

UNIVERSITY OF MUMBAI

No.UG / 256 of 2009

CIRCULAR :-

A reference is invited to the Ordinances, Regulations and syllabi relating to the Bachelor of Engineering degree courses vide this office Circular No.UG/461 of 2003, dated 19th September, 2003 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 1st April, 2009 has been accepted by the Academic Council at its meeting held on 27th May, 2009 vide Item No.4.17 and that, in accordance therewith, the syllabus for the Third Year Construction Engineering (Sem. V and VI) of the B.E. degree course is revised as per Appendix and that the same has been brought into force with effect from the academic year 2009-2010.

MUMBAI-400 032

7th July, 2009

PRIN K VENKATARAMANI
REGISTRAR

To,

The Principals of the affiliated colleges in Engineering.

A.C./4.17/27.05.2009

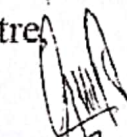
No.UG/256- A of 2009,

MUMBAI-400 032

7th July, 2009

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.


07/07/09

(D.H. KATE)

DEPUTY REGISTRAR
(U.G./P.G 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 (3 copies), the Deputy Registrar, Statistical Unit (2 copies), the Deputy Registrar (Accounts Section), Vidyanagari (2 copies), the Deputy Registrar, Affiliation Section (2 copies), the Director, Institute of Distance Education, (10 copies) the Director University Computer Center (IDE Building), Vidyanagari, (2 copies) the Deputy Registrar (Special Cell), the Deputy Registrar (PRO), the Assistant Registrar, Academic Authorities Unit (2 copies) and the Assistant



UNIVERSITY OF MUMBAI



Revised Syllabus for the Third Year Construction Engineering (Semester V & VI)

(With effect from the academic year 2009-2010)

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

THIRD YEAR ENGINEERING: (Construction Engineering)

Semester V

	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.	Structural Analysis-II*	4	-	2	3	100	25	-	25	150
2.	Geotechnical Engineering-I*	4	2	-	3	100	25	25	-	150
3.	Building Design and Drawing-II*	2	3	-	4	100	50	25@	-	175
4.	Building Services & Utilities	3	-	2	3	100	25	-	-	125
5.	Transportation Engineering-I *	4	-	2	3	100	25	-	-	125
6.	Construction Techniques	4	-	2	3	100	25	-	-	125
Total		21	5	8	-	600	175	50	25	850

* Common to Civil Engineering.

@ Oral and sketching

Semester - VI

	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.	Geotechnical Engineering - II*	4	2	-	3	100	25	-	25	150
2.	Design & Fabrication of Steel Structures	4	-	2	3	100	25	-	25	150
3.	Entrepreneurship & Management	3	-	-	3	100	-	-	-	100
4.	Transportation Engineering-II*	4	2	-	3	100	25	-	25	150
5.	Environmental Engineering	4	2	-	3	100	25	-	25	150
6.	Quality Management in Construction	4	-	2	3	100	25	-	25	150
Total		23	6	4	-	600	125	-	125	850

* Common to Civil Engineering

Class:-T E (Civil/Construction.)		Semester V	
Subject:-Structural Analysis - II			
Periods/week – each Period of 60 minutes duration	Lecture	04	
	Practical	-	
	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	General Types of structures occurring in practice and their classification. Stable and unstable structure, statical and kinematical determinacy and indeterminacy of structure. Symmetric structure, symmetrical and anti-symmetrical loads, distinction between linear and non-linear behaviour of material and geometric non-linearity.	06
2	Deflection of statically determinate structures: Review of general theorems based on virtual work and energy methods, introduction to the concept of complementary energy, absolute and relative deflections caused by loads, temperature changes and settlement of supports, application to beams, pin jointed frames and rigid jointed frames.	06
3	Analysis of indeterminate structures by flexibility method: Flexibility coefficients and their use in formulation of compatibility equations. Theorem of three moments, Castigliano's theorem of least work, application of above methods to propped cantilevers, fixed beams, continuous beams. Simple pin jointed frames including effect of lack of fit for members. Simple rigid jointed frames and two hinged parabolic arches.	14
4	Analysis of indeterminate structures by stiffness method: Stiffness coefficients for prismatic members and their use for formulation of equilibrium equations, direct stiffness method, slope deflection method, Moment distribution method. Application of the above methods to indeterminate beams and simple rigid jointed frames, rigid jointed frames with inclined member but having only one translational degree of freedom in addition to rotational degree of freedom including the effect of settlement of supports.	14
5	Introduction to plastic analysis of steel structures: Concept of plastic hinge and plastic moment carrying capacity, shape factor, determination of collapse load for single and multiple span beams.	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.

Termwork:-

Each student has to appear for at least one written test during the term.

At least 20 (twenty) solved problems based on the above syllabus and the graded answer paper of term test shall be submitted as term work. At least ten out of the 20 solved problems have to be validated by using available computer software.

The distribution of term work marks will be as follows:

Assignments	:	15 marks
Written test (at least one)	:	10 marks
Attendance (Theory & Tutorial)	:	05 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. Basic Structural Analysis: Reddy C.S., Tata McGraw hill.
2. Matrix Method in Structural Analysis: Pandit and Gupta, Tata McGraw hill.
3. Structural Analysis, Vol II: Junnarkar S.B. Charotar Publishers.
4. Modern Methods in Structural Analysis: Dr. B.N. Thadani And Dr. J. P.Desai, Weinall Book Corporation.
5. Intermediate Structural Analysis: Wang C.K., Tata McGraw hill.
6. Analysis of Framed Structures: Gere and Weaver, East-West Press.
7. Structural Analysis Vol.I and Vol. II: Pandit and Gupta, Tata McGraw hill.
8. Structural Analysis: L.S. Negi and R. S. Jangid, Tata McGraw hill.
9. Structural Analysis, A unified approach: Prakash Rao D.S., University press.
10. Matrix Methods of Structural Analysis: Dr. A. S. Meghre, S. K. Deshmukh, Charotar Publishing House.
11. Structural Analysis: Chajes A., Prentice Hall

