

GUJARAT TECHNOLOGICAL UNIVERSITY

CIVIL ENGINEERING (06)

ADVANCED SURVEYING

SUBJECT CODE: 2140601

B.E. 4th Semester

Type of course: Civil Engineering

Prerequisite: Elementary course on surveying

Rationale: A Civil Engineer has to be conversant with all the measurement techniques to know the ground topography and he should be able to use the modern survey equipments and be able to use different software applications in surveying.

Teaching and Examination Scheme:

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

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Tacheometric Surveying : Introduction, purpose, principle, instruments, stadia constants, methods of tacheometry, anallatic lens, subtense bar, field work in tacheometry, reduction of readings, errors and precisions.	7	15
2	Geodetic Surveying- Principle and Classification of triangulation system- Selection of base line and stations- Orders of triangulation- Triangulation figures- Station marks and signals- marking signals- Extension of base, Reduction of Centre, Selection and marking of stations	7	15
3	Theory of Errors : Introduction, types of errors, definitions, laws of accidental errors, laws of weights, theory of least squares, rules for giving weights and distribution of errors to the field observations, determination of the most probable values of quantities.	7	15
4	Field Astronomy: Introduction, purposes, astronomical terms, determination of azimuth, latitude , longitude and time corrections to the observations.	6	10
5	Aerial photogrammetry : Introduction, Principle, Uses, Aerial camera, Aerial	6	10

	photographs, Definitions, Scale of vertical and tilted photograph,, Ground Co-ordinates, Displacements and errors, Ground control, Procedure of aerial survey, Photomaps and mosaics, Stereoscopes, Parallax bar.		
6	Modern Surveying Instruments: Introduction, Electromagnetic spectrum, Electromagnetic distance measurement, Total station, Digital self-leveling levels , scanners for topographical survey.	2	10
7	Remote Sensing- Introduction, Principles of energy interaction in atmosphere and earth surface features, Image interpretation techniques, visual interpretation, Digital image processing, Global Positioning system	4	15
8	Geographical Information System- Definition of GIS, Key Components of GIS, Functions of GIS, Spatialdata,spatial information system Geospatial analysis, Integration of Remote sensing and GIS,and Applications in Civil Engineering.	3	10

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
10%	40%	40%	5%	5%

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate 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. Surveying Vol. I, II and III by Dr. B.C. Punamia, Laxmi Publishers. New Delhi
2. Surveying and Levelling Vol. I and II by T.P Kanetkar and S.V Kulkarni, Pune Vidhyarthi Gruh
3. Surveying Vol. I, II and III by Dr. K.R. Arora, Standard Book House. New Delhi
4. Surveying Vol. I and II by S. K. Duggal, Tata Mcgraw Hill, New Delhi
5. Surveying and Levelling by N.N. Basak, Tata Mcgraw Hill, New Delhi
6. Surveying and Levelling by R. Agor, Khanna Publishers, New Delhi
7. Advanced Surveying by R. Agor, Khanna Publishers, New Delhi
8. Fundamentals of Surveying by Roy, S.K., Prentice Hall India, New Delhi
9. Surveying and Leveling by Subramanian, R., Oxford University Press, New Delhi
10. Remote Sensing and GIS by B Bhatia, Oxford University Press, New Delhi.
11. Remote sensing and Image interpretation by T.M Lillesand,. R.W Kiefer,. and J.W Chipman, 5th edition, John Wiley and Sons India
12. Surveying theory and practice 7th Edition by James M Anderson and Adward M Mikhail Tata McGraw Hill Publication.

Course Outcomes:

After studying this subject students will be able to:

1. Conduct tacheometry and geodetic survey.

2. Apply principles of theory of errors for correction of measurements.
3. Apply knowledge of astronomy for solving civil engineering problems.
4. Explain use of aerial camera, aerial photographs and procedure of aerial survey.
5. Utilize stereoscope and parallax bars.
6. Utilize total station and other modern survey instruments.
7. Apply GIS in solving engineering problems

Project Work:

Students shall perform the tachometry survey project at the hilly region.

Term Work:

- (1) Students will prepare contour map by manual calculation of horizontal distances and reduced levels from the field observations made at the project site, also the students shall desirably use the software for preparing three dimensional map of the ground and shall compare the contour map prepared by them with the ground view prepared by software.
- (2) Students shall complete all assignments given to them.

