

**UNIVERSITY OF MUMBAI**



**Scheme of Instructions and Examination  
(RR-2007)**

**For**

**The Final Year  
(Semester VII & VIII)**

**of the**

**B.E. Degree Course  
In  
Civil Engineering**

**(With effect from academic year 2010-2011)**

**UNIVERSITY OF MUMBAI**  
**SCHEME OF INSTRUCTIONS AND EXAMINATION**  
**(RR-2007)**

**FOURTH YEAR ENGINEERING: (Civil Engineering)**

**Semester VII**

	Subjects	No. of periods per week (60 minutes each)			Duration of theory paper (hours)	Marks				
		Lecture	Practical	Tutorial		Theory Paper	Term Work	Practical	Oral	Total
1.	Limit State Method for Reinforced Concrete Structures*	4	-	2	3	100	25	-	-	125
2.	Quantity Survey, Estimation and Valuation*	4	-	2	4	100	25	-	25	150
3.	Irrigation Engineering*	4	-	2	3	100	25	-	25	150
4.	Environmental Engineering-II	4	2	-	3	100	25	-	25	150
5.	Elective-I	4	-	2	3	100	25	-	25	150
6.	Project-A*	-	-	4	-	-	50	-	25@	75
<b>Total</b>		<b>20</b>	<b>2</b>	<b>12</b>	<b>-</b>	<b>500</b>	<b>175</b>	<b>-</b>	<b>125</b>	<b>800</b>

\* Common to Construction Engineering

@ Seminar on project (Internal)

**Semester – VIII**

	Subjects	No. of periods per week (60 minutes each)			Duration of theory paper (hours)	Marks				
		Lecture	Practical	Tutorial		Theory Paper	Term Work	Practical	Oral	Total
1.	Design and Drawing of Reinforced Concrete Structures*	4	-	2	4	100	25	-	25	150
2.	Construction Engineering	4	-	2	3	100	25	-	25	150
3.	Construction Management	4	-	2	3	100	25	-	25	150
4.	Elective-II	4	-	2	3	100	25	-	25	150
5.	Project-B*	-	-	4	-	-	50	-	50#	100
<b>Total</b>		<b>16</b>	<b>-</b>	<b>12</b>	<b>-</b>	<b>400</b>	<b>150</b>	<b>-</b>	<b>150</b>	<b>700</b>

\* Common to Construction Engineering

# Presentation on project & Oral

**UNIVERSITY OF MUMBAI  
(RR-2007)**

**FORTH YEAR ENGINEERING: (Civil Engineering)**

**List of Electives**

Semester VII Elective-I (Lecture-4, Practical / Tutorial-2)	
1	Advanced Surveying *
2	Advanced Engineering Geology*
3	Applied Hydrology and Flood Control
4	Solid Waste Management
5	Systems Approach in Civil Engineering*
6	Risk and Value Management *
7	Advanced Structural Analysis
8	Structural Dynamics
9	Advanced Structural Mechanics
10	Advanced Foundation Engineering
11	Ground Water Hydrology
12	Pavement Subgrade & Materials
13	Air Pollution
14	Prestressed Concrete
15	Traffic Engineering and Control
16	Reinforced Concrete Repairs and Maintenance*
17	Advanced Computational Techniques

\* Common to Construction Engineering

Semester VIII Elective-II (Lecture-4, Practical / Tutorial-2)	
1	Advanced Construction Engineering*
2	Rock Mechanics
3	Geographical Information System
4	Water Resources Engineering & Management*
5	Bridge Design & Engineering
6	Environmental Impact Assessment and Audit*
7	Appraisal & Implementation of Infrastructure Projects*
8	Disaster Management*
9	Pavement Design and Construction
10	Advanced Design of Steel Structures
11	Earthquake Engineering
12	Soil Dynamics
13	Building Services*
14	Design of Hydraulic Structures
15	Industrial Waste Treatment
16	Transportation planning and Economics
17	Advanced Repairs and Rehabilitation of Structures*

\* Common to Construction Engineering

<b>Class:-B E (Civil/Construction)</b>		<b>Semester VIII</b>	
<b>Subject:- Design and drawing of Reinforced Concrete structures</b>			
Periods/week – each	Lecture	04	
Period of 60 minutes duration	Practical	-	
	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	04	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	Design of Foundations: (limit state method of design) Design of simple raft subjected to symmetrical loading	08
2	Design of staircases: (limit state method of design) Design of Dog legged, Open well type staircase.	06
3	Complete design of residential, commercial or Industrial building including staircase and foundations. (limit state method of design)	12
4	Design of retaining walls: (limit state method of design) Design of Cantilever, Counter fort type retaining wall.	08
5	Design of water tanks: (working stress method) Circular and rectangular, at ground level, underground and overhead water tanks both by IS coefficient and - approximate methods, including supporting structure for overhead water tanks.	14

Note: Relevant and latest IS codes of practice shall be followed for all the topics

#### Theory Examination:-

1. Question paper will consist of total five questions.
2. Question number 1 will be compulsory having 40 marks and two options.
3. Remaining four questions will be of 20 marks each.
4. Only three questions need to be attempted from remaining four questions.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

#### Oral and sketching Examination:-

Oral and sketching examination will be based on entire syllabus.

#### Term work:-

Design report and at least four A1 (Full imperial) size drawings sheets for three projects covering the above syllabus shall be submitted as term work. All drawing work is to be done in pencil only. Exposure to design by available software for design is also to be considered.

Each student has to appear for at least one written test during the term. The term work mentioned as above and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Design report and drawing sheets	:	15 marks
Written test (at least one)	:	10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Limit State Theory for Reinforced Concrete Design: Huges B. P., Pitman
2. Limit State Design - Reinforced Concrete: Jain A. K., New Chand, India
3. Reinforced Concrete: Warener R. F., Rangan B.C. & Hall A. S.
4. Illustrated Design of G+3 Building: Shah & Karve, Structural Publishers.
5. Reinforced Concrete: S. N. Sinha, TMH, New Delhi
6. Reinforced Concrete: H. J. Shah, Charotar Publisher
7. Relevant I.S. codes and design aids, BIS Publications.
8. Reinforced Concrete Fundamentals: Ferguson P.M., Breen J.E., and Jirsa J.O., 5<sup>th</sup> Edition, John Wiley & Sons, 1988.
9. Illustrated Reinforced Concrete Design: Dr. V.L. Shah & Dr. S.R. Karve, Structural Publishers.

