

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: Civil Engineering
SUBJECT NAME: Design of Reinforced Concrete Structures
SUBJECT CODE: 2170607
B.E. 7th SEMESTER

Type of course: Applied Mechanics

Prerequisite: Mechanics of Solids, Structural analysis I & II, Concrete technology, Elementary Structural Design

Rationale: Majority of civil engineering structures are normally made up of Reinforced Cement Concrete. Knowledge of designing and detailing of reinforced concrete structures is very important for civil engineers in order to make structures safe and serviceable during its life span. Limit State design philosophy is currently used worldwide for design of RC structures. Proper detailing of reinforcement in structural drawing is necessary in order to get the correct behavior of structures and leads to smooth construction of RC structures. This course will provide detailed knowledge of design and reinforcement detailing as per related Indian standards.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
PA	ALA	ESE	OEP							
04	02	00	06	70	30	00	30	00	20	150

ESE-End Semester Exam, PA-Progressive Assessment, E-External, M-Mid semester, V-Viva (External) , I-Internal, ALA-Active Learning Assignment, OEP-Open Ended Problem

Note: IS:456(2000), SP(16), IS:1893, IS:875, IS 3370, IS1343, IS:13920 are permitted in the examination.

Content:

Sr. No.	Content	Total Hrs.	% Weightage
1	Building Layout and Design: Loads as per I.S., distribution & flow of loads, lateral load due to wind and seismic as per latest IS standards, load combinations, guide lines for preparation of structural layout for building. Analysis, design & detailing of G + 3 RC framed building for residential /commercial purpose including ductile detailing.	16	30
2	Design of Retaining wall: Types, behavior and application of retaining wall, stability criteria, design & detailing of cantilever & counterfort type retaining wall for various ground conditions.	10	20
3	Design of Water Tank: Classification of water tank and method of analysis, permissible stresses, codal provisions, Design of circular and rectangular under-ground water tanks using IS code method, Design of elevated water tank with Intze type of container, frame and shaft type of staging and foundation considering effect of earthquake and wind forces.	12	25

4	Design of Flat Slab: Direct design method – Distribution of moments in column strips and middle strip-moment and shear transfer from slabs to columns – Shear in Flat slabs- Check for one way and two way shears, Limitations of Direct design method, Introduction to Equivalent frame method.	08	10
5	Earthquake Resistant Design of building: Earthquake resistant design philosophy, capacity design concept, four virtues of Earthquake Resistant design: strength, stiffness, ductility and configuration, Irregularities in structures, Lateral load distribution – Torsionally coupled & uncoupled system, Seismic coefficient Method, Ductile detailing as per IS:13920.	10	15

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
05	10	30	30	20	5

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. S. R. Karve and V. L. Shah, Illustrated Design of Reinforced Concrete Buildings, Structures Publishers.
2. N. Krishna Raju, Advanced Reinforced Concrete Design, CBS Publishers.
3. S. Unnikrishna Pillai and Devdas Menon, Reinforced Concrete Design, Tata McGraw Hill.
4. H. J. Shah, Reinforced Concrete, Vol. I and II, Charotar Publishing.
5. Punmia B.C "Advanced RCC Design" Laxmi Publications Pvt. Ltd". 2006.
6. Varghese A. V., Advanced Reinforced Concrete, Varghese, Prentice Hall of India.
7. Sinha S. N., Reinforced Concrete Design, Tata Mc-Graw Hill, Delhi.
8. IS Codes (latest) : IS:456, IS:875 (all parts), IS:1893(P-1,2), IS:4326, IS:13920, IS: 3370 (P-1 to 4), SP:16, SP:34.

Course Outcome:

After learning the course, the students should be able to:

1. Assess loads, prepare layout, analyse, design and detail of various structural elements for RC framed structure up to G+3.
2. Identify the typical failure modes of RC building, retaining walls, water tanks, flat slabs & prestressed concrete sections.
3. Apply the principles, procedures and current Indian code requirements to the analysis and design.
4. Design & detail RC structures like Retaining Wall, Water Tank and Flat slab.
5. Apply the concept of earthquake resistant design in the building.

