

UNIVERSITY OF MUMBAI

No. UG/236 of 2010

CIRCULAR:-

A reference is invited to the Ordinances, Regulations and syllabi relating to the Bachelor of Engineering (B.E.) degree course vide this office Circular No.UG/60 of 2004, dated 24th February, 2004 and the Principals of the affiliated Colleges in Engineering are hereby informed that the recommendation made by the faculty of Technology at its meeting held on 9th December, 2009 has been accepted by the Academic Council at its meeting held on 27th July, 2010 vide item No. 4.2 and that, in accordance therewith, the revised syllabus of Fourth Year (Semester VII & VIII) of the B.E. Degree Course in branch of Construction Engineering is as per Appendix and that the same has been brought into force with effect from the academic year 2010-2011.

MUMBAI-400 032
12th August, 2010

L. R. Mane
Offg. Registrar

To,

The Principals of the affiliated Colleges in Engineering.

A.C./4.2/27/07/2010

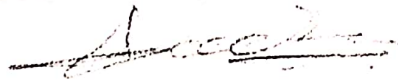
No. UG/236-A of 2010,

MUMBAI-400 032

12th August, 2010

Copy forwarded with compliments for information to:-

- 1) The Dean, Faculty of Technology,
- 2) The Chairman, Board of Studies in Civil Engineering.
- 3) The Controller of Examinations,
- 4) The Co-Ordinator, University Computerization Centre,


(D. N. Jadhav)
Ag. Deputy Registrar
(UG/PG Section)

Copy to:-

The Director, Board of College and University Development, the Deputy Registrar (Eligibility and Migration Section), the Director of Students Welfare, the Executive Secretary to the Vice-Chancellor, the Pro-Vice-Chancellor, the Registrar and the Assistant Registrar, Administrative sub-center, Ratnagiri for information.

The Controller of Examinations (10 copies), the Finance and Accounts Officer (2 copies), Record Section (5 copies), Publications Section (5 copies), the Deputy Registrar, Enrolment, Eligibility and Migration Section (5 copies), the Deputy Registrar, Statistical Unit (2 copies), the Deputy Registrar (Accounts Section), Vidyanaagari (2 copies), the Deputy Registrar, Affiliation Section (2 copies), the Professor-cum-Director, Institute of Distance and Open Learning Education, (10 copies) the Director University Computer Center (IDE Building), Vidyanaagari, (5 copies) the Deputy Registrar (Special Cell), the Deputy Registrar, (PRO) the Assistant Registrar, Academic Authorities Unit (2 copies) and the Assistant Registrar, Executive Authorities Unit (2 copies). They are requested to treat this as action taken.



27-7-2010

UNIVERSITY OF MUMBAI



**Revised Syllabus
for the
Final Year
(Semester VII & VIII)
of the
B.E. Degree Course
in
Construction Engineering**

(with effect from the academic year 2010 - 2011)

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

FORTH YEAR ENGINEERING: (Construction 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. Construction Management – I	4	-	2	3	100	25	-	25	150
5. Elective – I	4	-	2	3	100	25	-	25	150
6. Project-A*	-	-	4	-	-	50	-	25@	75
Total	20	-	14	-	500	175	-	125	800

* Common to Civil 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. Administration of Construction Contracts	4	-	2	3	100	25	-	25	150
3. Construction Management – II	4	-	2	3	100	25	-	25	150
4. Elective – II	4	-	2	3	100	25	-	25	150
5. Project-B*	-	-	4	-	-	50	-	50#	100
Total	16	-	12	-	400	150	-	150	700

* Common to Civil Engineering

Presentation on project and oral

FORTH YEAR ENGINEERING: (Construction Engineering)

List of Electives

Semester VII Elective-I (Lecture-4, Practical/ Tutorial-2)	
1	Advanced Surveying *
2	Systems Approach in Civil Engineering *
3	Risk and Value Management *
4	Advanced Engineering Geology *
5	Legal Aspects in Construction
6	Safety Management in Construction
7	Reinforced Concrete Repairs and Maintenance*
8	Productivity in Construction

* Common to Civil Engineering

Semester VIII Elective-II (Lecture-4, Practical/Tutorial-2)	
1	Advanced Construction Engineering *
2	Water Resources Engineering & Management*
3	Environmental Impact Assessment and Audit *
4	Appraisal & Implementation of Infrastructure Projects*
5	Disaster Management *
6	Building Services *
7	Advanced Construction Techniques
8	Advanced Repairs and Rehabilitation of R.C. Structures*

* Common to Civil Engineering

Class:- B E (Civil/Construction)

Subject:- Limit State Method for Reinforced Concrete Structures		Semester VII
Periods/week – each of 60 Period minutes duration	Lecture	
	Practical	04
	Tutorial	-
		02

Evaluation System	Theory Examination	Hours	Marks
	Practical	03	100
	Oral	-	-
	Term Work	-	-
	Total	-	25
			125

Detailed Syllabus

Module	Topics	No. of Lectures
1	Ultimate Load Method: Brief introduction to fundamentals of ultimate strength theory: curved stress distribution, compressive stress block, simplified rectangular stress block as per Whitney's approach, ultimate moment of resistance of singly reinforced section and doubly reinforced sections.	05
2	Limit State Method: Introduction to limit state method of design as per IS 456 (latest edition): concepts of probability and reliability, characteristic loads, characteristic strength, partial safety factors for loads and materials, introduction to various limit states.	04
3	Limit State of Collapse - Flexure: Limit state of collapse in flexure, shear and Limit state of serviceability in deflection and cracking, design of singly and doubly reinforced rectangular and T sections for flexure, design of members in shear and bond, design of beam subjected to bending and torsion. Requirements governing reinforcement detailing.	16
4	Design of Slabs: Design of one way and two way slabs.	05
5	Limit State of Collapse - Compression: Limit state of collapse - compression for short and slender column. Members subjected to combined axial and uni-axial as well as biaxial bending. Development of interactive curves and their use in column design.	08
6	Design of Foundations: Isolated square and rectangular footings subjected to axial load and moments. Design of combined rectangular pad footings, slab beam type footing and strap footing	10

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.