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

Detailed Syllabus

Module	Topics	No. of Lectures
1.	Introduction i Definitions: soils, soil mechanics, soil engineering, rock mechanics. ii Geotechnical Engg: scope of soil engineering, comparison between soil & rock.	01
2.	Basic definitions & relationship i Soil as three phase system in terms of weight, volume, void ratio, porosity. ii Definitions: moisture content, unit weights, degree of saturation, void ratio, porosity, specific gravity, mass specific gravity etc. Relationship between volume-weight, void ratio-moisture content, unit weight-percent air voids, saturation-moisture content, moisture content-specific gravity etc. iii Determination of various parameters such as moisture content by oven dry method, pycnometer, sand bath method, torsional balance method, radio activity method, alcohol method. iv Specific gravity by density bottle method, pycnometer method, measuring flask method. v Unit weight by water displacement method, submerged weight method, core cutter method, sand replacement method.	09
3.	Plasticity characteristics of soil i Introduction to definitions of: plasticity of soil, consistency limits - liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and consistency indices, flow & toughness indices, definitions of activity and sensitivity. ii Determination of: liquid limit, plastic limit, shrinkage limit iii Use of consistency limits.	05
4.	Classification of soils i Introduction of soil classification: particle size classification, textural classification, unified soil classification, Indian standard soil classification system ii Identification: field identification of soils, general characteristics of soils in different groups.	03

5.	Permeability of soils i Introduction to hydraulic head, Darcy's law , validity of Darcy's law ii Determination of coefficient of permeability, Laboratory methods: constant head method, falling head method, Field methods: pumping-in test, pumping-out test iii Permeability aspects: permeability of stratified soils, factors affecting permeability of soil.	05
6.	Seepage analysis Introduction, stream and potential functions, characteristics of flow nets, graphical method to plot flow nets, use of flow nets.	03
7.	Effective stress principle i Introduction, effective stress principle, nature of effective stress, effect of water table ii Fluctuation of effective stress, effective stress in soils saturated by capillary action, seepage pressure, quick sand condition.	03
8.	Compaction of soils i Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. ii Compaction in the field, compaction specification and field control.	02
9.	Consolidation of soils Introduction, comparison between compaction & consolidation, initial, primary & secondary consolidation, spring analogy for primary consolidation, consolidation test results, basic definitions, Terzaghi's theory of consolidation, final settlement of soil deposits; consolidation settlement: one-dimensional method, secondary consolidation.	07
10.	Shear strength Principal planes parallel to the coordinate axes, Mohr's circle, important characteristics of Mohr's circle, Mohr-Coulomb theory, types of shear tests, direct shear test, merits of direct shear test , tri-axial compression tests, test behaviour of UU, CU and CD tests, relation between major and minor principal stresses, unconfined compression test, vane shear test.	05
11.	Soil exploration Introduction, methods of investigation, methods of boring, soil samplers and sampling, number and disposition of trial pits and borings, penetrometer tests, borehole logs, geophysical methods.	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.

Practical Examination:-

Practical examination will be based on the experiments conducted.

List of practicals:- (at least ten to be performed)

- 1 Field density using core cutter method
- 2 Field density using sand replacement method
- 3 Natural moisture content using oven drying method
- 4 Field identification of fine-grained soils
- 5 Specific gravity of soil grains
- 6 Grain size distribution by sieve analysis
- 7 Grain size distribution by hydrometer analysis
- 8 Consistency limits by liquid limit
- 9 Consistency limits by plastic limit
- 10 Consistency limits by shrinkage limit
- 11 Permeability tests using constant test method
- 12 Permeability tests using falling head method
- 13 Compaction test: standard proctor test.
- 14 Compaction test: modified proctor test
- 15 Relative density

Term work:

Each student has to appear for at least one written test during the term

Report on experiments performed as detailed above, assignments including 15 problems based on the above syllabus (preferably 2 problems on each topic) and the graded answer paper of the term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Reports of experiments performed and assignments	:	15 marks
Written test (at least one)	:	10 marks
Attendance (Theory & Practical)	:	05 marks

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

Recommended Books:

1. Soil Engineering in Theory and Practice: Alam Singh, CBS Publishers & Distributors, New Delhi.
2. Soil Mechanics and Foundation Engineering: V. N. S. Murthy, Saitech Publications.
3. Soil Mechanics and Foundation Engineering: K. R. Arora, Standard Publishers and Distributors, New Delhi.
4. Geotechnical Engineering: C. Venkatramaiah, New Age International.
5. Fundamentals of Soil Engineering: Taylor, D. W., John Wiley & Sons
6. An Introduction to Geotechnical Engineering: Holtz, R. D., Printice Hall, New Jersey
7. Soil Mechanics: Craig, R. F., Chapman & Hall
8. Soil Mechanics: Lambe T. W. & Whitman R. V., John Wiley & Sons
9. Theoretical Soil Mechanics: K. Terzaghi, John Wiley & Sons
10. Relevant Indian Standard Specifications & Codes, BSI Publications, New Delhi.