Term-Work:

The students will have to solve at least full design of (1) design of G+3 building (design manually & check with software) (2) Retaining wall/water tank and at least five examples from remaining topics of the syllabus. The students have to draw detailing of full design problems A2 size drawing sheet and sketches of various structural components with proper detailing in sketch book/A3 size sheet from remaining topics of the syllabus.

Practical examinations shall consist of oral based on term work and above course.

Design based problem/ Open ended problem may also considered as a part of Term-work.

List of Experiments: - NIL –**Design based Problems (DP)/Open Ended Problem:**

A group of students has to undertake one open ended problem/design problem. Few examples of the same are given below:

1. Development of spread sheets for design of various structural elements like beam, column, slab, foundation etc.
2. Design of any one RCC structure from the course using any open-source / professional software and/or self-developed spread sheet/programs.
3. Site visit related to construction stages and report preparation
4. Failure study : during and/or after construction, due to earthquake etc.

Major Equipment: - NIL -**List of Open Source Software/learning website:**

1. <http://nptel.ac.in>
2. elearning.vtu.ac.in
3. www.gsdma.org
4. www.nicee.org

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: CIVIL ENGINEERING

SUBJECT NAME: IRRIGATION ENGINEERING

SUBJECT CODE: 2170609

B.E. 7th SEMESTER

Type of course: Civil Engineering

Prerequisite: Knowledge of Fluid Mechanics, Hydrology and Water Resources Engineering

Rationale:

To develop understanding about water requirement of crops, irrigation methods, and irrigation engineering works like weir/barrage, storage and outlet works, distribution works, regulating and cross drainage works and importance of drainage in irrigated areas.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks	
L	T	P	C	Theory Marks			Practical Marks		
				ESE (E)	PA (M)		ESE (Viva)		PA (I)
					PA	ALA			
3	2	0	5	70	20	10	30	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	<p>Module I</p> <p>Introduction- Definition, Necessity, Scope, Benefits and ill effects of irrigation, Types of irrigation schemes, Social and environmental considerations, Irrigation development in India.</p> <p>Water Requirement of Crops- Soil-water-plant relation- field capacity, wilting point, available water, consumptive use, Irrigation requirements – Net irrigation requirement, Field irrigation requirement, Gross Irrigation requirement, Soil moisture extraction pattern, Frequency of irrigation, Principal Indian crops, Gross command area, Culturable command area, Intensity of irrigation, Duty and delta relation, Introduction to various methods of application of irrigation water, Irrigation efficiency, assessment of irrigation water</p>	10	25
2	<p>Module 2</p> <p>Diversion Works: Different stages of a river and their flow characteristics, Weir and barrages, Various parts of a weir and their functions, Exit gradient, Principles of weir design on permeable formations -Bligh's creep theory and Khosla's theory</p>	12	25

	Storage and Outlet works: Types of earthen dams, Seepage in earth dams, Gravity dams, Forces acting on a gravity dam, Rock-fill dams, Spillways, Types of spillways, Spillways gates and energy dissipation works.		
3	Module 3 Distribution works: Modes of conveying irrigation water- Types of irrigation canals- contour canal, ridge canal, side sloping canals, Canal sections-filling, cutting, partial cutting and partial filling, Balanced depth, Canal FSL, Capacity factor and Time factor, L-section, Losses of canal water, Silting and scouring of canals, Method of design of unlined section of irrigation canal, Silt theories, Lined canals, Design of lined canal, Link canals	11	20
4	Module 4 Regulating and Cross Drainage Works: Canal falls, Cross drainage works, Types of cross drainage works, Canal escapes, Head regulator and Cross regulator, Silt ejector, Flow meters - Parshall flume, Irrigation outlets and types of outlets.	8	20
5	Module 5 Water logging-causes, Reclamation, Drainage principles and practice	4	10

Note: Term work shall be based on above mentioned syllabus.