Term work:-

Each student has to appear for at least one written test during the term. Assignments consisting of minimum twenty 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	:	15marks
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 Reinforced Concrete Structures: Dayaratnam P, Oxford & IBH.
2. Limit State design - Reinforced Concrete: Jain A K, New Chand.
3. Limit State Design - Reinforced Concrete: Shah & Karve, Structure Publication, Pune.
4. Ultimate Strength Design for Structural Concrete: Arthur P D & Ramkrishnan V, Wheeler & Co. Pvt Ltd.
5. Limit State Theory for Reinforced Concrete Design: Huges B P, Pitman.
6. Reinforced Concrete: Warner R F, Rangan B C & Hall A S, Pitman.
7. Reinforced Concrete: H.J. Shah, Charotar Publisher.
8. Fundamentals of Reinforced Concrete: Sinha & Roy, S. Chand & Co. Ltd
9. Illustrated Reinforced Concrete Design: Dr. V.L. Shah & Dr. S.R. Karve, Structure Publication, Pune.
10. Reinforced Concrete Design: Wang, C. K., Salmon, C.G., and Pincheira, J.A . 7th Edition, John Wiley, 2007.
11. Reinforced Concrete Fundamentals: Ferguson, P.M., Breen J.E., and Jirsa J.O., 5th Edition, John Wiley & Sons, 1988.

Class:- B E (Civil/Construction)		Semester VII	
Subject:- Quantity Survey, Estimation & Valuation			
Periods week – each of 60 Period minutes duration	Lecture		
	Practical		04
	Tutorial		-
		Hours	02
Evaluation System	Theory Examination		Marks
	Practical	04	100
	Oral	-	-
	Term Work	-	25
	Total	-	25
Detailed Syllabus			150

Detailed Syllabus

Module	Topics	No. of Lectures
1	Estimates: Various types, their relative importance, factors to be considered, complete set of Estimate. Approximate estimates: importance, purpose, different methods. Use of CBRI Equations for the same. Methods of preparation of estimates for projects such as i) Building R.C.C., Load bearing ii) Road	14
2	Measurements for various items: Use of relevant Indian Standard Specifications for the same, taking out quantities from the given bending schedules, Mass haul Diagrams	06
3	Material survey: Approximate estimates of requirement of various materials for building works, percentage breakup of the cost, cost sensitive index, market survey of basic materials	05
4	Specifications: types, requirements and importance, detailing of specifications for various items	03
5	Rate analysis: purpose, importance and necessity of the same, factors affecting, task work.	06
6	Tender: preparation of tender documents, importance of inviting tenders, contract types, relative merits, prequalification. general and special conditions, termination of contracts, extra work and items, penalty and liquidated charges, Settlement of disputes, R.A. Bill & Final Bill, Payment of advance, insurance, claims, price variation, etc.	06
7	Valuation : different terms used, the role of a valuer, purpose and necessity of the same. Capitalised Value, Years purchase, sinking fund, depreciation, types of values, Purpose of valuation Different methods of valuation for i. open plots. ii. open plots with existing residential & commercial structures iii. lease hold properties Use of valuation tables and formulae	06
8	Introduction to Acts related to construction	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:-

The term work shall consist of the following:

- i. To find out the approximate estimate of a multistoried building by approximate method.
- ii. Detailed estimate of any FOUR of the following with the required material survey for the same.
 - a. An R.C.C. structure
 - b. a retaining wall
 - c. a factory building
 - d. a road work
 - e. an overhead and underground water tank
 - f. a load bearing structure
- iii. Assignments on rate analysis, market survey, specifications and simple estimates.
- iv. Detailed estimate of minor structure
- v. Bar bending schedule
- vi. Use of quantity survey software and use of worksheets / databases for some of the above assignments.
- vii. Assignments on Tenders, Contracts & Valuation

Each student has to appear for at least one written test during the term. The termwork detailed 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:

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 minimum passing in the term-work.

Recommended Books:-

1. Estimating, Costing Specifications & Valuation: M Chakraborty, M. Chakraborty, Kolkata.
2. Building & Engineering Contracts: B.S. Patil, University Press, Hyderabad.
3. Estimating & costing: B N Datta, UBS Publications
4. Relevant Indian Standard Specifications, BIS Publications
5. World Bank approved contract documents