Class:-T E (Civil/Construction.)		Semester V	
Subject:-Building Design and Drawing – II			
Periods/week – each Period of 60 minutes duration	Lecture	02	
	Practical	03	
	Tutorial	-	
Evaluation System		Hours	Marks
	Theory Examination	04	100
	Practical (Sketching & Oral)	-	25
	Term Work	-	50
	Total		175

Detailed Syllabus

Module	Topics	No. of Lectures
1.	Planning & design of public buildings such as; i. Buildings for education: schools, colleges, institutions, libraries ii. Buildings for health: hospitals, health centers, dispensaries, maternity homes, sanatoriums iii. Industrial buildings iv. Buildings for entertainment: theatres, cinema halls, club houses, sports clubs v. Offices vi. Hostels, hotels, boarding houses, rest houses	9
2.	Architectural planning, massing and composition, concept of built environment and its application in planning	2
3.	Perspective drawing: one point and two point perspective	3
4.	Principles of modular planning, planning as recommended by National Building Organization	2
5.	Town planning: objectives and principles, master plan, road systems, zoning, green belt, slums	2
6.	Use of computers in building planning and designing.	2
7.	Understanding certification methods (TERI, LEEDS) for Green buildings.	3

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.

Practical Examination (Oral & sketching):-

Practical examination will be based on the entire syllabus. The examination shall consist of drawing sketches and oral based on the entire syllabus.

Term Work:

Term work shall consist of at least three A1 (Imperial) size drawing sheets giving details of minimum two different types of public buildings. One building shall be planned in RCC framed structure and shall have ground plus at least one upper floor. Other building shall be planned as a load bearing single storied structure situated in rural area and has to be constructed with locally available materials.

The drawings should include following details: floor plans, elevation, typical section, roof plan, foundation plan, site plan, layout plan with drainage lines, and any other typical details.

The drawings should accompany a report with following details: description of site, plot area, FSI statement, finer points in architectural planning and brief description of items of construction.

The report should also include at least two A1 size sheets with sketches giving details of some elements of the buildings drawn in AUTOCAD or similar software.

The distribution of term work marks will be as follows:

Drawings	:	25 marks
Report on planning and design of buildings	:	15 marks
Written test (at least one)	:	10 marks
Attendance (Theory and practical)	:	05 marks

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

Recommended Books:

1. Building Drawing: M.G. Shah, C.M. Kale, S.Y. Patil, Tata McGraw Hill, Delhi.
2. Civil Engineering Drawing: M. Chakraborty, Monojit Chakraborty Publication, Kolkata.
3. Building Drawing and Detailing: BTS Prabhu, K.V. Paul and C. Vijayan, SPADES Publication, Calicut.
4. Planning and Designing Buildings: Y.S. Sane, Modern Publication House, Pune.

Class:-T E (Construction)		Semester V	
Subject:- Building Services & Utilities			
Periods/week – each Period of 60 minutes duration	Lecture	03	
	Practical	-	
	Tutorial	02	
Evaluation System		Hours	Marks
	Theory Examination	03	100
	Practical	-	-
	Oral	-	-
	Term Work	-	25
	Total	-	125

Detailed Syllabus

Module	Topics	No. of Lectures
1.	Electrical installation: Introduction to electric power generation, terms and units used in connection with electric installation, materials, accessories and fittings used for electric installation, wiring layout, types of wiring, earthing, protection of building from lightning, safety in electric installation.	04
2.	Lighting : i. Relevant terms and units used in connection with lighting such as- illumination, brightness ration or contrast, luminance, luminous flux, illumination level, candela flux, lumen, etc. ii. Day lighting, day light area, day light factor, components of day light factor like sky component, internal reflected component, external reflected component, corrections for various factors, computation of day light factor. iii. Glare: causes and effect of glare, reflected glare veiled glare, ways to minimize glare. iv. Aims of good lighting for building, valued for illumination recommended for various tasks, lighting for various areas such as work space, corridors, passages, entrances, foyers and staircases. v. Artificial lighting to supplement day lighting.	05
3.	Ventilation: objectives of ventilation, method of ventilation, natural ventilation, mechanical ventilation, rate of ventilation.	03
4.	Air conditioning: necessity of air conditioning, various terms used in connection with air conditioning, centralized air conditioning, plant rooms, air handling unit, risers, cooling towers.	03
5.	Telephones and other communication services in the buildings	03
6.	Acoustics: various terms and units used in connection with acoustics, sources and layout of different types of buildings from the point of view of acoustics, use of various materials, Sabine's formula, sound insulation, relevant construction techniques.	03
7.	Lifts: necessity of lifts, types of lifts, various terms used in connection with lifts, location of lifts- factors that need consideration, quantity of lift services, quality of service, passenger handling capacity, control of lifts, lift well and machine room, maintenance of lift service, escalators.	03
8.	Plumbing for house water supply, gas supply & drainage i. Water supply: sources of water and supply of water for domestic use, storage capacity, factors influencing the storage calculation, material and fixtures used in plumbing for domestic water supply, hot water supply water meters maintenance of plumbing for water supply.	09

	ii. Drainage: wastes and their classification, methods of disposing wastes, drainage/sewerages, requirements of good building drainage, sanitary fittings such as kitchen sinks, wash basins, w.c. pans, urinals, their installation, materials and accessories used in plumbing for drainage, traps – different types and their uses, flushing cisterns, their working, connection, their sizes etc., systems of sewerages such as combined and separate systems, one pipe system, two pipe system etc., their merits and demerits, septic tanks, their working, sizes, construction etc., disposal of rain water from roof and surroundings of a building, typical layout for the drainage of building. iii. Gas lines for domestic use, sources of supply, precautions for safety and maintenance.	
9.	Fire Protection: fire hazards, classification of fires, classification of buildings on the basis of fire loads, prevention of fire and protection from fire, provisions in buildings, fire proof exits and escapes.	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.