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
15	20	20	20	15	10

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Irrigation & Water Power Engineering - Dr. B.C.Punmia & B.B.Pande, Laxmi Publications, (P) Ltd, New Delhi
2. Irrigation, Water Resources & Water Power Engineering - Dr. P.N.Modi, Standard Book House, Delhi
3. Irrigation, Water Power & Water Resources Engineering - Dr. K.R.Arora Standard Publishers Distributors, Delhi
4. Irrigation Engineering and Hydraulic Structures - S.K.Garg, Khanna Publishers, Delhi
5. Irrigation Engineering, S.K. Mazumder, Galgotia Publications Pvt Ltd., New Delhi

Course Outcome:

After learning the course the students should be able to:

1. Understand the irrigation methods and duty-delta relation for crops
2. Calculate Net Irrigation Requirement (NIR), Field Irrigation Requirement (FIR) and Gross Irrigation Requirement (GIR)
3. Calculate the pressure at key points of sheet piles and floor thickness for a weir/barrage using Khosla's theory
4. Plot seepage line of earthen dam with corrections at entry and exit
5. Calculate forces on gravity dam.
6. Understand function of spillway and energy dissipation
7. Design unlined canal using silt theories
8. Design a lined irrigation canal
9. Understand functions of regulating and cross drainage works
10. Understand drainage principles

List of Open Source learning website:

www.nptel.ac.in

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should be submitted to GTU.

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: CIVIL ENGINEERING
SUBJECT NAME: PROFESSIONAL PRACTICE AND VALUATION
SUBJECT CODE: 2170610
B.E. 7th SEMESTER

Type of course: Core Subject

Prerequisite: Civil Engineering Drawing, Construction and Construction Equipments

Rationale: A Civil Engineer is supposed to find out

- 1) Estimated cost of a proposed structure.
- 2) The value of the existing structure.
- 3) Rates of items of civil engineering works.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	2	0	5	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Computation of areas and volumes for following objects; (i) Cylinder- Area of curved surface and volume (ii) Cone- Volume and area of curved surface (iii) Frustum of cone- Volume and curved surface area (iv) Frustum of pyramid- Volume and surface area of all sides. (v) Area of sector and segment of a circle (vi) Area and volume of sphere and segment of sphere (vii) Ellipse- Area of ellipse and Units of measurements	04	10
2	Estimates- Definition, Units of measurements, types of estimates, Different methods to find the quantities of civil works. Estimated cost And its importance. Provisions of IS-1200, for working out quantities and deductions in civil works. Entering the measurements in quantity	10	25

	sheet and calculation of quantities of various items of civil works for residential , commercial and industrial buildings, Market rates of material and labour, Introduction to schedule of rates, Entering quantities and rates in abstract sheet, calculation of estimated cost.		
3	Specifications- Definition, importance of specification , Types of specification, Care to be taken while drafting specifications, Drafting general specifications, and detailed specifications for various civil work items.	04	10
4	Rate Analysis- Definition of rate analysis, Definition of task, Determination of man power and material requirement for a given quantity of items of civil works, study of present wages of labour and prices of material in the market. Study of market rents of different construction equipments, Determination of rate of item of civil work. Working out rates of various items of civil works like 10m ² plaster, 10m ³ 1:2:4 plain and reinforced concrete, 10m ³ brick work etc.	06	15
5	Contract- Definition, legal requirements of a valid contract ,types of contracts, conditions of contract, sub contracts and contractual disputes, Arbitration.	04	10
6	Tender and Tender notice- Bidding process, Prequalification process, tender notice and its essential features, drafting tender notice, Bid submission, Analysis of tenders, Basis for evaluation and acceptance, letter of intent, work order, agreement.	04	10
7	Valuation-Definitions of value, price and cost, depreciation, sinking fund , different type of values and their significance, factor affecting value, rent and standard rent, Years purchase , valuation tables, Easement, types of easements, significance of easement in valuation, Methods of valuation of buildings and land, Estimation of values of different types of buildings and lands.	10	20