<b>Class:-B E (Civil)</b>		<b>Semester VIII</b>	
<b>Subject:-Construction Engineering</b>			
Periods/week – each	Lecture	04	
Period of 60 minutes duration	Practical	-	
	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	<p>Construction equipment: Standard types of equipment, special equipment, cost of owning and operating equipment, depreciation costs, investment and operating costs, economic life, sources of construction equipment, factors affecting selection of construction equipment, balancing of equipment</p> <p>Study of equipments with reference to available types and their capacities, operations and factors affecting their performance:</p> <p>Earthmoving equipment: tractors and attachments, dozers and rippers, scrapers, shovels, draglines, trenching machines, clamshell, hoes, trucks and wagons, dumpers, dozers, trenching machines, rollers and compactors</p> <p>Drilling and blasting equipment: bits, jackhammers, drifters, drills, blasting material, firing charge, safety fuse, electric blasting caps, drilling patterns, transporting and handling of explosives</p> <p>Pile driving equipment: types, pile driving hammers: single acting and double acting, differential acting hammers, hydraulic and diesel hammers, vibratory pile drivers</p> <p>Pumping equipment: reciprocating, diaphragm &amp; centrifugal pumps, wellpoint system</p> <p>Stone crushing equipment: jaw, gyratory and cone crushers, hammer mills, roll crushers, rod and ball crushers, aggregate screens and screening plants, portable plants</p> <p>Air compressor</p> <p>Equipment for moving materials: builder's hoists, forklifts, cranes, belt-conveyors, cableways, ropeways</p>	<p>04</p> <p>03</p> <p>03</p> <p>04</p> <p>03</p> <p>02</p> <p>02</p> <p>02</p> <p>03</p>
2	<p>Tunneling: Selection of alignment, methods of tunneling in soft soils and in hard rock, sequence of operations for drilling and blasting method, mechanical moles, boomers, tunnel boring machines, mucking, ventilation of tunnels, dust control, types of tunnel supports, sequence of lining operation, lining with pneumatic placers and by pumpcrete method</p>	10
3	<p>Soil stabilization techniques: sand drains, stone columns, use of geotextiles and chemicals, diaphragm wall, rock anchors, foundation grouting</p>	05
4	<p>Concrete: mass concreting, vaccum concrete, forms for concrete construction: slip forms, collapsible forms, forms for cantilevers</p>	05

**Theory Examination:-**

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

**Oral Examination:-**

Oral examination will be based on entire syllabus.

**Term work:-**

Each student has to appear for at least one written test during the term. At least two site visits should be arranged to give an exposure to various construction techniques discussed in the above syllabus. A report on site visit, at least 10 assignments (including sketches for various equipment and construction details) and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Report on site visits and assignments	:	15 marks
Written test (at least one)	:	10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Construction Equipment and Planning: R L Purifoy and Ledbetter, McGraw Hill
2. USBR, Earth Manual
3. USBR, Concrete Manual
4. Handbook of Heavy Construction: O'Brien, Havers & Stubb, McGraw Hill
5. Foundation Analysis and Design: Bowels J E,
6. Construction Engineering & Management: S Seetharaman, Umesh, S Chand, New Delhi
7. Concrete Technology: M S Shetty, Khanna
8. Construction Equipment & Its Management: S C Sharma, Khanna Publications

<b>Class:-B E (Civil)</b>		<b>Semester VIII</b>	
<b>Subject:-Construction Management</b>			
Periods/week – each	Lecture	04	
Period of 60	Practical	-	
minutes duration	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	Construction: Unique features of construction, construction project, types and features, phases of a project, agencies involved and their methods of execution.	03
2	Construction project planning: Stages of project planning: pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Process of development of plans and schedules, work break-down structure, activity lists, assessment of work content, estimating durations, sequence of activities, activity utility data	07
3	Techniques of planning: Bar charts, Networks: basic terminology, single and overlapping relationships preparation of CPM networks: activity on link and activity on node representation, analysis of single relationship (finish to start) networks, computation of float values, critical and semi-critical paths, calendering networks	10
4	Resource Scheduling: Bar chart, line of balance technique, resource constraints and conflicts, resource aggregation, allocation, smoothening and leveling	05
5	PERT: Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion	06
6	Planning and organizing construction site and resources: Site: site layout, developing site organization, record keeping at site, Manpower: planning, organizing, staffing, motivation, Materials: concepts of planning, procurement and inventory control, Equipment: basic concepts of planning and organizing, Funds: cash flow, sources of funds	07
7	Construction costs: Classification of costs, time cost trade-off in construction projects, compression and decompression	03
8	Monitoring & control: Supervision, record keeping, periodic progress reports, periodical progress meetings Updating of plans: purpose, frequency and methods of updating Common causes of time and cost overruns and corrective measures Quality control: concept of quality, quality of constructed structure, use of	04



	<p>manuals and checklists for quality control, role of inspection, basics of statistical quality control</p> <p>Safety and health on project sites: accidents; their causes and effects, costs of accidents, occupational health problems in construction, organizing for safety and health</p>	
9	<p>Purpose and brief provisions in brief of following acts: Minimum wages act, The building and other construction workers (regulation of employment and conditions of service) Act, The building and other construction workers welfare cess Act, Contract Act, Alternative disputes resolution methods</p>	03

**Theory Examination:-**

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

**Oral Examination:-**

Oral examination will be based on entire syllabus.

**Term work:-**

Each student has to appear for at least one written test during the term. At least 12 assignments including numerical problems and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Assignments	:	15 marks
Written test (at least one)	:	10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Professional Construction Management: Barrie D.S. & Paulson B C, McGraw Hill
2. Construction Project Management: Chitkara K K, Tata McGraw Hill
3. Handbook of Construction Management: P K Joy, Macmillan, India
4. Construction Hazard and Safety Handbook: King & Hudson, Butterworths
5. Critical Path Methods in Construction Practice: Antill J M & Woodhead R W, Wiley
6. Relevant acts

<b>Class:-BE(Civil/Construction)</b>		<b>Semester-VIII</b>	
<b>Subject:- Elective-II: Advanced Construction Engineering</b>			
Periods/week – each Period of 60 minutes duration	Lecture	04	
	Practical	-	
	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	Large and heavy engineering projects: Characteristics and complexities, methods statement for major activities like excavation, concreting, steel fabrication and erection for projects like earthen dams, hydropower projects, nuclear power plant, refineries and other industrial projects etc.	06
2	Excavation for heavy engineering projects: Excavation in various types of soils, selection of equipment, safety measures in excavation, drainage in excavation	06
3	Concrete construction for heavy engineering projects: Selection of equipment for batching, mixing, transporting, placing and compacting for various types of jobs, safety measures during concreting, Special concretes and mortars: preplaced aggregate concrete, roller compacted concrete, grouting	06
4	Prefabricated construction: Planning for pre-casting, selection of equipment for fabrication, transport and erection, quality measures, safety measures during erection	05
5	Steel construction: Planning for field operations, selection of equipment and erection tools, tools and methods of welding, tools and methods of cutting and joining, bridge erection, quality measures, safety measures during fabrication and erection	05
6	Specific issues related to planning, site layouts, equipment selection and pre-project activities for large size construction projects like earthen dams, concrete dams, thermal power stations, nuclear power stations, light houses, airports and ports, bridges	05
7	Information related to special equipments and their applications to Off-shore construction, underground utility construction	05
8	New materials and equipment for construction	05
9	Case studies of heavy construction projects	05

**Theory Examination:-**

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

**Oral Examination:-**

Oral examination will be based on entire syllabus.

**Term work:-**

Each student has to appear for at least one written test during the term. A detail report of site visit to any heavy construction work, at least five assignments and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

A report of site visit and assignments	:	15 marks
Written test (at least one)	:	10 marks

The final certification and acceptance of term work ensures the satisfactory performance of laboratory work and at least passing in the term-work.