Term Work:

Each student has to appear for at least one written test during the term. Report on at least ten assignments based on the above syllabus and the graded answer paper for the term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Report on assignments	:	15 marks
Written test (at least one)	:	10 marks
Attendance (Theory & tutorial)	:	05 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. Building Construction: S. P. Bindra & S. P. Aurora, Dhanpat Rai & Son 1992.
2. Building Construction: B. C. Punmia & A K Jain, Laxmi Publications, No. 1984.
3. National building code and other Indian standard codes for different topics.
4. Building drawing: M. G. Shah, C. M. Kaje, S. Y. Patki, Tata McGraw Hill, Delhi
5. Services in building complex: V. K. Jain, Khanna Publishers
6. Materials of construction: D. N. Ghose, Tata McGraw Hill, Delhi
7. Architectural materials science: D. Anapetor, Mir Publishers
8. Introduction to engineering materials: B. K. Agrawal, Tata McGraw Hill New Delhi
9. Engineering materials: Rangwala, Charotar Publications
10. Engineering materials: P. Surendrasingh, Vani Education Books New Delhi.
11. Building construction: Rangwala, Charotar Publications

Class:-T E (Civil/Construction.)		Semester V	
Subject:-Transportation Engineering - I			
Periods/week – each Period of 60 minutes duration	Lecture	04	
	Practical	-	
	Tutorial	02	
Evaluation System		Hours	Marks
	Theory Examination	03	100
	Practical	-	-
	Oral	-	-
	Term Work	-	25
	Total		125

Detailed Syllabus

Module	Topics	No. of Lectures
01	Introduction: Role of transportation in Society, objectives of transportation system, different types of modes, planning & coordination of different modes for Indian conditions.	04
02	Railway Engineering i Merits of rail transportation, railway gauges and problems due to non uniformity of gauges. ii Cross section of permanent way and track components, sleeper – functions and types, sleeper density, ballast functions and different ballast materials. iii Rails: coning of wheels and tilting of rails, rail cross sections, wear and creep of rails, rail fastenings. iv Geometrics: gradients, transition curves, widening of gauge on curves, cant and cant deficiency. v Points and crossing: design of turnouts, description of track junctions, different types of track junctions. vi Yards: details of different types of railway yards and their functions. vii Signalling and interlocking: classification of signals, interlocking of signals and points, control of train movement. viii Construction and maintenance of railway track, methods of construction, material requirements, maintenance of tracks and traffic operations. ix Modernization of track and railway station for high speed trains special measures for high speed track.	16
03	Airport Engineering i Aircraft component parts and its function, aircraft characteristics and their influence on airport planning. ii Airport planning: topographical and geographical features, existing airport in vicinity, air traffic characteristics, development of new airports, factors affecting airport site selection. iii Airport obstruction: zoning laws, classification of obstructions, imaginary surfaces, approach zones, turning zones. iv Airport layout: runway orientation, wind rose diagrams, basic runway length, corrections for runway length, airport classification, geometric design, airport capacity, runway configuration, taxiway design, geometric standards, exit taxiways, holding aprons, location of terminal buildings, aircraft hangers and parking.	24

	v Airport marking and lighting marking and lighting of runways, taxiway, approach and other areas. vi Terminal area & airport layout: terminal area, planning of terminal buildings, apron: size of gate position, number of gate position, aircraft parking system, hanger, general planning considerations and blast considerations. vii Air traffic control: Air traffic control aids, en-route aids, landing aids. viii Airport drainage: requirement of airport drainage, design data, surface drainage design. ix Airport airside capacity and delay: runway capacity and delays, practical hourly capacity, practical annual capacity, computation of runway system, runway gate capacity, taxiway capacity. x Air traffic forecasting in aviation: forecasting methods, forecasting requirement and applications.	
4.	Introduction of water transportation system, harbors and docks, port facilities.	04

Theory Examination:-

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

Term Work:

Each student has to appear for at least one written test during the term. Report on 10 assignments (including numerical problems and layout sketches) and the graded answer paper for the term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Reports of assignments	:	15 marks
Written test (at least one)	:	10 marks
Attendance (Theory & Tutorial)	:	05 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. A Course of Railway Engineering: Saxena S C and Arora S P, Dhanpat Rai and Sons, New Delhi.
2. Airport Planning and Design: Khanna & Arora, Nemchand Bros, Roorkee
3. Indian Railway Track: Agarwal M. M., Suchdeva press New Delhi.
4. Docks and Harbour Engineering: Bindra S P. Dhanpat Rai and Sons
5. Harbour, Dock and Tunnel Engineering: R Shrinivas, Chrotar Publishing House
6. A Text Book on Highway Engineering and Airports: Sehgal S E, Bhanot K L, S. Chand & Co.
7. Planning and Design of Airport: Horonjeff and Mckelrey, Tata McGraw Hill.
8. Design & Construction of Ports and Marine Structures: Quinn A D, Tata McGraw Hill.
9. Airport Engineering: Rao G V, Tata McGraw Hill

Class:-T E (Construction)		Semester V	
Subject:- Construction Techniques			
Periods/week – each Period of 60 minutes duration	Lecture		04
	Practical		-
	Tutorial		02
Evaluation System		Hours	Marks
	Theory Examination	03	100
	Practical	-	-
	Oral	-	-
	Term Work	-	25
	Total	-	125

Detailed Syllabus

Module	Topics	No of Lectures
1.	Setting out of buildings, excavation for foundation – load bearing and framed structures (steel and reinforced concrete).	03
2.	Masonry i. Stone masonry: terms used, types of stone masonry, lifting devices, strength and uses of stone masonry, scaffolding. ii. Brick masonry: terms used, brick laying, bonding and finishing, reinforced brickwork, composite walls. iii. Hollow and solid blocks, material & construction, bonding and finishing, laying of blocks, strength of hollow blocks.	08
3.	Construction of structures, load bearing, framed (steel and reinforced concrete), prestressed, pre-cast and composite construction, construction of arches, lintels, chajjas, formwork, scaffolding and prefabrication required for construction.	06
4.	Timber construction: timber as construction material, fasteners, structural components like columns, beam & trusses.	03
5.	Floor construction: industrial and residential buildings, basement floors- single and multiple, types of floor finishes.	03
6.	Roof construction: different types and their layouts, types of roof coverings, purlins, drainage arrangement, false ceiling.	03
7.	Staircase construction: types- materials & geometry, design and construction, ramps, ladders, lifts and escalators.	03
8.	Doors and windows: industrial and residential buildings, different types of doors, ventilators and windows, materials for doors and windows.	03
9.	Finishes: plastering, pointing, painting, damp-proofing, types of terrace waterproofing, wood finishes.	03
10.	Earthquake resistant construction: materials to be used, construction techniques for earthquake resistance of load bearing and framed structures.	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.