List of Practical:

1. Determination of multiplying and additive constants of a Tacheometer
2. Use of (i) Tacheometer, (ii) Total Station for determination of Reduced levels and Horizontal distances of various points in the field.
3. Examples on triangulations adjustments
4. Solution of examples on theory of errors
5. Interpretation of R S maps using image browser
6. Local survey using GPS
7. Use of different Softwares for surveying
8. Stereoscope and parallax bar and their applications
9. GIS Software and their application in surveying.

Design based/open ended problem

1. For depressed terrain:

Determine the water storage capacity in case of probable storage site assuming the height of barriers located at selected places

2. For Rough terrain:

Determine the optimal alignment for the site giving minimum cross drainage works and decide the proper gradient giving equal quantity of cutting and filling

3. In surveyed terrain, planning of small colony and road networks, water supply & drainage system.

Major Equipments:

1. Tacheometer
2. Total Station
3. Digital self leveling level
4. Stereoscope

List of open Source Software/learning website:

1. ocw.mit.edu
2. 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

ENGINEERING ECONOMICS AND MANAGEMENT

SUBJECT CODE: 2140003

B.E. 3rd/4th SEMESTER

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
			PA		ALA	ESE	OEP			
3	0	0	3	70	20	10	0	0	0	100

Content:

Sr. No	Topics	Hrs.	Module Weightage
1.	Introduction to Economics; Definitions, Nature, Scope, Difference between Microeconomics & Macroeconomics Theory of Demand & Supply; meaning, determinants, law of demand, law of supply, equilibrium between demand & supply Elasticity; elasticity of demand, price elasticity, income elasticity, cross elasticity	04	10%
2.	Theory of production; production function, meaning, factors of production (meaning & characteristics of Land, Labour, capital & entrepreneur), Law of variable proportions & law of returns to scale Cost; meaning, short run & long run cost, fixed cost, variable cost, total cost, average cost, marginal cost, opportunity cost. Break even analysis; meaning, explanation, numerical	04	10%
3.	Markets; meaning, types of markets & their characteristics (Perfect Competition, Monopoly, Monopolistic Completion, Oligopoly) National Income; meaning, stock and flow concept, NI at current price, NI at constant price, GNP, GDP, NNP, NDP, Personal income, disposal income.	05	10%
4.	Basic economic problems; Poverty-meaning, absolute & relative poverty, causes, measures to reduce Unemployment: meaning, types, causes, remedies Inflation; meaning, types, causes, measures to control	04	10%
5.	Money; meaning, functions, types, Monetary policy- meaning, objectives, tools, fiscal policy-meaning, objectives, tools Banking; meaning, types, functions, Central Bank- RBI; its functions, concepts; CRR, bank rate, repo rate, reverse repo rate, SLR.	04	10%
6.	Introduction to Management; Definitions, Nature, scope Management & administration, skill, types and roles of managers Management Principles; Scientific principles, Administrative principles, Maslow's Hierarchy of needs theory	04	11%
7.	Functions of Management; Planning, Organizing, Staffing, Directing, Controlling (meaning, nature and importance) Organizational Structures; meaning, principles of organization, types-formal and informal, line, line & staff, matrix, hybrid (explanation with merits and demerits), span of control, departmentalization.	05	11%
8.	Introduction to Marketing management; Marketing Mix, concepts of marketing, demand forecasting and methods, market segmentation Introduction to Finance Management; meaning, scope, sources, functions	05	11%
9.	Introduction to Production Management; definitions, objectives, functions, plant layout-types & factors affecting it, plant location- factors affecting it. Introduction to Human Resource Management; definitions, objectives of manpower planning, process, sources of recruitment, process of selection	05	11%
10.	Corporate Social Responsibility; meaning, importance Business Ethics; meaning, importance.	02	6%

Reference Books:

1. Engineering Economics, R.Paneerselvam, PHI publication
2. Fundamentals of Management: Essential Concepts and Applications, Pearson Education, Robbins S.P. and Decenzo David A.
3. Economics: Principles of Economics, N Gregory Mankiw, Cengage Learning
4. Principles and Practices of Management by L.M.Prasad
5. Principles of Management by Tripathy and Reddy
6. Modern Economic Theory, By Dr. K. K. Dewett & M. H. Navalur, S. Chand Publications

Course Outcomes: The course is intended to provide basic understanding of Economics and Management to engineering students with following aspects:

- To impart knowledge, with respect to concepts, principles and practical applications of Economics, which govern the functioning of a firm/organization under different market conditions.
- To help the students to understand the fundamental concepts and principles of management; the basic roles, skills, functions of management, various organizational structures and basic knowledge of marketing.