**Recommended Books:-**

1. Handbook of Heavy Construction: Stubbs, McGraw Hill, New York
2. Construction equipments: Jagdish Lal.

<b>Class:-B E (Civil)</b>		<b>Semester VIII</b>	
<b>Subject:-Elective-II : Rock Mechanics</b>			
Periods/week – each	Lecture	04	
Period of 60 minutes duration	Practical	02	
	Tutorial	-	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	Structural Geology of Rocks:	04
2	Subsurface Investigations in Rocks and Engineering Characteristics of Rock Masses:	04
3	Engineering Classification of Rocks and Rock Masses: Classification of intact rocks, rock mass classifications {rock quality designation, rock structural rating, geomechanics classification (RMR)}, strength and modulus from classifications, classification based on strength and modulus, geo-engineering classification, Deere and Miller's Engineering Classification.	05
4	Stress Distribution in Rocks: Field and Laboratory Tests on Rocks	05
5	Strength, Modulus and Stress-Strain Responses of Rocks: Factors influencing rock responses, strength criteria for isotropic intact rocks, modulus of isotropic intact rocks with confining pressure, uni-axial compressive strength of intact anisotropic rocks, strength due to induced anisotropy in rocks, compressive strength and modulus from SPT, stress-strain models (constitutive models, elastic stress-strain model, elasto-plastic stress-strain model, equivalent material concept), influence of intermediate principal stress.	06
6	Bearing Capacity of Rocks: Estimation of bearing capacity (foundation on intact rock, heavily fractured rock, UBC with Hoek-Brown criterion, foundation on slope), stress distribution in rocks, factor of safety, strengthening measures (concrete shear keys, bored concrete piles, tensioned cable anchors, concrete block at toe), settlement in rocks (from joint factor, for horizontal joints, from field tests).	06
7	Stability of Rock Slopes: Modes of failure, rotational failure, plane failure, wedge method of analysis, buckling failure, toppling failure, improvement of slope stability and protection.	06
8	Opening in Rocks: Introduction to theory of elasticity, lines and unlined tunnels, pressure tunnels and tunnels for other purposes.	06
9	Rock Bolting and Grouting: Grouting in rocks, objectives, contact grouting, consolidation grouting,	05

process of grouting, grout requirement, types of grout, stage grouting, grout curtain. Rock bolts, rock bolt types and applications, theory of rock bolting, rock anchors, modes of failure, uplift capacity.	
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**Theory Examination:-**

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

**Oral Examination:-**

Oral examination will be based on entire syllabus.

**List of Practicals**

Practicals include confined and unconfined compression test, point load test, Brazilian tensile test, permeability test and modulus of elasticity of rocks.

**Term work:-**

Each student shall prepare a report on experiments conducted and a project report covering the selection of design parameters, design analysis including drawing on any aspect of rock mechanics included in the syllabus.

Each student has to appear for at least one written test during the term. The project report referred above, at least five examples report on experiments and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Assignments and reports	:	15 marks
Written test (at least one)	:	10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Fundamentals of Rock Mechanics: J. C. Jaeger and N. G. W. Cook, Oxford Press.
2. Rock Mechanics and Design of Structures on Rock: Obert, Leon and W. I. Duvall
3. Rock Mechanics in Engineering Practice: K. G. Stagg and O. C. Zienkiewicz, John Willey & Sons, New York.
4. Rock Mechanics - Vol. I & II: Jumukis, Trans Tech Publication, USA.

<b>Class:-B E (Civil)</b>		<b>Semester VIII</b>	
<b>Subject:-Elective-II : Geographical Information System</b>			
Periods/week – each	Lecture	04	
Period of 60 minutes duration	Practical	02	
	Tutorial	-	
		<b>Hours</b>	<b>Marks</b>
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	<b>Total</b>		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	Introduction to GIS: Definition, sources of data, types of data, concept of space and time in GIS, spatial information theory, history of GIS, elements of GIS, objectives of GIS, hardware and software requirements of GIS, application of GIS	08
2	Data models of spatial information: Layers and coverage, conceptual models of spatial information, representation of spatial data models in computer: raster and vector models, comparative overview between raster and vector models	10
3	Data models of non-spatial information: Database management systems, hierarchical structure, network structure, relational structure	06
4	Digitizing, Editing and Structuring of map data: Digitizing: manual, semi-automatic and automatic, editing: error detection and correction, tolerances, topology creation, attribute map generation	10
5	Digital Elevation Model: Need of DEM, Various structures of DEM: line, TIN, grid.	08
6	Application of Remote sensing and GIS: Forest resource management, agriculture and soil management, water resource management, land use and land suitability, disaster management	06

#### Theory Examination:-

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

#### Oral Examination:-

Oral examination will be based on entire syllabus.

**List of Practicals:**

At least TEN practicals shall be performed from the list given below.

1. Installation of GIS software
2. Getting Familiarized with GIS menu and Tools
3. Map Projections
4. Map digitization
5. Geo-referencing
6. Creating Vector data
7. Creating Raster data
8. Creating attribute table
9. Measure road length and area of the buildings
10. Data viewing based on Single Symbol
11. Data viewing on Graduated Symbol
12. Data viewing on Continuous color
13. Data viewing on unique value
14. Labeling the features
15. Selection tool
16. Coordinate capture – to save in notepad
17. Geo-processing tool (Buffer, Clip, intersect and difference)
18. Joining layers based on common field
19. Data conversion
20. Convert polygon to polyline
21. Add Graphic overlay to a vector layer
22. Import and export data
23. Map Layout

**Term work:-**

Each student has to appear for at least one written test during the term. Report on practicals conducted, at least 5 assignments and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Report on practicals conducted and assignments	:	15 marks
Written test (at least one)	:	10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Geographic Information Systems and Science, Second Edition 2005: Longley, Paul A., Michael F. Goodchild, David J. Maguire, David W. Rhind, John Wiley & Sons, New York.
2. Modeling Our World: The ESRI Guide to Geodatabase Design: Zeiler, M. 1999. ESRI Press, Redlands, California
3. GIS, Spatial Analysis and Modeling: Maguire, D., M. Batty, and M. Goodchild. 2005, ESRI Press.
4. Introduction to geographic Information Systems: Kang-tsung Chang, Tata mcgraw Hill.
5. Advanced Surveying (Total Station, GIS and Remote Sensing) First Edition 2007: SatheeshGopi, R. Sathikumar, N. Madhu,

<b>Class:-B E (Civil/Construction)</b>		<b>Semester VIII</b>	
<b>Subject:-Elective-II : Water Resources Engineering and Management</b>			
Periods/week – each Period of 60 minutes duration	Lecture	04	
	Practical	-	
	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	Water resources project planning: Investigations in project planning, planning data requirement and collection, levels of planning and objectives, project formulation and evaluation, multipurpose project planning, Drawbacks in planning, system approach in water resources planning.	08
2	Water resources development and environment: Objects of water resources development, Water resources system design, Water resources assessment, augmentation of water resources, Economics of water resources development, Integrated and conjunctive use of water development, Irrigation and water management, Constraints in irrigation development, National water policy, Environmental planning, environmental impact assessment, measurement of EI, status of EIA in India.	12
3	Engineering economy in flood control projects: Flood estimation and flood control measures, flood forecasting and warning, effect of urbanization on runoff, peak flow methods in urban area, Flood routing through reservoirs and channels, discounting formulae, discounting methods, economics of flood control, estimating flood damages, estimating flood control benefits, reservoir sedimentation and control.	08
4	Modeling watershed hydrology: Hydrologic processes, rainfall-runoff measurement and analysis, Hydrographs and IUH, Mathematical models in hydrology, Nash and Clark model, Generalised watershed simulation models, GIS tool in watershed management, probability and stochastic models, frequency analysis, Regression and correlation, optimisation techniques for water resources projects by linear programming, non-linear programming and dynamic programming, mathematical models for large scale multipurpose projects, different case studies.	14
5	Multipurpose developmental issues: hydro-electric power development and power sector, inland water transportation, micro-level planning, watershed management, rainwater harvesting, cloud seeding, cost-benefit considerations in water resources planning, River basin management.	06



**Theory Examination:-**

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

**Oral Examination:-**

Oral examination will be based on entire syllabus.