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

Detailed Syllabus		Topics
Module		No. of Lectures
1	Introduction: Irrigation, water resources in India, need of irrigation in India, development of irrigation in India, impact of irrigation on human environment, irrigation systems: minor and major, command area development.	4
2	Water requirement of crops: Crops and crop seasons in India, cropping pattern, duty and delta. Quality of irrigation water. Soil water relationship: soil characteristics significant from irrigation considerations, root zone soil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation. Methods of applying water to the fields: surface, sub-surface, sprinkler and drip irrigation.	8
3	Hydrology: Hydrologic cycle, rainfall and its measurement, streamflow measurement runoff process, factors affecting runoff, runoff hydrograph, runoff computations, flood discharge calculations, unit hydrograph, S-hydrograph.	8
4	Ground water and well hydraulics: Ground water resources, occurrence of ground water, methods of ground water exploration, well irrigation. Well hydraulics: steady state flow in wells, equilibrium equations for confined and unconfined aquifer, aquifer tests, design of water wells.	6
5	Reservoir planning: Investigations, selection of site, zones of storage, storage capacity and yield, reservoir sedimentation.	4
6	Dams: Introduction, classification. Gravity dams: forces acting on gravity dam, modes of failure, stability analysis, design, galleries, joints, keys, water seals. Earth and rockfill dams: types, causes of failure, seepage analysis, stability analysis, design, rockfill dams. Arch and buttress dams: types. Spillways and other energy dissipating devices: types.	14

7	Distribution systems: Canal systems, alignment of canals, canal losses, estimation of design discharge. Bandhara irrigation Canal outlets: non-modular, semi-modular and modular outlets Waterlogging: causes, effects and remedial measures. Lining of canals: economics of lining. Drainage of irrigated land: necessity, methods. Canal regulation works. Cross drainage works.	8
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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.

Term work:-

Each student has to appear for at least one written test during the term. At least seven assignments covering the 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. Garg, 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. Irrigation and Water Resources Engineering: G.L.Asawa, New Age International Publishers.

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

Detailed Syllabus

Module	Topics	No. of Lectures
1	Management: Concept of management, objectives, emergence of management thought, brief description of contributions by Fredrick Taylor, Henry Fayol, Elton Mayo and Gilbreth, basic functions of management, planning, organizing, staffing, directing, coordinating and control.	10
2	Construction Project: What is a project - types and characteristics of a project, phases of a project, agencies involved and their roles, methods of execution.	08
3	Construction Project Planning: Stages of project planning, pre-tender planning, pre-construction planning, detailed construction planning, role of client and contractor, level of detail. Development of plan and schedules, work break-down structure, activity lists, assessment of work content, estimating durations. Networks, basic terminology, types of precedence relationships, finish to start, start to start, finish to finish, start to finish. preparation of CPM networks, activity on link and activity on node representation, analysis of network for networks with single (finish to start) relationships, computation of float values, critical and semi-critical paths, calendaring networks, preparation of networks with overlapping relationships.	14
4	Construction Project Scheduling: Bar chart, line of balance technique, resource constraints and conflicts, resource aggregation, allocation, smoothening and leveling.	08
5	PERT Method of Planning: Assumptions underlying PERT analysis, determining three time estimates, analysis, slack computations, calculation of probability of completion.	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 has to appear for at least one written test during the term. At least 10 assignments covering the 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. Management: Koontz, McGraw Hill,
2. Construction Equipment and it's Planning and Application: Varma M, Metropolitan Book
3. Professional Construction Management: Barrie D S & Paulson B C, McGraw Hill
4. Management in Construction Industry: Dharwadkar PP., Oxford & IBH
5. Industrial Organization & Engineering Economics: Banga & Sharma, Khanna Publishers
6. Handbook of Construction Management: P K Joy, MacMillan

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

Detailed Syllabus		Topics	No. of Lectures
Module			
1	Modern Surveying Equipment: Data and equipment needed for engineering projects. Changing scene in surveying and mapping, map substitutes, use and advantage of modern surveying equipment in project. Modern surveying electronic equipment, their principles, constructions working and use – Electronic Theodolite, E.D.M. Instruments- Distomat, Total station. Application of lasers in distance and angular measurements. Introduction of electronic navigation and position fixing. Different systems and their characteristics.		05
2	Global Positioning System : Introduction to navigation and positioning, Geodesy; geospatial reference systems, overview of GPS; GPS segments, 2D and 3D positioning, GPS error sources and handling, GPS applications.		05
3	Geographic information system: Geographic Information System (GIS) – Definition of GIS, Geographical concepts and terminology, Components of GIS, Data acquisition, Raster and vector formats, scanners and digitizers. Advantages of GPS and GIS in the storage thematic information extracted from remotely sensed images.		05
4	Photogrammetry: Definition of photogrammetric terms, geometry of aerial and terrestrial photographs, aerial camera and phototheodolite, scales of photographs, tilt and height displacements , stereoscopic version and stereoscopes, height determination from parallax measurements, flight planning , maps and map substitutes and their uses.		06
5	Remote sensing: Introduction and definition of remote sensing terms, remote sensing system, principles of remote sensing, Interaction of EMR, Fundamentals of aerial photography, platforms and orbits, sensors, data products, principles of visual interpretation, principles and uses; thermal remote sensing, microwave remote sensing.		08
6	Image interpretation: Principles of interpretation of aerial and satellite images, equipments and aids required for interpretation, ground truth-collection and verification, advantages of multirate and multiband images, digital image processing; introduction, image enhancement techniques, digital image classification.		06
7	Field astronomy: Terms, coordinate systems, hour angle, right ascension, declination, altitude, azimuth: study of astronomical charts, determination of latitude and bearing by observation on the sun and polestar, time, standard time, local time, universal time, equation of time.		08

8	Hydrographic surveying: Uses ,Method of hydrographic surveys, mean sea-level, tide gauges, sounding equipments, location of soundings, the capacity of reservoir, stream gauging.	05
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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:-