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
30	20	20	10	10	-

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

- (1) B. N. Dutta, Estimation and Costing In Civil Engineering, Ubs Publishers Distributors, Ltd.
- (2) S. C. Rangwala, Estimating and Costing, Charotar Publishing House.
- (3) G. S. Birdi, Textbook of Estimating & Costing, Dhanpat Rai and Sons, Delhi.
- (4) M. Chakraborti, Estimating, Costing, Specification and Valuation.
- (5) P.W.D. Handbook and SOR, IS Code – 1200.
- (6) A. S. Kotadia, Professional Practice and Valuation, Mahajan Publications.
- (7) S. C. Rangwala, Valuation of Real Properties, Charotar Publication.

Course Outcome:

After learning the course the students should be able to:

- (1) Work out (i) the estimated cost of any proposed civil engineering structure and
(ii) The value of any old structure
- (2) Apply the software for working out quantities of items of civil works.

List of Experiments:

- (1) Work out quantities of various items of civil works from working drawings of residential, industrial and commercial buildings.
- (2) Work out quantities of various items of civil works from drawings of culverts, L/s and C/s of Highways, etc.
- (3) To work out rates of items of civil works
- (4) Examples on valuation of land and buildings.
- (5) Drafting specifications for various items of civil works.
- (6) Use of Software Revit , BIM, etc.

Design based Problems (DP)/Open Ended Problem:

- (1) Students may carry out valuation of existing buildings with premises that are put for sale by the owner.
- (2) Students can take up the case of a proposed residential society project from the builder and work out estimated cost of the project.
- (3) Students can visit the construction site for hydraulic, transportation, environment structure and acquire enough data to find out the estimated cost.
- (4) Same project be evaluated for estimated cost or valuation as the case may be by two groups of students and there may be a debate on points where there are major differences and correcting the same as per teacher's guidance.
- (5) Student shall verify the quantities worked out manually with the help of software, for a given drawing of Construction Project.

Major Equipment:

- (1) Computer system supporting the softwares like Revit, Primavera, BIM, MS Project, etc.

List of Open Source Software/learning website: *nptel.ac.in/*

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: CIVIL ENGINEERING

SUBJECT NAME: APPLICATION OF GEOINFORMATICS IN CIVIL ENGINEERING

SUBJECT CODE: 2170606

B.E. 7th SEMESTER

Type of course: Remote Sensing and Geographical Information System

Prerequisite: Basic knowledge of surveying, computer and its peripherals, Fundamentals of Photogrammetry, Remote Sensing, GPS and GIS.

- Rationale:**
- (1) To develop understanding about Photogrammetry, remote sensing system, Global Navigation Satellite System (GNSS) and GIS.
 - (2) To enable students to make measurements using photogrammetric technique, to carryout analysis of remotely sensed data and extract information from it.
 - (3) To enable students conversant with data collection using GNSS systems and Differential GPS.
 - (4) To enable students prepare thematic maps and carryout analysis using GIS technique.
 - (5) To enable students learn different applications of Photogrammetry, remote sensing system, Global Navigation Satellite System (GNSS) and GIS.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	1	0	4	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightag
1	INTRODUCTION: Introduction to geo-informatics. Conventional methods of mapping. Advanced methods of mapping. Comparison of methods.	6	10
2	AERIAL PHHOTOGRAMMETRY: Development and classification of Photogrammetry, Aerial Photogrammetric processes: acquisition of data, classification of photographs, photographic scale, relief displacement, flight planning, stereo Photogrammetry, Stereo model compilation, principal and use of stereoscopic 3D view and parallax bar, Ortho-rectification, Orientation and triangulation, DEM Generation.	8	15