**Term work:-**

Each student has to appear for at least one written test during the term. Minimum 10 assignments covering entire syllabus and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Assignments	:	15 marks
Written test (at least one)	:	10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Water Resources Engineering: Ralph A Wurbs, Weseley P James, Prentice Hall, India
2. Economics of Water Resources Planning: L D James, R R Leo, MC Graw Hill
3. Elements of Water Resources Engineering: K N Duggal & J P Soni, New Age International Publishers
4. Environmental Impact Assessment: Larry W Canter, MC Graw Hill, 1997
5. Introduction to Hydrology: Warren Viessman, Jr. & Gary L Lewis, Pearson Education, 2007
6. Hydrology- Principles, Analysis, Design: H.M.Raghunath, New Age International Publishers

<b>Class:-B E (Civil)</b>		<b>Semester VIII</b>	
<b>Subject:-Elective-II : Bridge Design and Engineering</b>			
Periods/week – each	Lecture	04	
Period of 60	Practical	-	
minutes duration	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	Introduction: Types of Bridges, selection of suitable type of bridge, aesthetics, economic span.	08
2	Design loads and their distribution: IRC loads, analysis of deck slab and IRC loads, load distribution among longitudinal beams of a bridge, railway loading.	10
3	Design of superstructure: Design of balanced cantilever concrete bridge, design of prestressed concrete bridge, design of lattice girder railway bridge, introduction to design of RC Arch bridges and box girder bridges.	15
4	Design of substructure: Different types of foundations, their choice and methods of construction, design of well foundation, design of piers and abutments, various types of bearings and their suitability.	12
5	Construction Methods: Erection of bridge superstructure, cantilever construction.	03

#### Theory Examination:-

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

#### Oral Examination:-

Oral examination will be based on entire syllabus.

**Term work:-**

Each student has to appear for at least one written test during the term. At least five design problems in the assignments, ten sketches and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Assignments	:	15 marks
Written test (at least one)	:	10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Design of Bridges: Raju N. K., Oxford & IDH
2. Bridge Engineering: Ponnuswamy S., Tata McGraw Hill.
3. Concrete Bridge Practice: Raina V.K., Tata McGraw Hill.
4. Essentials of Bridge Engineering: Victor D. J., Oxford & IDH
5. Design of Bridge Structures: T.R Jagdeesh & M.A Jayaram, Prentice Hall India Private Ltd. New Delhi.

<b>Class:-B E (Civil/Construction)</b>		<b>Semester VIII</b>	
<b>Subject:-Elective-II : Environmental Impact Assessment &amp; Audit</b>			
Periods/week – each Period of 60 minutes duration	Lecture	04	
	Practical	-	
	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	Environmental impact assessment What is it, Environmental attitudes, Brief history of EIA, Significance of EIA, Role of EIA in planning & decision making process, objectives of EIA.	06
2	Environmental assessment process Assessment methodology , Socioeconomic impact assessment, Air quality impact analysis, Noise impact analysis, Energy impact analysis, Water quality impact analysis, Vegetation & wild life impact analysis, Cumulative impact assessment, Ecological impact assessment, Risk assessment.	12
3	Environmental Impact Assessment Basic concept behind EIS, Stages in EIS production: Screening, scoping, prediction, evaluation, reducing impact, monitoring, conclusions, typical EIS outline,	06
4	Rapid EIA	06
5	Environmental Auditing Definition, aims & objectives, audit principles, incentives to undertake audit, partial environmental audits, stages of implementing environmental audits, scope of audit	06
6	Provisions of various environmental acts of India	06
7	Case Studies	06

#### Theory Examination:-

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

#### Oral Examination:-

Oral examination will be based on entire syllabus.

#### Term work:-

Each student has to appear for at least one written test during the term. At least 10 assignments and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Assignments : 15 marks

Written test (at least one) : 10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Corporate Environmental Management: Welford R, University Press
2. Environmental Assessment: Jain R K, McGraw Hill
3. Environmental Impact Assessment: Harry W Conter, McGraw Hill
4. Environmental Impact Assessment – Handbook: John G Rau & D C Wooren, McGraw Hill.

<b>Class:-B E (Civil/Construction)</b>		<b>Semester VIII</b>	
<b>Subject:-Elective-II : Appraisal and Implementation of Infrastructure Projects</b>			
Periods/week – each	Lecture	04	
Period of 60	Practical	-	
minutes duration	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	Project report preparation Basic study, investigations and feasibility studies, project formulation, SWOT analysis, project report	07
2	Appraisal What is an infrastructure project, project development cycle, what is appraisal, Need of appraisal, steps of appraisal	05
3	Market appraisal Demand analysis, forecasting demand, sources of information, market survey, uncertainties in demand forecasting	06
4	Management appraisal Assessment of entrepreneur, chief executive, board of directors, departmental heads, organization as a whole	06
5	Technical appraisal Location, land, buildings, technology and its appropriateness, size of plant, plant and machinery, raw materials, energy requirements, water supply, effluent disposal	07
6	Financial and economic appraisal: Cost of project, means of financing, profitability, break-even analysis, financial projections, financial appraisal tools: urgency, payback period, accounting rate of return, net present value, internal rate of return, benefit cost ratio, cost of capital, risk analysis, social cost benefit analysis	06
7	Ecological appraisal: Environmental impact analysis	04
8	Project implementation Agencies involved in implementation, methods of implementation like Build, operate and transfer (BOT) method and its variants like BOO, BOOT, BOLT etc. Project financing: types and sources (local and international)	07

### Theory Examination:-

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

**Oral Examination:-**

Oral examination will be based on entire syllabus.

**Term work:-**

Each student has to appear for at least one written test during the term. At least 10 assignments and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Assignments : 15 marks

Written test (at least one) : 10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Project Preparation, Appraisal, Budgeting, and Implementation: Prasanna Chandra, Tata McGraw Hill.

<b>Class:-B E (Civil/Construction)</b>		<b>Semester VIII</b>	
<b>Subject:-Elective-II : Disaster Management</b>			
Periods/week – each Period of 60 minutes duration	Lecture	04	
	Practical	-	
	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	Disasters: Definitions & terminologies – hazard, risk, accident, disaster, vulnerability, disaster management, Significance of disaster management and role of civil engineers in it	04
2	Types of hazards and disasters: Natural and human made, geological, biological, environmental, climatic, chemical, nuclear and other industrial, civil and political hazards, earthquakes, landslides, floods, cyclones, draughts, pest attacks, cold and heat waves, tsunami, terrorist attacks, war and other industrial accidents etc and their impact on constructed facilities and the construction activity in general	04
3	Performance of structures during earthquakes, landslides, liquefaction, fires, tsunamis, floods, radiation, chemical spills etc., effect on life of the structure due to exposures to hazardous environment	10
4	Safe construction of facilities: Design concepts and construction materials for Earthquake / cyclone / fire resistant facilities	12
5	National disaster management acts, policies, guidelines and plans, National Disaster Management framework and role of local / state/ national government and non-government and other multilateral agencies	05
6	Survey of recent regional disasters, forecasts and disaster preparedness plans	05

#### Theory Examination:-

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

#### Oral Examination:-

Oral examination will be based on entire syllabus.

#### Term work:-

Each student has to appear for at least one written test during the term. At least 10 assignments and the graded answer paper of term test shall be submitted as term work.