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory. 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

CIVIL ENGINEERING (06)

STRUCTURAL ANALYSIS-I

SUBJECT CODE: 2140603

B.E. 4th Semester

Type of course: Applied Mechanics

Prerequisite: Mechanics of Solids

Rationale: This subject is conceptual applications of principles of mechanics of rigid and deformable bodies in Engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
		PA	ALA		ESE	OEP				
4	2	0	6	70	20	10	30	0	20	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Fundamentals of Statically Determinate Structures: Types of statically determinate & indeterminate structures, static and kinematic indeterminacy, stability of structures, principle of superposition, Maxwell's reciprocal theorems. Computation of internal forces in statically determinate structures such as plane truss, plane frame, grids.	06	10
2	Displacement of Determinate Beams and Plane Truss: Differential equation of elastic curve, relation between moment, slope and deflection, Macaulay's method, Moment Area Method, Conjugate Beam Method applied to beams. Joint displacement of determinate plane truss using unit load method.	10	20
3	Direct and Bending stresses: Members subjected to eccentric loads, middle third rule, kernel of section, chimney subjected to wind pressure, retaining walls, dams subjected to hydraulic pressure.	06	15
4	Columns and Struts: Buckling of columns, different end conditions, effective length, least radius of gyration, Euler's and Rankine's formulae, columns with initial curvature, eccentrically loaded columns, columns with lateral loading.	06	10
5	Arches, Cables and Suspension Bridges: Calculation internal forces in three hinge arches with circular and parabolic shapes subjected to various types of	08	10

	loading. Forces and end actions in cables due to various types of loading. Unstiffened three hinged parabolic and cantenary type suspension bridge.		
6	Thin cylinder: Analysis of thin cylinder and spherical vessels under pressure.	04	5
7	Fixed Beams & Consistent Deformation Method: Computation of fixed-end actions for various types of loads and secondary Effects using basic principles, beams of varying moment of inertia. Analysis of propped cantilever beams & beams of varying moment of inertia using Consistent Deformation Method	06	10
8	Strain Energy Resilience, strain energy due to axial loads & flexure, proof resilience, modulus of resilience, impact loads, and sudden loads.	10	20

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate 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. Junarkar S.B. & Shah H.J.; Mechanics of Structures Vol-I; Charotar publishing house, Anand
2. Wang C. K.; Intermediate Structural Analysis; Tata McGraw Hill book Company, New Delhi
3. Popov E.P.; Engineering Mechanics of Solids; Prentice Hall of India, New Delhi
4. Ryder G.H.; Strength of Materials; Mcmillan
5. Gere & Timoshenko; Mechanics of Materials; CBS Publishers & Distributors, Delhi
6. Hibbler R C; Mechanics of Materials; Pearson Education
7. Hibbler R C; Structural Analysis; Pearson Education

Course Outcomes:

After studying this subject students will be able to:

1. Apply principles of statics to determine reactions & internal forces in statically determinate structures.
2. Determine displacements of statically determinate structures.
3. Determine stresses due to axial & eccentric loading.
4. Determine buckling load for columns & struts with different end conditions.
5. Determine strain energy stored in a body.
6. Determine stresses in thin cylinders and spherical vessels

Term-Work:

1. The students will have to solve at least five examples and related theory from each topic as an assignment/tutorial. Practical examinations shall consist of oral based on term work and above course.

List of Open Source Software/learning website:

www.nptel.iitm.ac.in/courses/

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

CIVIL ENGINEERING (06)

NUMERICAL AND STATISTICAL METHODS FOR CIVIL ENGINEERING

SUBJECT CODE: 2140606

B.E. 4th Semester

Type of course: Engineering Mathematics

Prerequisites: The students are required to have a reasonable mastery over calculus, Differential equations and Linear algebra and introductory knowledge of probability and statistics.

Rationale: Mathematics is a language of Science and Engineering.