List of Sketches

1. Stone masonry
2. Brick masonry
3. Hollow block construction
4. Composite walls
5. Footings, chajjas, arches and lintels
6. Doors and windows- shutters and frames including wooden, steel, aluminium and concrete
7. Floors and floor finishes
8. Roofs
9. Staircase types
10. Tools for masonry construction, plastering, pointing, etc.
11. Features of earthquake resistant structures

Term work

Each student has to appear for at least one written test during the term. At least 25 sketches based on 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:

Reports of sketches

Written test (at least one)

~~Assignment (Theory and Tutorial)~~

: 15 marks
: 10 marks
: ~~05 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. Building Construction: Janardhan and Jha, Chandan,
2. Building Construction: Sushil Kumar, Standard Publishers, Delhi.
3. Building Construction: Rangwala, Charotar Publishers, Anand.
4. Construction Technology Vol. 1 to 4: Chudley, ELBS.

Class:-T E(Civil/Construction.)		Semester VI	
Subject:-Geotechnical Engineering - II			
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

Module	Topics	No. of Lectures
1.	Stability of slopes Introduction, different factors of safety, types of slope failures, analysis of finite and infinite slopes, wedge failure, Swedish circle method, friction circle method, stability numbers and charts.	05
2.	Lateral earth pressure theories i Introduction: applications of earth pressure theories, different types of earth pressures - at rest, active and passive pressures ii Rankine's earth pressure theory: Rankine's earth pressure theory, active earth pressure and passive earth pressure for horizontal and inclined backfill including the direction of failure planes for cohesionless and cohesive soils. iii Coulomb's wedge theory: Coulomb's active pressure in cohesionless soils, expression for active pressure, Coulomb's passive earth pressure. iv Rebhann's construction for active pressure, Culmann's graphical solutions for active wedge method, passive pressure by friction circle method for cohesionless and cohesive soils.	10
3.	Earth retaining structures Rigid and flexible retaining structures, stability analysis of retaining walls, cantilever retaining walls, deflection, bending moment and earth pressure diagrams for cantilever sheet piles, computation of embedment depth, construction details, drainage and wall joints.	05
4.	Bearing capacity of shallow foundations i Definitions of ultimate bearing capacity, gross, net and safe pressures, allowable bearing pressure, types of shallow foundations, modes of failures. ii Bearing capacity theories: Rankine's approach, Prandtl's approach and Terzaghi's approach, concept behind derivation of equation, general bearing capacity equation, bearing capacity equations for square and circular footings, factors influencing bearing capacity, performance of footings in different soils, Vesic's chart, ultimate bearing capacity in case of local shear failure. Plate load test in detail with reference to IS 1888 and its applications and estimation of settlements, bearing capacity based on standard penetration test.	12

5.	Axially loaded pile foundations i Introduction to pile foundations, necessity of pile foundation, classification of piles, construction methods of bored piles, concrete bored piles, driven cast in-situ piles. ii Pile capacity based on static analysis, piles in sand, piles in clay, dynamic methods and their limitations, in-situ penetration tests and pile load test as per IS 2911 specifications, negative skin friction. iii Pile groups, ultimate capacity of groups, settlement of pile groups in sand and in clays as per IS 2911 and critical depth method.	06
6.	Underground conduits Classes of underground conduits, load on a ditch conduit, settlement ratio, ditch condition and projection condition, imperfect ditch conduit.	03
7.	Open cuts Difference in open cuts and retaining walls, apparent pressure diagrams, average apparent pressure diagrams for sand, soft and stiff clay, estimation of loads on struts.	03
8.	Reinforced soil The mechanism, reinforcement (elements), reinforced-soil interaction, applications, reinforced soil embankments, simple problems.	04

Theory Examination:-

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

Oral Examination:-

Oral examination will be based on entire syllabus.

List of practicals: (At least six to be performed)

1. Consolidation test
2. Triaxial test (UU)
3. Direct shear test
4. Unconfined compression strength test
5. California bearing ratio test
6. Vane shear Test
7. Determination of free swell index

Application of the test performed to foundation problems should be demonstrated by solving at least two problems using data from the test conducted.

Termwork:-

Each student has to appear for at least one written test during the term. Report on experiments performed as detailed above, assignments including 10 problems and the graded answer paper for the term test shall be submitted as term work

The distribution of term work marks will be as follows:

Report on experiments performed and assignments	:	15 marks
Written test (at least one)	:	10 marks
Attendance (Theory and Practical)	:	05 marks

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

Recommended Books:-

1. Soil Engineering in Theory and Practice: Alam Singh, CBS Publishers & distributors, New Delhi
2. Soil Mechanics and Foundation Engineering: V. N. S. Murthy, Saitech Publications
3. Soil Mechanics and Foundation Engineering: K. R. Arora, Standard Publishers and Distributors, New Delhi
4. Soil Mechanics in Engineering Practice: K. Terzaghi and R. B. Peck, II Edn.
5. Foundation Engineering: R. B. Peck, W. E. Hansen & T. H. Thornburn, Wiley Eastern
6. Design aids in Soil Mechanics and Foundation Engineering: S. R. Kaniraj, Tata McGraw Hill, New Delhi
7. Foundation Design Manual: N. V. Nayak, Dhanpat Rai Publications, New Delhi
8. Relevant Indian Standard Specifications & Codes, BIS Publications, New Delhi.