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

1. Traversing using Total Station
2. Establishing Waypoints / Network using GPS receivers
3. Demonstration of GIS software
4. Measurement of Relief Displacement using Mirror Stereoscope

Term work:-

Each student has to appear for at least one written test during the term. Report on the practicals conducted, at least five 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:

A report of practicals performed 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. Higher surveying: A.M. Chandra New Age International publishers.
2. Higher surveying: B.C. Punamia, Ashok jain, Arun k. jain Laxmi publications (P). Ltd.
3. Geographic Information Systems and Science, Second Edition: Longley, Paul A., Michael F. Goodchild, David J. Maguire, David W. Rhind. 2005.. John Wiley & Sons, New York.
4. Modeling Our World: The ESRI Guide to Geodatabase Design: Zeiler, M. 1999.. ESRI Press, Redlands, California
5. GIS, Spatial Analysis, and Modeling: Maguire, D., M. Batty, and M. Goodchild. 2005. ESRI Press (G70.212 .G584 2005)
6. Global Positioning System: Signals, Measurements, and Performance, Second Edition (2006): Pratap Misra and Per Enge, Ganga Jamuna Press.
7. Remote Sensing Principles and Interpretation: Floyd, F. Sabins, Jr., Freeman and Co., San Francisco, 1978.
8. Remote Sensing and Image interpretation: Lillesand and Kiefere., John Wiley, 1987, India.
9. A remote sensing perspective: Introductory Digital Image Processing., John R. Jensen, Prentice Hall.
10. Imaging Radar for Resource Survey: Remote Sensing Applications: W Travelt, Chapman & Hall, London
11. Remote Sensing – Principles and Applications: B. C. Panda, Viva Book.

Class:-B E (Civil/Construction)			Semester VII
Subject:-Elective-I : Systems Approach in Civil Engineering			
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		150
Detailed Syllabus			
Module	Topics		

Detailed Syllabus

Module	Topics	No. of Lectures
1	Concept of systems approach: system, boundaries of system, goals and objectives, optimality, mathematical models, objective function and constraints, problem solving mechanism, types of problems, modeling / problem formulation, sub-optimization, solution techniques, sensitivity analysis	06
2	Decision theory: classification of decision situations, decision tables and decision tree, criteria for decision making under certain, uncertain and risk conditions, utility theory	05
3	Time series analysis: variations in time series, trend analysis: method of moving averages, method of least squares	05
4	Index numbers: basic requirements of index numbers, constructing index numbers: using relatives, using aggregates	04
5	Linear programming: general nature of problem, formulation of problems, graphical method of solution, simplex method, dual, sensitivity analysis	07
6	Distribution models: transportation and assignment problems and their solutions	06
7	Queuing models: various situations, queue discipline and customer behaviour, single server model	06
8	Basic functions of inventory and inventory decisions, Inventory control model – economic order quantity	04
9	Simulation: general approach, Monte Carlo simulation, simple problems using hand calculations	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 assignments and 3 problems on each of the topic 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
Written test (at least one)

: 15 marks
: 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. Quantitative Techniques for Managerial Decisions: Shrivastava, Shenoy & Sharma, Wiley Eastern

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

Detailed Syllabus

Module	Topics	No. of Lectures
1	Risks: Definition, dynamic and static risk, uncertainty and risk	01
2	Risk and construction: Time, money and technology, the people and the risks, processes and risks, risks and clients, consultants and contractors, decision making in construction, contracts and risks	04
3	Risk management system: Risk identification, sources of risks, risk classification, types, impact and consequences of risk, risk analysis, risk quantification, scenario analysis, risk response: retention, reduction, transfer, avoidance	12
4	Value: Definitions: Value, value engineering, value analysis, value management, habits, roadblocks & attitudes and their relation to value engineering	01
5	Value Engineering Job Plan: Various versions of job plan, phases of job plan: information, creative, analytical, investigation, recommendation, implementation	04
6	Function Analysis: Function & its role in achieving value, function in terms of its cost & worth, Graphical function analysis, function analysis system technique	06
7	Creative thinking: Definition, creative people, creative processes, conducting creative session	04
8	Life cycle costing: Definition, purpose & implications, economic principles for life cycle costing, types of life cycle costs.	02
9	Energy: Energy resources & consumption, energy embodiment of construction materials, factors affecting energy consumption, impact of maintenance on energy saving.	04
10	Integrated approach to value and risk management	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 five assignments and at least one case study report with complete job plan 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 case study 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. Value Engineering: L.W. Zimmerman, G.D.Hart, CBS publishers & distributors
2. Value & risk management, M F Dallas, Blackwell Publishing
3. Value Engineering in the Construction Industry: Dell'Isola, A J, Construction Publication Company.
4. Value Analysis in Design & Construction: O'brien, J J, McGraw Hill
5. Risk management and Construction: R Flagnan R and G Norman, Blackwell Scientific.
6. Engineering Construction Risks- A guide to Project risk analysis and risk management: Thompson P A and Perry J G, Thomas Telford.