3	REMOTE SENSING: Introduction to Electromagnetic Spectrum (EMR), interaction of EMR with atmosphere and target, Resolutions: Spatial, temporal, spectral and radiometric, sensor characteristics, satellite data products, digital imaging, digital image processing, visual image interpretation, digital image interpretation. microwave remote sensing.	11	20
4	GNSS and SCANNERS: Global Navigation Satellite System (GNSS) basic concepts, GPS (NAVSTAR), Galileo, GLONASS and Indian Regional Navigation Satellite System (IRNSS). Functional segments of GPS and components. Working principle, factors affecting, GPS setup and accessories, satellites & receivers, Differential GPS (DGPS), Applications of GNSS. Scanners: Introduction, Classification, Principle and Application.	9	20
5	GIS: Structure of GIS: Cartography, Geographic mapping process, GIS data models, database management systems, Raster data representation, Vector data representation, transformations, map projections, Geographic Data Representation, Storage, Quality and Standards, Assessment of data quality, Managing data errors, Geographic data standards. GIS Data Processing, Analysis and Modeling: Raster based GIS data processing – Vector based GIS data processing – Queries – Spatial analysis – Descriptive statistics – Spatial autocorrelation–Quadrant counts, and nearest neighbor analysis – Network analysis – Surface modeling – DEM.	11	20
6	APPLICATION of GEOINFORMATICS: Case studies of applications of geo-informatics to following areas: a. Environment. b. Water Resources. c. Transportation. d. Town Planning. e. Geology. f. Disaster Management. g. Mapping.	8	15
	TOTAL	53	100

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	20	20	20	15	15

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. B. Bhatta, Remote Sensing and GIS, 2nd Edition, Oxford University Press, New Delhi
2. J.R. Jensen, Introductory Digital Image Processing, Prentice-Hall, New Jersey
3. J.R. Jensen, Remote Sensing of Environment: An Earth Perspective, Pearson Education, Delhi, 2004
4. P.A. Burrough and R.A. McDonnell, Principles of Geographical Information Systems, 2nd ed. Oxford, England, Oxford University Press.
5. T.M. Lillesand, R.W. Kiefer and J.W. Chipman, Remote Sensing and Image Interpretation, 5th edition, John Wiley and Sons, India
6. George Joseph, Fundamentals of Remote Sensing, Universities Press, India, 2005

Course Outcome:

After learning the course the students should be able to:

1. Ability to develop Orthographic and Contour maps using aerial photographs and Remote sensing Images
2. Ability to develop maps using Total Station, GIS, GPS and Scanners
3. Ability to create GIS application referencing Spatial features with Attribute data

List of Experiments/Tutorials:

1. Photo interpretation and Photogrammetry
2. Image Registration and Georeferencing
3. Image Interpretation
4. Image classification
5. Application of GIS and GPS
6. Creation of thematic maps
7. Overlay analysis
8. Digital Elevation Modeling
9. Geospatial analysis and Map based Queries

Design based Problems (DP)/Open Ended Problem:

Faculty may give any open ended problem related to image interpretation and analysis, GPS use, digitization, overlay analysis, map based query and spatial analysis.

List of Open Source Software/learning website:

<https://www.itc.nl>;
<http://52north.org/ilwis>
<http://nptel.ac.in/courses/105108077/24>
<http://nptel.ac.in/courses/105102015/>

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: CIVIL ENGINEERING (06)

SUBJECT NAME: Infrastructure Engineering and Management

SUBJECT CODE: 2170611

B.E. 7th Semester

Type of course: Departmental Elective Subject in Civil Engineering

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE	PA(M)		PA(V)		PA	
					PA	ALA	ESE	OEP	(I)	
3	1	0	4	70	20	10	20	10	20	150

Topics:

Module No.	Topics	Teaching Hrs.	Module Weightage
1	Infrastructure: Definitions of infrastructure, Governing Features, Historical overview of Infrastructure development in India, Infrastructure Organizations & Systems, Challenges of managing Infrastructures.	04	10
2	Infrastructure Planning: Typical infrastructure planning steps, Planning and appraisal of major infrastructure projects, Screening of project ideas, Life cycle analysis, Multi-criteria analysis for comparison of infrastructure alternatives, Procurement strategies, Scheduling and management of planning activities, Infrastructure Project Budgeting and Funding, Regulatory Framework, Sources of Funding, Maintenance, Rehabilitation and Reconstruction strategies.	04	10