Class:-T E (Construction)		Semester VI
Subject:- Design & Fabrication of Steel Structures		
Periods/week – each Period of 60 minutes duration	Lecture	04
	Practical	-
	Tutorial	02
Evaluation System	Hours	Marks
	Theory Examination	03
	Practical	100
	Oral	-
	Term Work	25
Total		25
		150

Detailed Syllabus

Module	Topics	No. of Lectures
1	Introduction to types of steel, mechanical properties of steel, advantages of steel as structural material, design philosophies of Working Stress Method (WSM) and Limit State Method (LSM)	02
2	Limit state method, limit state of strength and serviceability (deflection, vibration, durability, fatigue, fire), characteristics and design loads, Classification of cross section- plastic, compact, semi-compact and slender, limiting width to thickness ratio.	07
3	Fabrication techniques Welding tools and equipment, welding machines Welding process- gas welding, arc welding, selection of welding process for a job, precautions to be taken. Cutting, process of flame cutting, precautions to be taken, factors affecting flame cutting. Inspection and testing - testing of weld material and tests on welded joints, bend test, tensile test, Nick break test, tightness test. Process of preparation of shop drawings for beam-column system.	05
4	Design of tension members with welded / bolted end connections using single and double angle sections by LSM, design strength due to- yielding of gross section, rupture of critical section and block shear.	05
5	Design of compression members with welded / bolted end connections using single and double angle by LSM, design strength, effective length of compression members.	04
6.	Design of columns with single and built-up sections, design of lacing and batten plates with bolted and welded connections using LSM, column buckling curves, effective length, slenderness ratio, limiting values of effective slenderness ratio, buckling class of various cross sections.	04
7.	Design of slab base and gusseted base using bolted and welded connection by LSM, effective area of a base plate.	04

8.	Design of members subjected to bending by L&M, design strength in bending, effective length, laterally supported and unsupported beams, single lag effect, design for shear, web buckling and web crippling	02
9.	Introduction to bolted and welded connections by L&M, beam to beam and beam to column connections, design of framed, unstiffened and stiffened seat connections.	01

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. Solution of at least 20 problems with neat sketches wherever necessary and graded answer paper shall be submitted as term work.

The distribution of term work marks will be as follows:

Minimum of assignments	:	15 marks
Written test (at least one)	:	10 marks
Attendance (Theory and tutorials)	:	05 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. Design of Steel Structures: Arya and Ajmani, Nemchand Brothers.
2. Design of Steel Structures, Vol I and Vol II: Ramchandra, Standard Book House
3. Design of Steel Structures: Punamia, Jain, Laxmi Publications
4. Design of Steel Structures, Third Edition: Edwin H. Gaylord, Charles N. Gaylord and James E. Stallmeyer, McGraw-Hill, 1992.
5. Design of Steel Structures: Mac. Ginely T.
6. Design of Steel Structures: N. Subramanian, Oxford.
7. LRFD Steel Design, Second Edition: William T. Segui, PWS Publishing, 1999.
8. Structural Steel Design, LRFD Method, Third Edition: Jack C. McCormac and James K. Nelson, Jr., Prentice Hall, 2003.
9. Steel Structures Design and Behavior, Fourth Edition: Charles G Salmon and John E. Johnson, Harper Collins, 1996.
10. Design of Steel Structures: Syal and Satinder Singh Standard Publishers
11. Design of Steel Structures: Dayaratnam, Wheeler Publication.
12. Behaviour of Structures: Engerlink.

Class:-T E (Construction)		Semester VI	
Subject:- Entrepreneurship & Management			
Periods/week – each Period of 60 minutes duration	Lecture	03	
	Practical	-	
	Tutorial	-	
Evaluation System		Hours	Marks
	Theory Examination	03	100
	Practical	-	-
	Oral	-	-
	Term Work	-	-
	Total	-	100

Detailed Syllabus

Module	Topics	No of Lectures
1.	Definitions of entrepreneurship, concept of entrepreneur and entrepreneurship. characteristics of entrepreneurship, an ideal entrepreneur	03
2.	The entrepreneurial culture Aspects of entrepreneurship, environment for entrepreneurship, culture: elements of culture, business culture and culture of society, entrepreneurial culture, cultural change, socio-economic origins of entrepreneurship, barriers to entrepreneurship, factors affecting entrepreneurship	04
3.	Classification and types of entrepreneurship Classification depending on type of business, technology, motivation, growth, stages of development	04
4.	Entrepreneurial traits and motivation Entrepreneurial initiative, characteristics of an entrepreneur, qualities of an entrepreneur, entrepreneurial skills, entrepreneurship: sources of supply & motivation, Growth of entrepreneurs, entrepreneurial functions	05
5.	Project development Project: stages of project, project development cycle, life cycle of project, ISO certification & its importance, search for an idea, preliminary screening, project identification, project Formulation, SWOT analysis, project report. Project appraisal: market, technical, financial, economical, social, ecological, organizational. Tools of analysis: time value of money, compounding & discounting, break-even analysis, payback period, net present value, social cost-benefit analysis Sources & types of finance	06
6.	Present scenario of Indian industry and entrepreneurs, government policies promoting entrepreneurship, institutions in aid of entrepreneurs, finance for entrepreneurs, sources and types of finance, small scale industries related to civil engineering, steps for starting a small scale industry, safety rules & regulations for construction industries, selection of type of own organization, ownership types: sole proprietorship, partnership, private company, public limited company	05

7.	Project accounting: generally accepted accounting principles, book keeping, double entry system and ledger, preparation of income statement and balance sheet	04
8.	Management: concept of management, objectives, basic functions of management, emergence of management thought, brief description of contributions by Fredrick Taylor, Henry Fayol, Elton Mayo and Gilbreth, Principles of organization, forms of organization: line, line & staff, functional and matrix	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 will be proportional to the number of respective lecture hours as mentioned in the syllabus.