Teaching and Examination Scheme:

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

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
	Probability		
1	Reorientation: Definition of probability, Exhaustive events, Pair wise independent events, Multiplicative law of probability, Conditional probability, Baye's theorem	03	07
2	Probability Distributions: Random variable, Mathematical Expectation, Standard Deviation, Binomial, Poisson and Normal distributions, Mean, Median, Mode	05	12
	Statistics		
3	Descriptive Statistics: Mean, Median, Mode, Standard deviation, Skewness	03	08
4	Correlation and Regression: Bivariate distribution, Correlation coefficients, Regression lines, Formulas for Regression coefficients, Rank correlation	04	10
5	Curve Fitting: Fitting of Linear, Quadratic, Exponential and Logarithmic curves, Least squares method	03	08
	Numerical Methods		
6	Finite Differences and Interpolation: Finite Differences, Forward, Backward and Central operators, Interpolation by polynomials: Newton's forward, Backward interpolation formulae, Gauss & Stirling's central difference formulae, Newton's divided and Lagrange's formulae for unequal intervals	08	15

7	Numerical Integration: Newton-Cotes formula, Trapezoidal and Simpson's formulae, error formulae, Gaussian quadrature formulae	03	08
8	Solution of a System of Linear Equations: Gauss elimination, partial pivoting, Gauss-Jacobi and Gauss-Seidel methods	03	07
9	Roots of Algebraic and Transcendental Equations: Bisection, false position, Secant and Newton-Raphson methods, Rate of convergence	04	10
10	Numerical solution of Ordinary Differential Equations: Taylor series method, Euler method, Runge-Kutta method of order four, Milne's Predictor-Corrector method	06	15

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
10	15	20	20	35

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate 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:

Reference Books:

1. E. Kreyszig, Advanced Engineering Mathematics(8th Edition), John Wiley (1999)
2. S. D. Conte and Carl de Boor, Elementary Numerical Analysis-An Algorithmic Approach (3rd Edition), McGraw-Hill, 1980
3. C.E. Froberg, Introduction to Numerical Analysis (2nd Edition), Addison-Wesley, 1981
4. Gerald C. F. and Wheatley P.O., Applied Numerical Analysis (5th Edition), Addison-Wesley, Singapore, 1998
5. Johnson Richard A., Miller and Freund's - Probability and Statistics (8th Edition), PHI.
6. S.C. Gupta and V. K. Kapoor, Fundamentals of Mathematical Statistics (11th Edition), Sultan Chand & Sons.

Course Outcomes:

After learning the course the students should be able to :

- Understand and apply the basic concepts of probability, random variables, probability distribution.
- Use statistical methodology and tools in the engineering problem solving process.
- Compute and interpret descriptive statistics using numerical and graphical techniques
- Understand the basic concepts of regression and curve fitting
- Calculate finite differences of tabulated data.
- use numerical methods to find integration and differentiation
- find an approximate solution of algebraic equations using appropriate method.

- find an approximate solution of ordinary differential equations using appropriate iterative method.

List of Open Source Software/learning website:

<http://nptel.ac.in/courses/111101003/>

<http://nptel.ac.in/syllabus/syllabus.php?subjectId=111101004>

<http://nptel.ac.in/courses/111105038/>

<http://nptel.ac.in/courses/111107063/>

<http://nptel.ac.in/courses/111105041/>

<http://nptel.ac.in/courses/111104079/>

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

CIVIL ENGINEERING (06)

BUILDING & TOWN PLANNING

SUBJECT CODE: 2140607

B.E. 4th Semester

Type of course: Civil Engineering

Prerequisite: Elements of drawing, Components of building and their types, Primary knowledge of surveying and levelling

Rationale: A Civil Engineer has to be conversant with building and town planning and their development controls, skill of preparing drawings of various types like, orthographic, perspective, working drawings etc.