Class:-B E (Civil/Construction)			Semester VII	
Subject:-Elective-I : Advanced Engineering Geology				
Periods/week – each Period of 60 minutes duration	Lecture		04	
	Practical		02	
	Tutorial		-	
		Hours		Marks
Evaluation System	Theory Examination	03		100
	Practical	-		-
	Oral	-		25
	Term Work	-		25
	Total			150
Detailed Syllabus				

Detailed Syllabus

Module	Topics	No. of Lectures
1	Introduction Importance of geological studies in engineering investigations, precautions to avoid misleading conclusions likely to be drawn while interpreting drilling data with particular reference to RQD, case studies illustrating economics made possible by proper geological studies.	04
2	Engineering Geology of Deccan trap basalts. Factors affecting strength and water tightness, stability of cuts and ability to stand without support, significance of features like gas cavities, jointing, weathering, hydrothermal alteration, volcanic breccias, tachylytes, dykes, fractures, field structures of flows, stratigraphic sequence of flows etc. and their significance in civil engineering projects.	05
3	Dams Strength and water tightness of deccan trap rocks from foundation point of view, physical properties such as compressive strength, water absorption etc. of basalts, effect of weathering and hydrothermal alteration on engineering properties of rocks, deterioration of rock masses on exposure to atmosphere and suitable treatment for such rocks. Investigations for determining the foundation treatment for adverse geological features, determination of foundation levels/cutoff levels for dams, groutability of rocks, correction of adverse feature by grouting, purpose of consolidated and curtain grouting, determining depth and zones of grouting, relation of zones of grouting with height of dams, foundation treatment for fractures having different manifestations, jointed rocks, tachylytes and dykes. Erosion of tail channel as a factor in selecting site for spillway causes of rapid erosion from side spillways, geological conditions leading to erosion. Case histories.	08
4	Tunneling Methodologies of investigations for different types of tunnels for different purposes, location spacing, angles & depths of drill holes for different types of tunnels, difference in behaviour of basalts because of jointing as exemplified by compact basalts & amygdaloidal basalts. Difficulties introduced by tachylytes, volcanic breccias, tuffs, intertrappean beds, fractures, dykes, hydrothermal alteration, flow contacts unfavourable field characters. Computing structural discontinuities in rock masses, RQD,	08

	joint frequency index. RMR values, Q system, standup time. Selection & provision of protective measures such as guniting, rock bolting, shotcreting, tunneling. Case histories.	
5	Bridges Investigations for bridge foundations, computing SBC for bridge foundation based on nature & structure of rock, foundation settlements. Case histories.	04
6	Geology of soil formation Residual & transported soils. Rock weathering conditions favourable for decomposition & disintegration, influence of climate on residual & transported soils in the deccan trap area. Nature of alluvium of deccan trap rivers & its engineering character. Effect of deposition of calcium carbonate. Scarcity of sand in the rivers in deccan trap area.	05
7	Geophysical Investigations Seismic and electrical resistivity methods of explorations	04
8	Construction material Deccan trap basalts and sedimentary rocks as construction material. Use of compact basalt and amygdaloidal basalt as rubble for masonry and concrete making.	05
9	Earthquakes Terminology, Classification, Causes, Effects, Recording of an earthquake, Location of Epicenter, Earthquake problems in India.	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.

List of Practicals

1. Logging of drill core, preparation of litho logs and interpreting drilling data, calculation of RQD and joint frequency index. Preparing geological cross sections from drill hole data and using them for designing of civil engineering structures.
2. Use of electrical resistivity method for determining depth of bed rock.
3. Study of geological aspects of an engineering projects and writing a report based on studies carried out during visit to civil engineering projects.

Term work:-

Each student has to appear for at least one written test during the term Reports on experiments performed as detailed 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:

Reports on experiments performed

:

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. PWD Hand Book, Engineering Geology, Government of Maharashtra
2. Text Book of Engineering Geology: R.B.Gupte, PVC Prakashan
3. Geology of India: D.H.Wadia, McGraw Hill, New Delhi.
4. Geology of India and Burma: M,S,Krishnan, CBS Publications
5. Engineering and General Geology: Parbin Singh, Kataria S. K., New Delhi
6. Test book of Engineering Geology: N.Chenna.Kesavulu
7. Principles of Geomorphology: Thornbury, W.D
8. Earthquake Geography and Management: Srivastav, H,N

Class-B E (Construction)		Semester VII		
Subject:- Elective-I : Legal Aspects in Construction				
Periods/week - each of 60 minutes duration	Lecture	04		
	Practical	-		
	Tutorial	02		
		Hours	Marks	
Evaluation System	Theory Examination	03	100	
	Practical	-	-	
	Oral	-	25	
	Term Work	-	25	
	Total		150	

Detailed Syllabus		Topics	No. of Lectures
Module			
1	Law and common man, Necessity of legal framework, construction characteristics and legal provisions		06
2	Necessity, broad provisions and applicability of following laws related to workforce: Children (Pledging of labor) act, 1933 Employment of children act, 1938 Factories act, 1948 Mines act, 1952 Employment exchange (Compulsory notification of vacancies) act, 1959 Industrial employment (standing orders) act, 1946 Industrial disputes act, 1947 Workmen's compensation act, 1923 Employers' liability act, 1938 Employees' state insurance act, 1948 Employees' provident fund and miscellaneous provisions act, 1952 Maternity benefit act, 1961 Payment of wages act, 1936 Motor transport workers' act, 1961 Contract labor (Regulation and abolition) act, 1970 Payment of gratuity act, 1972 Apprenticeship act, 1961 Equal remuneration act, 1976 Minimum wages act, 1948 Payment of bonus act, 1965 Weekly holidays act, 1942 The interstate migrant workmen (regulation of employment & conditions of service) act, 1979 Building & other construction workers (regulation of employment & conditions of service) act Building & other construction workers welfare cess act		18
3	Necessity and provisions of following laws: Collection of statistics act, 1953 The motor vehicles act, 1939 Shops & commercial establishments act, Indian explosives act, 1884		10

	The boilers act, 1923	
	The Indian electricity act, 1910 and rules, 1956	
4	General provisions of Indian contract act and arbitration act 1996 , case studies	08
5	Legal Procedures to be followed in case of accidents, damages due to manmade or natural hazards on construction sites	06
	NOTE: Latest act with all its amendments shall be considered for discussion. Also if any Act is repealed, same shall be deleted.	