Recommended Books:

1. Projects: Preparation, Appraisal, Budgeting & Implementation: Prasanna Chandra, Tata Mc Graw Hill
2. Dynamics of Entrepreneurial Development & Management: Vasant Desai, Himalaya Publishing House
3. Management: Koontz, O'Donell & Weirich, McGraw Hill
4. Entrepreneurship: R. Hisrich & M. P. Peters, Tata Mc Graw Hill
5. Entrepreneurship Development, Colombo plan Staff College for Technical Education, Tata Mc Graw Hill
6. Finance Sense: Prasanna Chandra, Tata Mc Graw Hill

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

Detailed Syllabus

Module	Topics	No. of Lectures
01	Highway Planing - i Classification of roads, brief history of road developments in India, present status of roads in India - ii Highway alignment, basic requirement of ideal alignment, factors governing highway alignment - iii Highway location survey, map study, reconnaissance, topographic surveys, highway alignment in hilly area, drawing and report preparation	03
02	Geometric design of highway - i Terrain classification, vehicular characteristics, highway cross section elements, salient dimensions, clearances, width of carriage way, shoulders, medians, width of road way, right of way, camber and its profile. - ii Design speed, sight distance, perception time, break reaction time, analysis of safe sight distance, analysis of overtaking sight distance, intersection sight distance - iii Horizontal curves: design of superelevation and its provisions, minimum radius of horizontal curves, widening of pavement, transition curves. - iv Gradients: different types, maximum, minimum, ruling and exceptional, grade compensation in curves, vertical curves: design factors, comfort and sight distance. Summit curve, valley curve. - v Introduction of geometric design software.	10
03	Pavement materials: - i Subgrade materials: desirable properties, modulus of elasticity, modulus of subgrade reaction, classification of subgrade soils, importance of CBR. - ii Subbase material: desirable properties, different tests on aggregate, requirement of aggregate for different types of pavements. - iii Bituminous materials: types of bituminous material, test on bituminous material, desirable properties, grade of bitumen	04
04	Pavement Design: i Types of pavements, different method of pavement design, comparison of flexible and rigid pavements, design wheel load, equivalent single wheel load, equivalent wheel load factor.	08

	- ii Flexible pavement design: GI method, IRC approach, Burmister's layers theory, introduction to AASHTO method. - iii Stress in Rigid Pavements, critical load position, stress due to load, stress due to temperature variation, combine loading and temperature stress. - iv Introduction to pavement design software, relationship between number of cumulative axle, strain value and elastic modulus of materials.	
05	Highway construction i. Modern equipment for road construction, construction of different types of roads: water bound macadam (WBM) road, different types of bituminous pavements, cement concrete pavement. ii. Constructions of stabilized roads: different method of soil stabilization, use of geo-textile and geogrid in highway subgrade.	05
06	Highway Maintenance and Rehabilitation i. Pavement failure: flexible pavement failure, rigid pavement failure, maintenance of different types of pavements. ii. Evaluation of pavements: structural evaluation of pavements, functional evaluation of pavement, iii. Strengthening of existing pavement: objective of strengthening, types of overlay, different types of overlay, design of overlay using Benkeleman beam method	05
07	Traffic Engineering and Control i. Traffic study and surveys: speed studies, presentation of data, journey time and delay studies, use of various methods, merits and demerits ii. Vehicular volume count: types, various available methods, planning of traffic count. iii. O- D survey, need and uses, various available methods iv. Parking survey, need and types, traffic sign and marking, signals, miscellaneous traffic control aids, traffic regulations, traffic signals. v. Intersection types: at grade and grade separation, factors influencing design. vi. Introduction to traffic design related softwares.	08
08	Highway drainage, necessity, surface drainage, subsurface drainage.	02
09	Bridge Engineering i. Bridge engineering: importance, investigations, site selection, collection of data, determination of flood discharge, waterway, afflux, economic span, scour depth ii. Pier, abutment, Bearing	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.

List of practicals:- (At least seven to be performed)

1. Impact test on aggregates
2. Abrasion test on aggregates
3. Crushing test on aggregates
4. Shape test on aggregates
5. Penetration test on bitumen
6. Ductility test on bitumen
7. Softening point test on bitumen
8. Viscosity test on bitumen

Term Work:

Each student has to appear for at least one written test during the term. A report on traffic volume and speed studies, report of experiments performed and at least 10 assignments (including numerical problems and layout sketches) and graded answer paper for the term test shall be submitted as term work.

The distribution of term work marks will be as follows:

Reports of experiments performed and assignments	:	15 marks
Written test (at least one)	:	10 marks
Attendance (Practical and theory)	:	06 marks

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

Recommended Books:

1. A Course of Railway Engineering: Saxena S. C. and Arora S. P., Dhanpat Rai and Sons, New Delhi.
2. Airport Planning and Design: Khanna & Arora, Nemchand Bros, Roorkee
3. Indian Railway Track: Agarwal M. M., Suchdeva press N.D.
4. Docks and Harbour Engineering: Bindra S. P., Dhanpat Rai and Sons
5. Harbour, Dock and Tunnel Engineering: R Shrinivas, Charotar Publishing House
6. A text book on Highway Engineering and Airports: Sehgal S. E., Bhanot K. L., S. Chand & Co.
7. Planning and Design of Airport: Horonjeff and Mckelrey, Tata McGraw Hill.
8. Design & Construction of Ports and Marine Structures: Quinn A D, Tata McGraw Hill
9. Airport Engineering: Rao G. V., Tata McGraw Hill