Teaching and Examination Scheme:

Teaching Scheme			Credits C	Examination Marks						Total Marks
L	T	P		Theory Marks			Practical Marks			
				ESE (E)	PA (M)		PA (V)		PA (I)	
		PA	ALA		ESE	OEP				
4	0	2	6	70	20	10	20	10	20	150

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
A	BUILDING PLANNING		
1	Introduction to buildings, Type of buildings, Principles of building planning, Principles of architecture composition	07	12
2	Building by-laws as per National Building Code, Standards for residential buildings, Building by-laws of local authority, standards for industrial, public, commercial and institutional buildings	06	12
3	Planning of earthquake resistant building considering symmetry, simplicity, continuity, consideration of locating staircase and overhead water tank, most sensitive to earthquake	03	10
4	Preparing working drawing of residential building, software application in planning, detached, semidetached, row houses and apartments with scale proportion, open spaces standard as per F.S.I. permissible	06	10
5	Elements of perspective views, Types of views such as one point, two point perspective etc	06	10
6	Building services like water supply, drainage, electrification etc. for modern buildings	04	4
B	TOWN PLANNING		
1	Historical aspects and origin of Town Planning in the World and in India	03	5

2	Necessity of Civic surveys for Planning purpose, types, data and its presentation and analysis, Fundamental principles of Town Planning	05	8
3	Land use Planning and percentage of different Land uses as per category of town.	05	8
4	Components of town such as Zones, Road Network, CBD, Neighbour hood planning, Development controls for new town planning schemes for growth negotiation	05	8
5	Formation of Slums, Reasons of Slum formation, remedial measures for avoiding slum foundation	03	8
6	Introduction to smart city, its Characteristics as per present scenario.	03	5

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
10%	45%	35%	5%	5%

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate 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. Planning, designing building by Y. S. Sane, Allies Book Stall
2. Town Planning by G. K. Hiraskar
3. National Building Code-2005, New Delhi
4. Building Planning, Designing and scheduling by Gurucharan Singh, Standard Book House, New Delhi
5. General Development Control Regulations published by AUDA and GICEA
6. Building Drawing by M. G. Shah, C. M. Kale and S. Y. Patki, Tata Mc Graw Hill, New Delhi
7. Town Planning by S.C. Rangwala, Charotar publishing House, Anand
8. Architecture- Form, Space and Order by Francis D.K. Ching
9. Architectural Graphics by Francis D.K. Ching

Course Outcomes:

After studying this subject students will be able to:

1. Comprehend local building bye-laws and provisions of National Building Code in respect of building and town planning
2. Discuss various aspects of principles of planning and architecture in planning building and mass composition
3. Explain the principles of planning and design considerations to construct earthquake resistant building
4. Prepare working drawings, foundation plans and other executable drawings with proper details for residential buildings

List of Experiments:

Term Work:

(A)

Four A1 Size Drawing sheet:

- (1) Residential Planning: Two storied Building: Plans, elevation, section, lay-out plan, key plan, site plan, area table, schedule of opening. Scale-1:100.
- (2) Public Building: Ground Floor plan, typical floor plan, elevation, section, lay-out plan, key plan, site plan, area table, schedule of opening.
- (3) Working Drawing: sheet should accommodate min. six types with sectional details. (Furniture plan, Drainage lay out, Toilet Detail, Wood work detail, Kitchen detail, Electrical plan etc)
- (4) Perspective Drawing: Two point perspective of sheet -1 planning.

(B)

Assignments:

- (1) Assignment -1: Principles of Planning & Architecture
- (2) Assignment -2: Building Bye laws
- (3) Assignment -3: Town Planning

Design based Problems (DP)/Open Ended Problem:

1. eco friendly planning
2. energy efficient buildings
3. smart building planning
4. Project report for detached house to urban development authority for approval
5. Project report for neighbourhood society to urban development authority for approval

Major Equipment:

None

List of Open Source Software/learning website:

1. ocw.mit.edu
2. 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

CIVIL ENGINEERING (06)

CONCRETE TECHNOLOGY

SUBJECT CODE: 2140608

B.E. 4th Semester

Type of course: Compulsory

Prerequisite: Material Science

Rationale: Concrete is the most widely used construction material in the world made by mixing Portland cement with sand, crushed rocks and water. It plays an important role in Infrastructure and Private building construction. It is heterogeneous and has complex microstructure. Understanding the basic behaviour of concrete is very important for civil engineering students to become efficient civil engineering professionals. The course on Concrete technology acquaints the students with this second largest material in use after water. It will help the students to explore the material, its properties, intrinsic nature and application & also the recent advances in field of concrete technology

Teaching and Examination Scheme:

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

L- Lectures; T- Tutorial/Teacher Guided Student Activity; P- Practical; C- Credit; ESE- End Semester Examination; PA- Progressive Assessment

Content:

Sr. No.	Topics	Teaching Hrs.	Module Weightage
1	Introduction of concrete, Historic development, Composition of concrete, Advantages of concrete over other materials, Advances and future trends in concrete, Overview of Sustainability and Concrete development.	02	10
2	Concrete Making Materials: 2.1 Cement: Chemical composition, Hydration of cement, structure of hydrated cement, Tests on cement (special cements, water chemical admixtures. 2.2 Aggregates: Classification, IS specifications, Properties, Grading, Methods of combining aggregates, specified gradings, Testing of aggregates. 2.3 Water – General requirements & limiting values of impurities	08	15
3	Fresh Concrete: Properties of fresh concrete, Definition and Measurement methods of workability as per IS and ASTM standards, factors affecting workability, Segregation & Bleeding, Slump loss, Re-tempering, Site preparations for concreting, Mixing, Conveying, Placing, Compaction, Finishing of concrete. Curing & various	05	15

	methods of curing.		
4	Hardened Concrete: Strengths of hardened concrete (Tensile & Compressive strength, Flexural & Bond strength), standard test methods as per IS and ASTM, Failure mechanism under compression & tension, Stress-strain behaviour of concrete, Overview of Modulus of elasticity, Dimensional stability –Creep & Shrinkage	05	15
5	Durability & Permeability of concrete: Causes of deterioration in concrete and durability problems, Factors affecting durability, Transport mechanism of gases & fluids in concrete, Cracking & causes of cracking, Carbonation induced & corrosion induced cracking, Alkali-aggregate reaction, Degradation by freeze & thaw, Sulphate attack, Durability under sea-water (marine environment).	07	15
6	Mix design of Concrete: Principles of concrete mix design, Parameters and factors influencing mix design, Indian Standard methods of mix design, Acceptability criteria, variability of results, Various provisions of IS code for sound concrete.	05	10
7	Special concrete and Concreting methods: advanced cement based composites, Fibre reinforced concrete, Polymer modified concrete, Self-compacting concrete, Light weight concrete, High strength concrete, Light-weight & heavy weight concrete, High volume fly ash concrete. Special concreting methods: Pumped concrete, Ready mix concrete, Under-water concreting, Hot & cold weather concreting, Precast concrete.	04	10
8	Miscellaneous Topics: Non-Destructive testing of concrete – Introduction to Destructive, semi-destructive & Non-destructive testing methodology, Problems faced during Non-destructive evaluation, Test methods like Rebound Hammer test, Ultra-sonic pulse velocity, Penetration tests, Pull out tests. Overview of Fracture Mechanics – Origin of fracture mechanics, Understanding the quasi-brittle nature of concrete, Failure of concrete under low stress, Micro—cracking, crack propagation, stress concentration at openings.	03	10

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks				
R Level	U Level	A Level	N Level	E Level
35	35	20	5	5

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate 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. Properties of Concrete - Neville A. M.
2. Concrete Microstructure, Properties and Materials –P.Kumar Mehta / Paulo J.M.Monteiro
3. Concrete Technology- Shetty M. S.
4. Advanced Concrete Technology – ZONGJIN Li
5. Concrete Technology- Gambhir M. L.
6. Concrete Technology by A.R. Santhakumar, IIT Madras

Course Outcome:

After learning the course the students should be able to understand the basic behaviour of concrete, its application in varied environment, help them to handle the material on site and thus become good professional engineers.

List of Experiments/Tutorials:

- (a) Tests on cement, aggregates, Design & making of concrete, Tests on fresh concrete, Hard concrete (destructive & non-destructive test methods),

Open Ended Problems:

1. Prepare Chart listing all the Indian Standard Codes relevant to testing of Sand, aggregate, cement, bricks, mix design, special concrete, concrete testing, reinforced cement concrete, non-destructive testing etc.
2. Prepare chart showing step-wise procedure for tests on Cement, Aggregate, mortar, Testing of fresh & hardened concrete, Non-destructive testing of concrete.
3. Prepare 3 specimens each of Plain concrete & Reinforced cement concrete of M20 grade. Test it under flexure and compare the failure, Plot the stress vs strain graph for the same. Subject the beam specimens to aggressive deterioration (like alternate wetting & drying, salt exposure), test the beams for carbonation and strength loss (if any).

Major Equipments: Compression testing machine, Concrete mixer

List of Open Source Software/learning website:

<http://nptel.ac.in>

<http://ocw.mit.edu/courses/civil-and-environmental-engineering>

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.