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 assignments based on the above 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. Bare acts as referred above
2. Law related to building and engineering contracts in India: Gajaria G T, N M Tripathi & Co.
3. Legal aspects of building and engineering contracts: Patil B S.

Class:-B E (Construction)		Semester VII	
Subject:-Elective-I : Safety Management in Construction			
Periods/week – each of 60 minutes duration	Lecture		
	Practical	04	
	Tutorial	-	
		02	
Evaluation System	Theory Examination	Hours	Marks
	Practical	03	100
	Oral	-	-
	Term Work	-	25
	Total	-	25
			150

Detailed Syllabus

Module	Topics	No. of Lectures
1	Definitions: safety, accident, hazard and occupational hazard, classification of construction accidents, types of hazards	05
2	Specific problems of construction, Common accidents & reasons for the same, measures of accidents, injury frequency, injury severity rates and injury index,	05
3	Precautions to be taken while performing construction activities; excavation, concreting, tunneling, blasting, and heavy (steel and prefabricated concrete components) erection, precautions to be taken while using ladders, scaffolds, temporary supports, removal of shuttering and temporary supports, etc.	08
4	Occupational health hazards-occupations affected, type of disease and causes for occupations like; bricklayer, carpenter, concreter, plasterer, painter, glazier, cladder, plumber, HVAC worker, welder, electrician, tiler, plant operator, labourer, storekeeper, supervisor	07
5	Fire hazard, causes, precautions to be taken	05
6	Personal protective clothing and equipment for the use of construction workers, eye, ear, head, face, feet and hand protection, protective gadgets for protection from fall	06
7	Direct & indirect costs of accidents, Behavioral approaches to safety & health, Physical approaches to safety & health, Safety campaign for project sites, check lists for safety during construction, Training for safety	07
8	Legal provisions for providing compensation to workforce in case of accidents, provisions in conditions of contract with reference to safety	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 five assignments based on the above 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. Construction Hazard and Safety Handbook: King & Hudson, Butterworths
2. Construction Safety Handbook: Davies & Tomasin, Thomas Telford
3. Construction safety management: Raymond & Sanderson, McGraw Hill Advanced

Class:-BE(Civil/Construction)			
Subject:- Elective-I: Reinforced Concrete Repairs and Maintenance			Semester-VII
Periods/week – each	Lecture		
Period of 60	Practical	04	
minutes duration	Tutorial	02	
		-	
Evaluation System	Theory Examination	Hours	Marks
	Practical	03	100
	Oral	-	-
	Term Work	-	25
	Total	-	25
Detailed Syllabus			150

Module	Topics	No. of Lectures
1	Introduction: Causes of deterioration of concrete structures. Effects of climate, moisture, temperature, chemicals, wear, erosion and loading on serviceability and durability. Design and construction errors. Causes of seepage and leakage in concrete structures. Formation of cracks including those due to corrosion.	6
2	Condition Survey, Evaluation and Assessment of Damage: Diagnostic methods and analysis. Destructive, Semi destructive and Non-Destructive methods including Core test, Carbonation test, Chloride test, Petrography, Corrosion Analysis, Cover meter test, Rebound Hammer test, Ultrasonic Pulse Velocity test, Crack measurement techniques, Concrete Endoscopy and Thermal imaging, Pull-off test and Pull-out test etc.	12
3	Materials and Methodology of Repairs: Repair analysis and design. Repair materials and their properties. Methodologies of crack and patch repair used of Polymer modified mortar, Polymer modified concrete, Polymer concrete. Injection grouting. Shotcreting. Joints and sealants. Rebar corrosion crack repair.	10
4	Protection of Concrete Structures: Protective materials and their properties for moisture barrier systems, Above-grade and below grade waterproofing of concrete structures. Systems like integral, crystalline, coatings, membranes etc., Thermal protection coatings.	8
5	Rebar Corrosion Protection: Methods of Corrosion protection. Corrosion inhibitors, Corrosion resistant steels, Cathodic Protection, Pre-packaged zinc sacrificial anode, Snap-on zinc mesh anode CP system	8
6	Maintenance of concrete structures: Facets of maintenance. Planned preventive maintenance. Maintenance cycles. Statutory legislation and obligation.	4

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 Practical:-(Minimum six experiments out of Sr. No 2 to 10)

1. Condition survey of any damaged structures by visual observation, crack measurement and preparing a report
2. Rapid chloride penetration test
3. Carbonation test by spraying phenolphthalein
4. Non destructive testing of concrete structures by Rebound hammer, UPV meter etc.
5. Corrosion analyzer by half-cell potential meter
6. Tests on polymer modified mortar/concrete and coating for adhesion by Pull-off test method
7. Outdoor exposure test to measure weathering of coating
8. Test for flexibility of coating by applying on a tin sheet
9. Test for effectiveness by measuring temperature difference of a thermal protection coating and concrete substrate on terrace
10. Test for effectiveness by measuring water absorption of coating applied on a card board