The distribution of term work marks will be as follows:

Assignments : 15 marks

Written test (at least one) : 10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Manual natural disaster management in India, M C Gupta, NIDM, New Delhi
2. Encyclopedia of disaster management, VOL I, II and III, S L Goyal, Deep & Deep, New Delhi
3. Disaster management act 2005, Govt. of India
4. Publications of NDMA on various templates and guidelines for disaster management

<b>Class:-B E (Civil)</b>		<b>Semester VIII</b>	
<b>Subject:-Elective-II : Pavement Design and Construction</b>			
Periods/week – each Period of 60 minutes duration	Lecture	04	
	Practical	-	
	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	Pavement structure and functional attributes, factor affecting pavement design, types of wheel loads for highways and airports, development of design method for highway and airport pavements.	03
2	Stresses in flexible pavements, 1-layer, 2-layer, 3-layers theories, EWLF, ESWL Stresses in Rigid pavement: load and temperature stresses, combined stresses.	03
3	Flexible Pavement Design Airport pavement: Corps of Engineer's method, FAA method CDOT method, Asphalt institute method. Highway Pavement: Empirical methods using no soil strength criteria, empirical method based on soil strength criteria: CBR method as specified by IRC, Road note 29 methods, AASHTO method, Asphalt institute method. Fatigue and rutting as a failure criterion.	08
4	Rigid Pavement Design: Airport pavements: PCA methods, corps of Engineer's method, FAA method. Joints and reinforcement requirement. Highway pavement: Current British procedure, IRC method.	06
5	Evaluation and strengthening: flexible and rigid pavement distresses, condition and evaluation surveys, present serviceability index, roughness measurement, Benkaleman beam deflections, design of overlays, skid resistance and measurement.	06
6	Concrete road construction: Mix design, concrete strength, size of aggregates, gradation, and workability, preparation of base form work, placing of reinforcement, compaction, and finishing, curing, joints.	04
7	Low Cost Roads (Rural Areas) Classification of low cost roads, construction of low cost roads, stabilization of subgrade, base and its advantages, construction of granular base courses, macadam surface, macadam bases, low cost materials and methods used for highway construction, suitability of different types of roads under different situation. Soils.	05
8	Road making machinery Role of labour versus machinery, in road construction, earth work machinery, rock excavation machinery, aggregate	08

	transportation and watering equipment, wet mix WMM Plant, Asphalt plant, (computerized), drum mix, Continuous batch mix, compaction equipment, bituminous equipment, storage, heating and spraying equipment, hot mix plants, cold mix plants, paver, finisher, concrete road making machinery, equipment usage rates, factors affecting usage rate.	
9	Quality control (QC) and Quality assurance (QA) during construction of various pavements, importance, process control and end product control, statistical methods in quality control, control charts, frequency of testing etc.	03
10	Introduction to pavement management systems.	02

**Theory Examination:-**

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

**Oral Examination:-**

Oral examination will be based on entire syllabus.

**Term work:-**

Each student has to appear for at least one written test during the term. At least 10 assignments and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Assignments : 15 marks

Written test (at least one) : 10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Principles and Practice of Highway Engineering: L.R.Kadiyali, Khanna publications.
2. Highway Engineering: Khanna S.K. and Justo C.E.G. Nem Chand.
3. The design and Performance of Road Pavements: Croney, David et al, McGraw Hill.
4. Pavement Design: Yoder and Witzech, McGraw-Hill, 1982.
5. Pavement Analysis and Design: Yang H. Huang, Prentice Hall, New Jersey, 1993

<b>Class:-B E (Civil)</b>		<b>Semester VIII</b>	
<b>Subject:-Elective-II : Advanced Design of Steel Structures</b>			
Periods/week – each Period of 60 minutes duration	Lecture	04	
	Practical	-	
	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	Moment Resistant Beam End Connections: Design of moment resistant bolted and welded beam end connections.	08
2	Round Tubular Structural Members Properties of steel tubes, design of tension and compression members, design of welded connections, design of flexural members, analysis and design of tubular trusses including purlins and supports.	10
3	Elevated Steel Tanks and Stacks: Loads acting on tanks including wind and earthquake, design of circular tanks with hemispherical and conical bottom, supporting ring beam, staging for circular tanks including design of columns and foundation, design of rectangular steel tanks including design of staging, columns and foundation.	12
4	Gantry Girder: Loads acting on gantry girder. Analysis and design of gantry girder.	05
5	Lattice Tower: Different configurations of lattice towers, loads acting on lattice towers, analysis and design of lattice tower including welded or riveted connections for members.	05
6	Steel Chimney: Forces acting on chimney, design of self supporting welded chimney and its components including design of foundation.	08

#### Theory Examination:-

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

#### Oral Examination:-

Oral / Sketching examination will be based on entire syllabus.

**Term work:-**

The term work shall consist of a design report and detailed drawings on three projects as indicated below:

1. Design of tubular trusses
2. Design of elevated circular tank with conical bottom or rectangular steel tank
3. Design of lattice tower or steel chimney.

The drawings should be drawn with pencil only on minimum of A1 (Imperial) size drawing sheets. Each student has to appear for at least one written test during the term. Term work as mentioned above and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Design report and drawings	:	15 marks
Written test (at least one)	:	10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Design of steel structures: Subramanian, Oxford Press.
2. Steel structures, Controlling behavior through design: R. Englekirk, Wiley
3. Design of steel structures: Negi L.S., Tata McGraw Hill
4. Design of steel structures: Kazimi S.M. A. & Jindal R.S., Prentice Hall of India.
5. Design of steel structures: Krishnamachar B.S, & Ajitha Sinha D.
6. Design of steel structures: Arya and Ajmani, New Chand & Bros.
7. Design of steel structures, Vol I & II: Ramchandran, Standard Book House, New Delhi.
8. Design of steel structures: Dayaratnam, Wheeler Publication, New Delhi
9. Design of steel structures: Breslar, Lin and Scalzi, John Willey, New York.
10. Structural steel work: Reynolds T.J., Kent L.E. & Lazenby, D.W., English University Press.
11. Comprehensive design of steel structures: Punamia, A.K. Jain & Arun Kumar Jain, Laxmi Publications Pvt. Ltd.
12. Design of steel structures: I C Sayal & Salinder Singh, Standard Publishers & Distributors.

<b>Class:-B E (Civil)</b>		<b>Semester VIII</b>	
<b>Subject:-Elective-II : Earthquake Engineering</b>			
Periods/week – each Period of 60 minutes duration	Lecture	04	
	Practical	-	
	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	Definitions of basic problems in dynamics, static v/s dynamic loads, different types of dynamic loads, undamped vibration of SDOF system, natural frequency and periods of vibration, damping in structure. Response to periodic loads, response to general dynamic load, response of structure subject to ground motion, use of Fourier series for periodic forces.	12
2	MDOF systems: Direct determination of frequencies and mode shapes, orthogonality principle, approximate methods for determination of frequencies and mode shapes. Forced vibration of MDOF system, modal analysis, applications to multistoried rigid frames subject to lateral dynamic loads including ground motion	08
3	Seismological background: Seismicity of a region, earthquake faults and waves, structure of earth, plate tectonics, elastic-rebound theory of earthquake, intensity and magnitude of earthquake, measurement of ground motion, seismogram, earthquake frequency, local site effects, seismotectonics and Seismicity of India.	06
4	Characterization of ground motion: Earthquake response spectra, factors influencing response spectra, design response spectra for elastic systems, peak ground acceleration, response spectrum shapes, deformation, pseudo-velocity, pseudo-acceleration response spectra. peak structural response from the response spectrum, response spectrum characteristics, construction site specific response spectra.	06
5	Deterministic earthquake response: Types of earthquake excitation, lumped SDOF elastic systems. translational excitation, lumped MDOF elastic systems, translational excitation, time history analysis, multistoried buildings with symmetric plans, multi storied buildings with un symmetric plans, torsional response of symmetric plan building, distributed - parameter elastic systems, translational excitation, combining maximum modal responses using mean square response of a single mode, SRSS and CQC combination of modal responses.	06
6	I. S. code method of seismic analysis: Seismic co-efficient method and its limitation, response spectrum method, IS 1893-2002 provisions for seismic analysis of buildings and water towers,	06

	seismic evaluation and retrofiting, types of structural system used in building to resist earthquake loads.	
7	Review of damages during past earthquakes and remedial measures, seismic design considerations, allowable ductility demand, ductility capacity, reinforcement detailing for members and joints as per IS 13920	04

**Theory Examination:-**

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

**Oral Examination:-**

Oral examination will be based on entire syllabus.