3	Project Management in Construction: Introduction to project management processes - Initiating, Planning, Executing, Controlling, and Closing processes; Project Integration Management - Project plan development, Project plan execution, and Overall change control; Project Scope Management - Initiation, Scope planning, Scope definition, Scope verification, and Scope change control.	30	70
4	Contracts and Management of Contracts: Engineering contracts and its formulation, Definition and essentials of a contract, Indian Contract Act 1872, types of contracts and clauses for contracts, Preparation of tender documents, Issues related to tendering process, Awarding contract.	04	10

Reference Books:

- A. S. Goodman and M. Hastak, Infrastructure planning handbook: Planning, engineering, and economics, McGraw-Hill, New York, 2006.
- J. Parkin and D. Sharma, Infrastructure planning, Thomas Telford, London, 1999.
- P. Chandra, Projects: Planning, analysis, selection, financing, implementation, and review, Tata McGraw-Hill, New Delhi, 2009.
- J. D. Finnerty, Project financing - Asset-based financial engineering, John Wiley & Sons, New York, 1996.
- L. Squire and H. G. van der Tak, Economic analysis of projects, John Hopkins University Press, London, 1975.
- T. Hegazy, Computer-based construction project management, Prentice Hall, New Jersey, 2002.
- S. M. Levy, Project management in construction, 5th ed., McGraw Hill, New York, 2007.
- PMI, A guide to the project management body of knowledge, 3rd ed., Project Management Institute, Pennsylvania, 1996.
- M. Mawdesley, W. Askew and M. O'Reilly, Planning and controlling construction projects, Addison Wesley Longman Limited, Essex, 1997.
- J. Kelly, S. Male and D. Graham, Value management of construction projects, Blackwell Publishing, Oxford, 2003.
- Vasant Desai, "Project Management", Himalaya Publishing, 1st Edition, 2010
- James C. Van Horne, John M. Wachowicz, "Fundamentals of Financial Management", PHI, 2nd Edition, 2000
- Ronald W Hudson, "Infrastructure Management: integrating design, Construction, maintenance, rehabilitation and renovation", MGH, 1st Edition, 1997
- "Codes of Practice and Standard Specifications" of AP PWD, CPWD, MES etc.
- B.J. Vasavada, "Engineering Contracts and Arbitration", Jubilee Publications, 2nd Edition., 1996
- Grig N. S., "Infrastructure Engineering and Management", Wiley-Interseience, 1988

Course Outcomes:

- After studying this subject students will be able to:
- Understand infrastructure organizations
- Prepare infrastructure master plan
- Schedule infrastructure project activities
- Prepare project development plan
- Prepare tender documents for infrastructure project contract

Term-Work:

- The students will have to prepare at least one infrastructure plan (individually) and should have to prepare project development plan and tender document for the same infrastructure plan. Students are requested to learn available project management tool.

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: Civil Engineering
SUBJECT NAME: Earthquake Engineering
SUBJECT CODE: 2170612
B.E. 7th SEMESTER

Type of course: Applied Mechanics

Prerequisite: Mechanics of Solids, Structural Analysis I & II, Design of Reinforced Concrete Structure.

Rationale: This subject is conceptual applications of principles of dynamics and earthquake resistant design & detailing of RC structures. Some special topics like Earthquake resistant masonry structures, liquefaction, structural controls and seismic strengthening are included aiming students know that these are challenges in this subject. This subject is useful to understand the behavior of the structure subjected to earthquake forces and earthquake resistant design of the structure.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
L	T	P	C	Theory Marks			Practical Marks			
				ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
3	0	1	4	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Earthquake Basics: Interior of Earth, plate tectonics, faults, consequences of earthquake, Basic parameters of earthquake, magnitude & intensity, scales, Seismic zones of India, damages caused during past earthquakes (worldwide).	3	10
2	Fundamentals of Earthquake Vibrations of buildings Static load v/s Dynamic load (force control and displacement control), simplified single degree of freedom system, mathematical modelling of buildings, natural frequency, resonance v/s increased response, responses of buildings to different types of vibrations like free and forced, damped and un-damped vibration, response of building to earthquake ground motion, Response to multi degree (maximum three) of freedom systems up to mode shapes.	11	25
3	Design Philosophy: Philosophy of earthquake resistant design, earthquake proof v/s earthquake resistant design, four virtues of earthquake resistant	11	25