Term work:-

Each student has to appear for at least one written test during the term. Report on condition survey and minimum six experiments performed 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 experiments and condition survey	:	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. 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

Class:-B E (Construction)			
Subject:-Elective-I : Productivity in Construction			Semester VII
Periods/week – each Period of 60 minutes duration	Lecture		
	Practical	04	
	Tutorial	-	
		02	
Evaluation System	Theory Examination	Hours	Marks
	Practical	03	100
	Oral	-	-
	Term Work	-	25
	Total	-	25
Total Syllabus			150

Detailed Syllabus

Module	Topics	No. of Lectures
1	Productivity: Definition and importance of productivity in construction. Measurement of productivity, productivity of construction resources, labour, materials and equipment, factors affecting productivity. Improvement of productivity, basic and added work content and related time contents of job, productivity improvement techniques	10
2	Work study: Definition and purpose, historical developments. Method study, definition and objectives of conducting method study. Steps in applying method study, select, record, critical examination, development, installation and maintenance, recording techniques, outline process charts, flow process charts, flow diagram, two handed process charts, multi-activity chart, travel chart, string diagram, layout maps. Micro-motion studies, sino-chart, cycle graph and chrono cycle graph, photographic techniques, THERBLIGS. Work measurement, definition and objectives, various techniques of work measurement. Time study, purpose of time study, time measuring devices, recording methods, steps in time study/rating of a worker, observed time, basic time, relaxation allowances, standard time of an operation. Work sampling techniques, basis of work sampling, concept of accuracy and reliability. Analytic and synthetic time standards.	30
3	Use of work study techniques in improving construction productivity.	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 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. Productivity Improvement in Construction: Oglesby, Clarkson H et al, McGraw Hill
2. Work Study: ILO
3. Construction Productivity: Alfred L E, McGraw Hill

Class:-BE(Civil/Construction)

Subject:- Project A

Semester-VII

Periods/week – each
Period of 60
minutes duration

Lecture

Practical

Tutorial

-

-

04

Evaluation System

Theory Examination

Hours

Marks

Seminar

-

-

Oral

-

25

Term Work

-

-

Total

-

25

50 (Internal)

A group of students is expected to take up a project from Civil Engineering field which is to be completed in Semester VII and Semester VIII.

The project work may include,

- experimental analysis / verification,
- development of design methods and verification,
- design and fabrication of a model for a civil engineering project,
- design for civil engineering structures and preparation of working drawings,
- developing a software for analysis and / or design of decision making in civil engineering and management practice
- technical and / or economic feasibility study
- study on new materials / methodology for construction

The students may be asked to work in groups with not more than four students in each group.

Basic study through review of literature on the topic selected shall be completed. The scope of the project, necessary data, sources of such data etc. shall be identified. The group of students has to prepare a brief report on the work done during the semester and is to be submitted. The report should at least include Introduction, Aim and objective of the project, scope of the project, methodology, review of literature and reference list. The group shall prepare and present a seminar based on this work.

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

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., 5th Edition, John Wiley & Sons, 1988.
9. Illustrated Reinforced Concrete Design: Dr. V.L. Shah & Dr. S.R. Karve, Structural Publishers.

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

Detailed Syllabus

Module	Topics	No. of Lectures
1	Methods of Executing Construction Projects: Departmental method, contract method, piece work system, day-work system, comparative merits and demerits	03
2	Stages in Contracting: Notice inviting tenders, tender documents, contents, general conditions of contract like, tender validity period earnest money deposit and security deposit, performance bond, etc., prequalification and post-qualification, purpose and methods, pre-bid conference, purpose and procedure, award of contract, scrutiny and acceptance of tender, letter of intent, signing of contract.	07
3	Construction Contracts: Definition, valid, invalid and voidable contract, Indian Contract Act, relevant sections, obligations, rights and responsibilities of parties to the contract, types of construction contracts, item rate, percent rate, cost plus, lump sum, turnkey, BOT etc., suitability of type of contract for different types of works, role and responsibilities of client and contractor in each type of contract.	08
4	Contract Documents: Standard contract documents, general and special conditions of contract, conditions related to time of completion, maintenance period, extension of time, subletting, interim and final payments, advances and their recoveries, change orders, price variation, breach of contract, reasons and remedies for breach, liquidated damage, termination of contract.	10
5	Claims and Disputes: Types of claims, settlement procedures, dispute resolution methods, mediation, arbitration. Litigation, arbitration, arbitration and conciliation act, process of arbitration.	08
6	Labour Laws: Historical developments in labour legislation, purpose and general provisions of following acts, Industrial disputes act, Payment of wages act, Contract labour (regulation & abolition) act, Minimum wages act, Interstate migrant workmen (regulation of employment and conditions of services) act, The building and other construction workers (regulation of employment and conditions of service) act, The building and other construction workers welfare cess act.	12

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 covering the 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. Contractors and Arbitration: Reddy Narsinha B V, Engineers.
2. Law Related to Building and Engineering Contract in India: Gajaria G T, N M Tripathi P, Ltd.
3. Construction Contracting: Clough R H, Wiley
4. Construction Project Administration: Fisk E R, Wiley

Class:-B E (Construction)			Semester VIII
Subject:- Construction Management - II			
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		150
Detailed Syllabus			