**Term work:-**

Each student has to appear for at least one written test during the term. At least 20 (twenty) solved problems based on the above syllabus and the graded answer paper of term test shall be submitted as term work. Exposure to computer aided analysis using available software be considered.

The distribution of term work marks will be as follows:

Assignments	:	15 marks
Written test (at least one)	:	10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. **Structural Dynamics-An introduction to Computer Methods: Roy R. Craig.**
2. Dynamics of Structures: Anil K. Chopra, Prentice Hall, India.
3. Dynamics of Structures: Cloguh & Penzien, Tata McGraw Hill
4. Structural Dynamics: John M. Biggs, Tata McGraw Hill
5. Fundamentals of Earthquake Engineering: N. M. Newmarks & E. Rosenblueth, Prentice Hall.
6. Earthquake Design Practice for Building: D. Key, Thomas Telford, London, 1988.
7. Earthquake Engineering: R. L. Wiegel, 2nd Edition, Prentice Hall, London, 1989
8. Design of Multistoried Buildings for Earthquake Ground Motions: J. A. Blume, Portland Cement Association, Chicago, 1961
9. Proceedings on World Conference on Earthquake Engineering: 1956-2000.
10. Earthquake Resistant Design of Structures: Pankaj Agarwal, Manish Shrikhande, Prentice Hall, India, 2006
11. I. S. codes No. 1893,4326, 13920. (all latest codes)

<b>Class:-B E (Civil)</b>		<b>Semester VIII</b>	
<b>Subject:-Elective-II : Soil Dynamics</b>			
Periods/week – each Period of 60 minutes duration	Lecture	04	
	Practical	-	
	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	Vibration of elementary system Degree of freedom Analysis of system with one degree of freedom , spring- mass system Harmonic vibration , uniform circular motion natural frequency, free and forced vibrations with and without damping Type of damping.	10
2	Wave propagation in elastic rods, in an elastic infinite medium, and in semi-elastic half space, wave generated by surface footing.	05
3	Liquefaction of soils , criterion and factors affecting liquefaction of soil, laboratory and field studies on liquefaction, liquefaction studies in oscillatory simple shear, evaluation of liquefaction potentials, liquefaction of clay.	10
4	Principles of machine foundation design, criteria for satisfactory machine foundation, degree of freedom of a block foundation analysis of vertical and sliding vibration of a machine foundation, mass of soil participating in vibration.	05
5	Vibration isolation and screening methods, improvement of distressed machine foundation.	06
6	Field and laboratory tests for evaluation of dynamic properties of soil under vertical vibration coefficient of elastic uniform compression, coefficient of elastic uniform shear, spring constant damping modulus of elasticity typical values of soils	06
7	Basics of dynamic earth pressure on retaining walls: conventional gravity type, reinforced soils, distribution of pressure, point of application of the resultant, simple examples.	06

#### Theory Examination:-

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

#### Oral Examination:-

Oral examination will be based on entire syllabus.



**Term work:-**

Each student shall prepare a project report covering the selection of design parameters, design analysis including drawing on any aspect of soil dynamics included in the syllabus.

Each student has to appear for at least one written test during the term. The project report referred above, at least five examples and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Assignments and report : 15 marks

Written test (at least one) : 10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Soil Dynamics: Shamsheer Prakash, McGraw-Hill Book Company
2. Principles of Soil Dynamics: Braja M. Das, PWS-Kent Publishing Company
3. Dynamics of Bases and Foundations: D. D. Barkan, McGraw-Hill Book Company.
4. Relevant IS Codes

<b>Class:-B E (Civil/Construction)</b>		<b>Semester VIII</b>	
<b>Subject:-Elective-II : Building Services</b>			
Periods/week – each	Lecture	04	
Period of 60	Practical	-	
minutes duration	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	Machineries: Lifts and Escalators – Special features required for physically handicapped and elderly – Conveyors –DC/AC motors – Generators – Laboratory services – Gas, water, air and electricity -Hot Water Boilers –Pumps	06
2	Plumbing Systems in Building: Plumbing services:-Water distribution system-Material for service pipes-Service connection-size of service pipe-Water meter-Valves-Storage tanks-Drainage system:-Pipe and traps-Sanitary fittings-system of plumbing-House drainage plans-Septic tank-Soak pit	09
3	Electrical Systems in Buildings Basics of electricity – Single / Three phase supply – Protective devices in electrical installations – Earthing for safety – Types of earthing – ISI specifications – Types of wires, wiring systems and their choice – Planning electrical wiring for building – Main and distribution boards – Transformers and switch gears – Layout of substations	06
4	Principles of Illumination & Design: Visual tasks – Factors affecting visual tasks – Modern theory of light and colour –Utilisation factor – Depreciation factor – MSCP – MHCP – Lans of illumination – Classification of lighting – Artificial light sources – Spectral energy distribution – Luminous efficiency – Colour temperature – Colour rendering. Design of modern lighting – Lighting for stores, offices, schools, hospitals and house lighting. Elementary idea of special features required and minimum level of illumination required for physically handicapped and elderly in building types.	08
5	Refrigeration Principles and Applications: Electric motors – Starters - Air handling units – Cooling towers – Window type and packaged air-conditioners – Chilled water plant – Fan coil systems – Water piping – Cooling load – Air conditioning systems for different types of buildings – Protection against fire by A.C. Systems	05
6	Fire Safety Installation: Causes of fire in buildings – Safety regulations – Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Special features required for physically handicapped and elderly in building types – Heat and smoke	05

	detectors – Fire alarm system, snorkel ladder – Fire lighting pump and water storage – Dry and wet risers – Automatic sprinklers	
7	Rain Water Harvesting Water Audit of India, Concept of rain water harvesting, Methodologies for Percolation/ recharge bore pit, Percolation/ recharge bore well, Percolation/ recharge well cum bore pit, Harvesting rooftop rainwater, Harvesting driveway runoff. National water harvesters network (NWHN). Some case studies.	06
8	Introduction to Green Building: Need for a green building, planning and design of green buildings, obstacles, Materials used in green building technology, Rating System (According to LEED-INDIA)	03

**Theory Examination:-**

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

**Oral Examination:-**

Oral examination will be based on entire syllabus.

**Term work:-**

Each student has to appear for at least one written test during the term. At last one site visit should be arranged to give an exposure to various construction techniques discussed in the above syllabus. A report on site, at least 10 assignments (including sketches) and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Report of site visit and assignments	:	15 marks
Written test (at least one)	:	10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Philips Lighting in Architectural Design, McGraw-Hill, New York, 1964.
2. The Lighting of buildings: R.G.Hopkinson and J.D.Kay, Faber and Faber, London, 1969.
3. Air-conditioning and Refrigeration: William H.Severns and Julian R.Fellows, John Wiley and Sons, London, 1988.
4. Air-conditioning and Energy Conservation: A.F.C. Sherratt, The Architectural Press, London, 1980.
5. National Building Code, BIS Publications New Delhi.
6. Building Construction: Dr. B.C. Punmia, Ashol K Jain, A.K Jain
7. Construction Engineering and Management: S. Seetharaman Umesh Publicatins, Delhi.
8. Water supply and Sanitary Installations: A. C. Panchdhari New age international publication, Delhi
9. Fire Safety in Building: V. K. Jain, New age international publication, Delhi
10. Green remodeling: David Johnston.
11. Green Building , Project Planning and Cost Estimation: R.S.Means
12. LEED – INDIA (Abridged Reference guide for Core and Shell, Version 1.0).

