, gradation, harmony, contrast and unity, creation of 2 D and 3 D compositions. (3 Hours)

3. THE INDUSTRIAL REVOLUTION

The emergence of engineer, new materials and techniques and the evolution of balloon frame and steel frame. (3 Hours)

4. ORIGIN OF MODERN ARCHITECTURE

Definition and concept of modern architecture, various pioneers of modern architecture (3 Hours)

5. TOWN PLANNING

Definition and meaning, age of planning, scope and motives of planning, brief history of town planning – its origin and growth, historically development of town planning in ancient valley Civilizations. Indus Nile Tigris and Euphrates, Greek Roman, Medieval and Renaissance town planning (3 Hours)

PART B

6. NEW CONCEPTS

Garden city movement, Linear city and concentric city concepts, Neighbourhood and Radburm, Radiant city to present day planning (3 Hours)

7. PLANNING PRINCIPLES

Types of town and their functions, types of town planning – Grid Iron, Radial, Spider webs, Irregular and Mixed, their advantages and disadvantages. (3 Hours)

8. PLANNING PRACTICE AND TECHNIQUES

Zoning – its definition, procedure and districts, height and bulk zoning, F. A. R., Master Plan – Meaning, preparation and realization, the scope of city planning – city rehabilitation and slum clearance (4 Hours)

9. BUILDING SERVICES

Water Supply, Sewerage and drainage systems, sanitary fittings and fixtures, Plumbing systems, principles of internal & external drainage systems, Principles of electrification of buildings, Intelligent buildings, elevators and escalators, their standards and uses, air-conditioning systems, fire-fighting systems, building safety and security systems. (5 Hours)

TEXT BOOKS RECOMMENDED

1. Cherry, Gordon,"Urban Planning Problems",Board Hill, London,1974.
2. Sundaram,K.V.,"Urban and Regional Planning in India" Vikas Publishing house(P) Ltd.,New Delhi,2000.

3. Gallion A B.,Eisner S., “The Urban Pattern” Van Nostrand reinhold,New York,1993.

OTHER RECOMMENDED BOOKS

1. Jon Lang,”A concise history of Modern Architecture in India”,Permanent Black Publishers,New York,1998.
2. Taurus Parke,”A City with view Florence”, I.B.Taurus Publishers, New York, 1994.

Course Title	**Concrete Technology Lab**		**Credits**	**01**
Course Code	**CIV 853**	**Max marks- 50**	**P**	**02**

1. To determine quality of hardened concrete by ultrasonic pulse velocity method.
2. To determine the size and location of bars using profometer.
3. To determine flexural strength of concrete.
4. Mix design of M20 concrete.
5. Mix design of M20 concrete using admixtures
6. Mix design of M20 using fly ash.
7. To determine the permeability of concrete.
8. To determine the workability of SCC by slump flow test.

BOOKS:

1. Laboratory Manual on Concrete Testing (Part-I) : V. V. Shastri and M. L. Gambhir
2. Laboratory Manual on Concrete Testing (Part-I) : C. B. Kukreja
3. Laboratory Manual on Concrete Technology :PD Kulkarni, LN Mittal & Hemant Sood