	structures (strength, stiffness, ductility and configuration), seismic structural configuration, Introduction to IS: 1893 (Part I), IS: 875 (Part V). Seismic load: Seismic Coefficient Method – base shear and its distribution along height. Introduction to Response spectrum, IS code provisions.		
4	Lateral Loads on Buildings: Lateral Load Distribution (SDOF): Rigid diaphragm effect, centers of mass and stiffness, torsionally coupled and uncoupled system. Lateral Load Analysis: Analysis of frames using approximate methods like portal & cantilever methods	6	15
5	Ductile Detailing: Concepts of Detailing of various structural components as per IS: 13920 provisions.	5	10
6	Special topics: Introduction to Earthquake Resistant Features of un-reinforced & reinforced masonry Structure, Confined Masonry, Soil liquefaction, Structural controls, Seismic strengthening.	6	15

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	30	20	20	5	5

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Manish Shrikhande & Pankaj Agrawal; Earthquake resistant design of structures, PHI Publication, New Delhi
2. S.K.Duggal; Earthquake resistance design of structures; Oxford University Press, New Delhi.
3. A.K.Chopra; Dynamics of structures , Pearson, New Delhi
4. Clough & Penzin; Dynamics of structures
5. Park & Pauly; Behaviour of RC structure
6. John M.Biggs; Introduction to Structural Dynamics
7. C V R Murthy - Earthquake Tips, NICEE
8. IITK-GSDMA EQ26 – V -3.0 Design Example of a Six Storey Building
9. S S Rao; Mechanical Vibration; Pearson, New Delhi.

10. IS Codes:

- Criteria for earthquake resistant design General provision & Building - IS: 1893 (Part I)- 2002
- Code of Practice for Ductile Detailing of RC Structures - IS: 13920 (1993).
- Code of Practice for earthquake resistant design & Construction of buildings – IS 4326 (1993).
- Improving Earthquake Resistance of Earthen Buildings - IS 13827(1993)
- Guide lines for Improving Earthquake Resistance low strength masonry buildings - IS 13828 (1993)

Course Outcome:

After learning the course the students should be able to:

1. Determine the response of SDOF & MDOF structural system subjected to vibration including earthquake.
2. Apply the concept of Earthquake Resistant Design & concept of lateral load distribution on buildings.
3. Determine the lateral forces generated in the structure due to earthquake.
4. Apply the concept of ductile detailing in RC structures.

Term Work:

Term work shall consist of laboratory works and following:

1. At least 25 problems based on the syllabus of Earthquake Engineering which are uniformly distributed & graded from each of the topic
2. Seminar/project assigned by the faculty member.

Design based Problems (DP)/Open Ended Problem: (This may be considered as a part of term work)

1. Site visit of real life structures to understand the irregularities. (Take Photographs)
2. Site visit of construction site to understand ductile detailing. (Take Photographs)
3. Model preparation to understand the behavior of structures under earthquake forces.

List of Experiments:

Following experiments should be carried out in laboratory.

1. Spring Mass model
2. Mode shapes of three storey building
3. Response of structure with & without Shear wall and bracing system
4. Response of building with re-entrant corner
5. Behaviour of structure under pounding
6. (a) Liquefaction potential of clayey & sandy soil (b) Response of structure with isolated, raft & pile foundation under liquefaction

Major Equipment:

1. Shake table to simulate earthquake
2. Models required to perform above experiments

List of Open Source Software/learning website:

1. www.nicee.org
2. www.eeri.org
3. www.gsdma.org
4. www.ndma.gov.in
5. www.nptel.iitm.ac.in/courses/
6. www.nisee.berkeley.edu/elibrary/getpkg?id=NONLIN

ACTIVE LEARNING ASSIGNMENTS:

Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.