<b>Class:-B E (Civil)</b>		<b>Semester VIII</b>	
<b>Subject:-Elective-II : Design of Hydraulic Structures</b>			
Periods/week – each Period of 60 minutes duration	Lecture	04	
	Practical	-	
	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	Dams{General}: Introduction, classification, comparative study of different types of dams, selection of type of dam, selection of site of dam, preliminary and final investigations of dam sites, fixation of storage capacity, reservoir losses, sedimentation in reservoirs, density currents.	4
2	Gravity dams: Criteria for selection of dam site, construction material, forces acting on gravity dam, modes of failure, stability analysis, safety criteria, methods of design, stress analysis and stress contours, galleries, instrumentation, joints, keys, water seals, temperature control in concrete dams, foundation treatment. Spillways and other energy dissipating devices: types.	12
3	Arch and buttress dams: Types of arch dams, forces on an arch dam, design. Types of buttress dams.	4
4	Earth and rockfill dams: Advantages and limitations, foundation of earth dams, causes and failures of earth dams, design criteria, design considerations in earthquake regions, seepage line for different conditions, filters, upstream blankets, stability analysis, Swedish circle method with pore pressure, details of construction and maintenance, types of rockfill dams, stability analysis, advantages.	10
5	Spillways and flood control works: Factors affecting design of spillway, types of spillways, design principles of ogee spillway, chute spillway, siphon spillway and shaft spillway. Design of bucket type energy dissipater and stilling basin, flood mitigation reservoirs. Crest gates, types, advantages, choice, design of radial gate. Outlet works through dams, intake structures.	10
6	Miscellaneous topics: Design of small bridges and culverts, data collection, high flood discharge, linear waterway calculation, scour depth, causeways and culverts, principles of hydraulic design. Design details of surplus weir, flush escape, direct sluice, canal drop, canal regulator, cross drainage works. Vibration and cavitation in hydraulic structures. Design of air vent.	8

**Theory Examination:-**

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

**Oral Examination:-**

Oral examination will be based on entire syllabus.

**Term work:-**

Each student has to appear for at least one written test during the term. Assignments (on each module ) consisting of theory and problems covering entire syllabus and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Assignments	:	15 marks
Written test (at least one)	:	10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Irrigation and Water Power Engineering: Dr. B.C. Punmia and Dr. Pande B.B.Lal, Laxmi Publications Pvt. Ltd. New Delhi.
2. Irrigation Water Resources and Water Power Engineering: Dr. P.N. Modi, Standard Book House. Delhi.
3. Irrigation Engineering and Hydraulics Structures: S. K. Gerg, Khanna Publishers. Delhi.
4. Design of Irrigation Structures: S. K. Sharma, S. Chand and Co.
5. Theory and Design of Irrigation Structures: R. S. Varshney and R. C. Gupta, Nem Chand
6. Engineering for Dams, Vol. I to III: by Crager, Justin and Hinds, John Wiley
7. Design of Small Dams: USBR
8. Hydro Power Structures: R. S. Varshney, Nem Chand and Bross.
9. Concrete Dams: R. S. Varshney, Oxford and IBH Publishing Co.

<b>Class:-B E (Civil)</b>		<b>Semester VIII</b>	
<b>Subject:-Elective-II : Industrial Waste Treatment</b>			
Periods/week – each Period of 60 minutes duration	Lecture	04	
	Practical	-	
	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	General: liquid wastes from industries – their volumes and characteristics, Effect of disposal into natural water courses, Municipal sewers and on land, River standards and effluent standards	06
2	Sampling and analysis of industrial wastes, Treatability study	06
3	Stream sanitation: Effects of industrial wastes on self-purification of streams and fish life, Statement and significance of the parameters of Streeter and Phelp's equation and BOD equations, Deoxygenating and reaeration , Oxygen sag	06
4	General treatment of industrial wastes: neutralization, equalization, segregation. Modification of conventional aerobic and anaerobic biological treatment methods. Dewatering and disposal of sludges – floatation, vacuum filtration, centrifugation, filter press	08
5	Detailed consideration of wastes produced from following industries: Processes normally followed , Volume and effects of raw and treated effluent on streams, sewers and land . Treatment methods , reuse-recovery 1) Textiles: cotton, wool, rayons. 2) Pulp & paper:- Sulphate process 3) Electroplating 4) Dairy 5) Sugar- sugarcane 6) Distilleries 7) Tanneries	14
6	Provision of various acts pertaining to industrial wastes / effluents, introduction to environmental impact assessment and environmental audit.	08

### Theory Examination:-

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

### Oral Examination:-

Oral examination will be based on entire syllabus.

**Term work:-**

Each student shall prepare a report comprising design criteria and flow sheet of the proposed treatment scheme including laboratory analysis for any one industrial waste. Demonstration of available software for design of effluent treatment plant is to be considered.

Each student has to appear for at least one written test during the term. The report mentioned above, at least 5 assignments and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Assignments and report	:	15 marks
Written test (at least one)	:	10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Waste Water Treatment: Rao & Datta, Oxford & IBH Publishing Co.
2. Industrial Water Pollution Control: W W Eckenfelder Jr, Mc Graw Hill
3. Industrial Water Pollution Management: E F Gurnham, John Wiley
4. Biological Waste Treatment: Eckenfelder & Connor Pergamon Press
5. Theories and Practices of Industrial Waste Treatment: Addison Wesley
6. Pollution Control in Process Industries: S P Mahajan , Tata mcgraw Hill
7. Industrial Waste: W Rudolfs ,(Ed), L E C Publishers Inc
8. The Treatment of Industrial Wastes: E D Besselievre Mcgraw Hill
9. Industrial Waste Disposal: R D Ross , (Ed), Reinhld Bok Croperation



<b>Class:-B E (Civil)</b>		<b>Semester VIII</b>	
<b>Subject:-Elective-II : Transportation Planning and Economics</b>			
Periods/week – each Period of 60 minutes duration	Lecture	04	
	Practical	-	
	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	<p>Transportation Planning and management: General Travel Forecasting Principles and techniques, Generalized demand, price and capacity relationship applied to travel forecasting, Practical problems of forecasting travel.</p> <p>Introduction to the process of urban transport planning.</p> <p>Travel demand forecasting: Trip generation analysis, trip classification, multiple regression analysis, category analysis, trip distribution analysis: introduction, methods of trip distribution, uniform and average factor method, Fratar method, Furness method, the gravity model and its calibration, Intervening and competing opportunities model, linear programming approach to trip distribution. Modal split analysis: introduction, Modal split analysis: Probit analysis, Logit analysis and Discriminant analysis, modal split models with behavioral basis. Traffic Assignment: purpose of traffic assignment, traffic flow characteristics, Assignment techniques: All or nothing assignment, Multiple route assignment, Capacity restraint assignment, Diversion curves. Rout building algorithms.</p> <p>Land-use transport models: Introduction, selection of Land-use transport models, The Lowry model, Grain – Lowry model, Applications of Lowry model.</p> <p>Introduction to advanced/soft computational techniques for transportation planning like Expert Systems, Neural Networks, Fuzzy Logic, Genetic Algorithm, Simulated Annealing, Hybrid systems etc.</p>	03  02 07  06 06
2	<p>Transport Economics: Economic evaluation of highway schemes, need for economic evaluation, cost and benefits of transportation projects, basic principles of economic evaluation, Net present value method, benefit/cost ratio method, internal rate of return method. Vehicle operating costs, Value of travel time saving, Accident costs and road pricing.</p>	08
3	<p>Public Transportation Introduction to various mass transportation systems, Classification of mass transit modes: Street transit or surface transit, Semi rapid transit, Rapid transit or mass rapid transit System, Special transit systems: magnetic levitation, monorails, water borne transport, Automated Guided Transit,</p>	02 05