Detailed Syllabus

Module	Topics	No. of Lectures
1	Organizing: Organization as a management function, principles of organization, structure of organization, line, line & staff, functional and matrix forms of organization, selecting the project manager organizing for site, mobilization and winding up, site layout.	04
2	Personnel management: Importance and objectives, manpower estimation and planning for projects, recruitment methods, training of personnel, performance evaluation, importance and methods of motivation.	03
3	Monitoring & control: Supervision, record keeping, periodic progress reports, updating of plans, purpose, frequency and methods of updating, time cost tradeoff in construction projects, compression and decompression, common causes of time and cost overruns and corrective measures.	05
4	Communication: Importance, elements of communication systems. Types of communication, written & non-written, verbal & non-verbal, formal & informal, barriers to effective communication.	05
5	Materials management: Importance and objectives, estimation and planning of materials, ABC analysis, procurement procedures, vendor evaluation, stock and inventory control, concept of economic order quantity, reorder level and reorder quantity, storage of materials, record keeping for materials management.	08
6	Equipment management: Mechanization in construction, sources of construction equipment, selection of equipment, standardization, matching and balancing of equipment, location on site for optimum utilization, cost of equipment, maintenance policies, record keeping for equipment management.	06
7	Quality control: Definition of quality, elements of quality, quality in various stages of project, use of manuals and checklists for quality control, role of inspection.	03
8	Cost control: Cost codification, tracking of costs, control budget, collection of data and reporting for cost control, time cost trade off, compression and decompression of project plans, cash flow analysis, variance analysis.	04
9	Productivity in construction: Concept of productivity in construction projects, factors affecting construction productivity, work study techniques for improving productivity.	03
10	Safety and health on project sites: Accidents, their causes and effects, cost of	04

	accidents, occupational health problems in construction, organizing for safety and health.	
11	Management information systems for construction projects	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 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. Management: Koontz, McGraw Hill.
2. Construction Equipment and it's Planning and Application: Varma M., Metropolitan Book.
3. Professional Construction Management: Barrie D S & Paulson B C., McGraw Hill.
4. Construction Project Management: Beneath J., Butterworths.
5. Construction Management: Helpin D W & Woodhead R W., Wiley.
6. Handbook of Construction Management: Joy P K, Macmillan.

Class:-BE(Civil/Construction)			Semester-VIII
Subject:- Elective-II: Advanced Construction Engineering			
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		150
Detailed Syllabus			

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.

Class:-B E (Civil/Construction)		Semester VIII	
Subject:-Elective-II : Water Resources Engineering and Management			
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		150

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

Class:-B E (Civil/Construction)		Semester VIII	
Subject:-Elective-II : Environmental Impact Assessment & Audit			
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		150
Detailed Syllabus			
Module	Topics		

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.

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

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

Written test (at least one)

: 15 marks

: 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.

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

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

Class:-B E (Civil/Construction)		Semester VIII	
Subject:-Elective-II : Building Services			
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		150
Detailed Syllabus			
Module	Topics		

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 – Lams 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).

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

Detailed Syllabus

Module	Topics	No. of Lectures
1	Soil stabilization: Definitions and necessity, methods of soil stabilization, sand drains, use of lime, cements bitumen &, columns, soil nailing, reinforced earth	08
2	Grouting: Definition, types of grouts, suspension grouts, grouting with soil, grouting with bentonite-cement mix, grouting with asphalt emulsions, solution grouts silicate derivatives, hignousulphate derivatives, water reactive grouts, phenoplasts, aminoplasts, grouting pressures, grouting materials and grouting equipments, guniting & shotcrete.	06
3	Construction of foundations in deep water: Pile foundations, types, suitability, construction methods, Cofferdams and cassions, types, suitability, construction methods.	06
4	Concrete construction: Concreting under water, concreting in extreme weather conditions, transport, placing and compaction of concrete, use of ready mixed concrete, vacuum processing of concrete, joints of concrete, high density concrete, fibre reinforced concrete, light weight concrete, IS recommendations for hot and cold weather concrete.	07
5	Foundation control techniques: Nondestructive testing including geophysics, seismic reflection, seismic refraction, electrical resistivity, magnetometry, ground probing radar (GPR), foundation instrumentation, load measurement, earth pressure measurement, deformation monitoring, Pour water pressure measurement.	07
6	Geotextiles (filter fabric): Introduction, geotextiles as separators, as reinforcement and infiltration and drainage, Geotextiles in erosion control	03
7	Pile driving equipment: Types, pile driving hammers, single and double acting, differential acting hammer, hydraulic and diesel hammers, vibratory pile drivers.	05
8	Miscellaneous: Building construction systems- on site, pre-casting, tilt-up, slip form, lift slab construction, ferrocement and its products, low cost housing systems.	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 & 10 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 and sketches	:	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 and Geotechnical Methods in Foundation Engineering: R M Koerner, McGrawHill.
2. Construction Planning, Equipment and Methods: R L Peurifoy, McGraw Hill.

Class:-B E (Civil/Construction)**Subject:-Elective-II : Advanced Repair and Rehabilitation of Structures****Semester VIII**

Periods/week – each Period of 60 minutes duration	Lecture		
	Practical	04	
	Tutorial	-	
		02	
Evaluation System	Theory Examination	Hours	Marks
	Practical	03	100
	Oral	-	-
	Term Work	-	25
	Total	-	25
		150	

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)			
Subject:- Project B			
Periods/week – each Period of 60 minutes duration	Lecture	Semester-VIII	
	Practical		
	Tutorial		
Evaluation System		Hours	04
	Theory Examination		Marks
	Seminar	-	-
	Presentation and Oral	-	-
	Term Work	-	50
	Total	-	50 (internal)
			100
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.			
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.			
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.			