1. Presentation on study of past Indian & International Earthquakes one each
2. Presentation of any one earthquake tip & every student will participate in Quiz based on Earthquake Tips.

GUJARAT TECHNOLOGICAL UNIVERSITY

BRANCH NAME: CIVIL ENGINEERING

SUBJECT NAME: TRAFFIC ENGINEERING (DEPARTMENT ELECTIVE II)

SUBJECT CODE: 2170613

B.E. 7th SEMESTER

Type of course: Department Elective II

Prerequisite: knowledge of road transportation

Rationale: Knowledge and understanding of the basic concept of Traffic Engineering is highly essential for the engineers designing and executing the road laying projects in order to make road transport system safe and workable. Students are expected to perform various traffic surveys, analyze data and interpret the results and design of traffic control device appropriately in order to apply their knowledge in designing efficient and safe road transport systems.

Teaching and Examination Scheme:

Teaching Scheme (Hours)			Credits	Theory Marks		Tutorial/ Practical Marks		Total Marks	Branch Code
Theory	Tutorial	Practical		ESE(E)	PA (M)	Viva (V)	PA(I)		
3	1	0	4	70	30	30	20	150	6

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Traffic Characteristics: (i) Road user's characteristics - general human characteristics, physical, mental and emotional factors, factors affecting reaction time, PIEV theory. (ii) Vehicular characteristics :(static and dynamic), Characteristics affecting road design-width, height, length and other dimensions. Weight, power, speed and braking capacity of a vehicle.	8	20
2	Traffic Studies: - Traffic volume count, methods of traffic volume count, Manual, mechanical, videography, passenger car unit. Presentation of traffic volume count. Speed studies, spot speed studies speed and delay studies and its presentation .Origin and destination studies. Necessity of parking studies types of parking off street parking, on street parking, Accident studies, causes of accidents, accident records condition and collision diagram, preventive measures.	14	30
3	Traffic regulation: - traffic signs types of traffic signs ,regulatory , mandatory, warning signs route marker, lane marking, lane width	10	20

	standards as IRC . Necessity of traffic signals criteria for providing traffic signals types of traffic signals. Methods of designing traffic signals.		
4	Street Lighting: (i) Methods of light distribution. (ii) Design of street lighting system. (iii) Definitions- Luminaire, foot candle, Lumen, utilization and maintenance factors. (iv) Different types of light sources used for street lighting. (v) Fundamental factors of night vision.	10	15
5	Traffic geometrics:- basic geometric elements, cross roads, rotary intersections grade separated intersection, clover leaf, fully and partial, terminal facilities	6	15

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	30	20	10	10	10

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books :-

1. Traffic Engineering and Transport Planning by L.R. Kadiyali, Khanna Publishers, Delhi
2. Traffic Engineering by Matson, W.S.Smith & F.W. Hurd
3. G.J. Pingnataro, Principles of Traffic Engineering
4. D.R.Drew, Traffic Flow Theory
5. W.R. Mcshane and R.P. Roess "Traffic Engg"
6. Wohl & Martin, Traffic System

Course Outcome:

After learning the course the students should be able to:

- i.) Conduct different types of Traffic Surveys
- ii.) Explain the reasons of accidents and their preventive measures
- iii) Design of traffic signals at intersections and rotary intersection.
- iv) Aware of various traffic regulation and control devices.

List of Experiments: NIL

Design based Problems (DP)/Open Ended Problem:

- 1) visit to nearby road and conduct traffic volume count survey
- 2) Collect data related to the road accidents and prepare report
- 3) conduct traffic speed study at busy road.

Major Equipment: NIL

List of Open Source Software/learning website: www.nptel.ac.in

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.