Detailed capacity assessment of some selected technologies: Conventional bus on bus bays, Light rail transit, Rail Rapid Transit, Regional rail Transit or Suburban Railway,	04
Suitability of Transit Systems for different travel demand for Indian Cities, Suitability of Transit Systems for Indian Cities of Different Population sizes and forms, Influence of other factors in selection of Mass Transit Systems,	04
Transit System Operations: Introduction, Route Development, Stop location and stopping policy, Schedule development, Capacity of transit systems.	02
Future of Public transportation.	02

**Theory Examination:-**

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

**Oral Examination:-**

Oral examination will be based on entire syllabus.

**Term work:-**

Each student has to appear for at least one written test during the term. Project work based on transportation planning or on Public transportation system / Application of transport planning or transport economics software, assignment consisting of at least 15 problems and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Assignments and project works	:	15 marks
Written test (at least one)	:	10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Traffic Engineering and Transport Planning: L.R. Kadiyali, Khanna publishers Delhi
2. Principles of Traffic Engineering: G.J. Pingnataro, Mc Graw-Hill, 1970.
3. Traffic System Analysis for Engineering and Planners: Wohl and Martin, Mc Graw Hill, 1983.
4. Introduction to Urban Transport Systems, Planning: B.G. Hutchinson, McGraw-Hill, 1970.
5. Economics of Transportation: Fair and Williams, Harperand Brothers, Publishers, New York.
6. Economic Analysis for Highway: Winfrey, Robley, International Textbook Co., Pennsylvania, USA, 1969.
7. Public Transportation Planning Operation and Management: Gray and Hoel, Prentice Hall Publication.
8. Principles of Transportation Engineering: Partha Chakroborty and Animesh Das, Prentice hall (India)

<b>Class:-B E (Civil/Construction)</b>		<b>Semester VIII</b>	
<b>Subject:-Elective-II : Advanced Repair and Rehabilitation of Structures</b>			
Periods/week – each Period of 60 minutes duration	Lecture	04	
	Practical	-	
	Tutorial	02	
		Hours	Marks
Evaluation System	Theory Examination	03	100
	Practical	-	-
	Oral	-	25
	Term Work	-	25
	Total		<b>150</b>

### Detailed Syllabus

Module	Topics	No. of Lectures
1	Introduction: Need for strengthening due to various reasons such as ageing, natural calamities, increase of load, change of function and design, construction errors	4
2	Structural Strengthening: Strengthening and retrofitting of columns, beams, walls, footings and slabs, piers of concrete structures by jacketing, external post-tensioning, replacing or adding reinforcement, plate bonding, textile reinforced concrete	11
3	Specialized Repairs: Electro chemical repair using re-alkalization and chloride extraction techniques, Specialized repairs for chemical disruption, fire, marine exposure etc, Repair of damaged structures of water retaining structures, hydraulic structures, Pavements and Runways, Tunnels, Bridges, Piers and Flyovers, Parking Garages, Underwater repair, Masonary Repair, Repair and Restoration of Heritage Structures	11
4	Retrofitting by composite materials: Fiber reinforced concrete, Ultra-high performance fibre reinforced concrete (UHPFRC), Fiber reinforced composites, Carbon fibre reinforced polymer (CFRP), Fibre wrapping (Carbon, Aramide, Glass)	10
5	Seismic Retrofitting: Seismic strengthening of existing RC structures, Use of FRP for retrofitting of damaged structures	6
6	Post-Repair Maintenance of Structures: Protection & Maintenance schedule against environmental distress to all those structures	4
7	Special care in repair and rehabilitation of heritage structures	2

### Theory Examination:-

1. Question paper will consist of total seven questions carrying 20 marks each.
2. Only five questions need to be attempted.
3. Question number 1 will be compulsory and based on maximum part of the syllabus.
4. Remaining questions will be mixed in nature.
5. In question paper, weightage of each module may be proportional to the number of respective lecture hours as mentioned in the syllabus.

**Oral Examination:-**

Oral examination will be based on entire syllabus.

**Term work:-**

Each student has to appear for at least one written test during the term. At least 8 assignments and the graded answer paper of term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Assignments	:	15 marks
Written test (at least one)	:	10 marks

The final certification and acceptance of term work ensures the satisfactory performance of tutorial work and at least passing in the term-work.

**Recommended Books:-**

1. Concrete Repair and Maintenance: Peter H .Emmons and Gajanan M. Sabnis, Galgotia Publication.
2. Repairs and Rehabilitation-Compilation from Indian Concrete Journal-ACC Publication.
3. Guide to Concrete Repair and Protection, HB84-2006, A joint publication of Australia Concrete Repair Association, CSIRO and Standards Australia.
4. CPWD hand book on Repairs and Rehabilitation of RCC buildings published by DG(Works), CPWD, Government of India (Nirman Bhawan), <http://www.cpwd.gov.in/handbook.pdf>
5. Guide to Concrete Repair, Glenn Smoak, US Department of the Interior Bureau of Reclamation, Technical Service Center , <http://books.google.co.in>
6. Management of Deteriorating Concrete Structures: George Somerville, Taylor and Francis Publication
7. Concrete Building Pathology: Susan Macdonald, Blackwell Publishing.
8. Testing of Concrete in Structures: John H. Bungey, Stephen G. Millard & Michael G. Grantham, Taylor & Francis Publication.
9. Durability of concrete and cement composites: C.L.Page & M.M. Page,Woodhead Publishing
10. Concrete Repair, Rehabilitation and Retrofitting: M. Alexander, H. D. Beushausen, F. Dehn & P. Moyo, Taylor & Francis Publication
11. Concrete Repair Manual, Volume I & II, Published jointly by ACI, BRE, Concrete Society, ICRI

Class:-BE(Civil/Construction)		Semester-VIII	
Subject:- Project B			
Periods/week – each Period of 60 minutes duration	Lecture	-	
	Practical	-	
	Tutorial	04	
		Hours	Marks
Evaluation System	Theory Examination	-	-
	Seminar	-	-
	Presentation and Oral	-	50
	Term Work	-	50 (internal)
	<b>Total</b>		<b>100</b>
<p>In continuation to semester VII work, the group of the students shall collect all necessary information pertaining to the project and analyse it. The group of the students shall prepare and submit a detailed report on the project.</p> <p>The report shall be typewritten on A4 size papers and hard bound as per prescribed norms. Broadly the report shall include: Introduction, Literature Review, Problem definition, Data collection and analysis, Results (Numerical / Experimental), Conclusions and discussions.</p> <p>Acquaintance with survey and research methods and their use in conducting systematic investigations, use of data analysis tools, computational methods and style of report, preparation and presentation shall form basis of evaluation. The group shall prepare and present a seminar based on this work before an external examiner.</p>			