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

Detailed Syllabus

Module	Topics	No. of Lectures
1.	Water - Man's environment: importance of environmental sanitation. - Water supply system: need for planned water supply schemes, components of water supply system and determination of their design capacities. - Sources of water: ground water and surface water, methods of exploitation. - Quality of water: wholesomeness and palatability, physical, chemical and bacteriological standards. - Treatment of water: impurities in water, processes for their removal, typical flow-sheets - Sedimentation: discrete particles - hydraulic settling values, Stoke' and Newton's laws(statement and significance of the various terms), ideal settling basin - factors affecting efficiency, types of settling tanks, design values of various parameters. Tube settlers, coagulation – flocculation – mechanism, common coagulants, rapid mixing and flocculating devices. G and Gt. Values, jar test, coagulant aids. - Filtration: classification of filters, slow and rapid sand filters. Sand, gravel, under-drainage system, mode of action, cleaning, limitations, operational difficulties; performance, basic design considerations. pressure filters: construction and operation, multimedia filters: general description. - Water softening: lime soda and base exchange methods, principle reactions; design considerations, sludge disposal. - Disinfection: chlorination, chlorine demand, free and combined chlorine, break point chlorination, super chlorination, prechlorination, chlorine residual, use of iodine and ozone as disinfectants. - Miscellaneous treatment methods: removal of iron and manganese, taste, odour and colour removal, principles and methods - Transmission and distribution of water: types and materials of conduits, gravitational and pumping systems of conveyance, factors involved in distribution systems, service reservoirs, fire storage and demand.	28

2.	Sewage - Conveyance of sewage: sewers, shapes and materials of sewers, sanitary, storm and combined sewers, capacities and design, appurtenance. - Sewage pumping, consideration in the selection of pumps and location of pumping stations. - Characteristics of sewage: composition, chemistry and biology of sanitary sewage, B.O.D., C.O.D., aerobic and anaerobic decomposition. - Sewage disposal: discharge of sewage into natural water courses, self purification of streams, oxygen economy, limits of dilution, sewage farming. - Sewage treatment: aims, typical flow sheets for primary and secondary treatment, design considerations and design values, disposal of screenings and grit. - Biological treatment method: principles, recirculation, trickling filters, activated sludge process – process and hydraulic design, sludge volume index, sludge bulking, principles of operation of oxidation ponds, and aerated lagoons, septic tanks and Imhoff tanks- principles and operation, design values. - Sludge digestion: principles of anaerobic digestion, quantity and characteristics of sludge, sludge digestion tanks and their design, disposal of digested sludge, design of sludge drying beds. - Tertiary treatment method – general description.	20
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Theory Examination:-

- Question paper will consist of total seven questions carrying 20 marks each.
- Only five questions need to be attempted.
- Question number 1 will be compulsory and based on maximum part of the syllabus.
- Remaining questions will be mixed in nature.
- 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 10 to be performed)

- Alkalinity
- Hardness
- pH
- Turbidity
- Jar test
- Residual chlorine
- Chlorides
- Solids: suspended solids, dissolved solids, total solids
- Dissolved oxygen
- Chemical oxygen demand (COD)
- Biochemical oxygen demand (BOD)
- Sludge volume index (SVI)

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 for the term shall be submitted as term work. A brief report on the visit to water treatment plant should also be included in the journal work.

The distribution of term work marks will be as follows:

Reports of experiments performed, assignments and site visit report	:	15 marks
Written test (at least one)	:	10 marks
Attendance (Practical and theory)	:	10 marks

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

Recommended Books:-

1. Water Supply & Sanitary Engineering: Birdie G. S., Dhanpat Rai & Sons.
2. Environmental Pollution Control Engineering: Rao C. S., Wiley Eastern
3. Environmental Engineering Vol. I & II: Punmia B. C., Arihant Publications.
4. Manual for Water Supply & Treatment: CPHEEO, New Delhi.
5. Manual for Sewerage & Sewage Treatment: CPHEEO, New Delhi.
6. Water & Wastewater Engineering: Fair G M, Geyer J C & Okun D A, John Wiley.
7. Water Supply & Pollution Control, Cark J W, Viessman W & Hammer M, Harper & Row.

Class:- T E (Construction)		Semester VI	
Subject:- Quality Management in Construction			
Periods/week – each Period of 60 minutes duration	Lecture	04	
	Practical	-	
	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.	Basic concepts and definition: quality, quality engineering, quality control, quality assurance, total quality management.	08
2.	Elements of quality: i. Quality characteristics: tangible and intangible parameters of quality. ii. Quality of design: role of various agencies involved and codes and specifications. iii. Quality of conformance and quality of performance.	08
3.	Economics of quality: cost of quality, cost of conformance, cost of non-conformance and cost of lost opportunities.	08
4.	Organisation for quality: identifying tasks, responsibilities and procedures, quality systems, typical organization structures, preparation of manuals, flow charts and checklists, role of inspection, stages in quality inspection.	08
5.	Statistical quality control. i. Review of basic concepts of statistics: measures of central tendency, measures of dispersion, frequency curves, frequency distributions. ii. Sampling: methods of sampling, sample size, acceptance sampling. iii. Controls charts: construction, interpolation and inferencing.	08
6.	Miscellaneous concepts and tools of quality management: kaizen concepts, quality circles, Fishbone diagram(Ishikawa diagram), Pareto diagram.	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. Reports of at least six assignments based on the above syllabus and graded answer paper shall be submitted as term work.

The distribution of term work marks will be as follows:

Reports of assignments	:	15 marks
Written test (at least one)	:	10 marks
Attendance (Theory and Tutorial)	:	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. The Essence of Total Quality Management: John Bank, Prentice Hall of India, 1995.
2. Inspection and Quality Control in Building Works: A C Panchandhari, Mandakini Publishers
3. Quality Assurance in Construction: Dunkan, Thorpe & Summer, Grower.

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