

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Matrix Analysis Of Framed Structures

Sr. No	Course content
1.	Introduction: Principles of Virtual work, Basic concepts of flexibility, Analysis of Plane truss, plane frames and grids using flexibility member approach.
2.	Stiffness methods: Analysis of Plane truss, plane frames, grids, space truss, space frame and composite structures by member approach. Special problems such as member discontinuities, non prismatic members, curved members, and beams on elastic supports, secondary effects due to temperature charges, Pre-strains and end displacements semi-rigid connections, plastic analysis, and effect of shear deformations by stiffness method, sub-structuring, Programming techniques for solution of large number of simultaneous equations.
3.	Introduction to Non-linearity in structure and non-linear analysis.

Reference Books:

1. Matrix Analysis of Framed Structure - Gere & Weaver
2. Structural Analysis - Ghali & Nevelle
3. Computer Analysis of Structural Systems - Fleming J.F.
4. Elementary matrix analysis of structures - H. Kardestuncer
5. Linear Analysis of Frame works - Graves Smith
6. Non-linear Structures - Majid
7. Computer Methods of Structural Analysis - Beaufait, Rowan, Hadley, Heckett
8. Numerical methods in finite element analysis - Bathe & Wilson

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Structural Dynamics & Earthquake Engineering

Sr. No	Course content
1.	Structural Dynamics: Response of SDOF to harmonic and general dynamic loading, Vibration of multiple degree of freedom systems, numerical techniques for finding natural frequencies & mode shapes, orthogonality relationship of principal modes, Rayleigh's & Dunkerley's principle, Evaluation of dynamic response by mode superposition method, Analysis by response spectrum theory and time history analysis.
2.	Earthquake Engineering: Causes of earthquake and their characteristic, earthquake parameters, seismic zoning of India, Lessons from past earthquake and remedial measures, Response spectra & Combined D-V-A plot,
3.	Behavior of floor diaphragms, effect of various structural irregularities, lateral force analysis of building - Torsionally uncoupled and coupled system
4.	Capacity design of various structural elements, various lateral load resisting structural systems – MR frame with shear wall & bracing, Provisions of IS 1893 & IS 13920
5.	Structural controls: Passive Controls – Base isolation, various dampers, Active controls
6.	Liquefaction: Causes, remedial measures
7.	Response of nonstructural components & structural considerations
8.	Modeling and response of structure to earthquake, dynamic analysis of high-rise buildings, structural system for low, medium and high rise building, water tank and bridges using professional software like STAAD, SAP, ETAB, MIDAS, ANSYS etc.

Reference Books:

1. Dynamics of Structures - A.K.Chopra
2. Structural Vibrations - Theory and Computation - Mario Paz
3. Earthquake Resistant Design - Manish Shrikhande & Pankaj Agrawal
4. Vibrations of Structures Application in civil Engg - J.W.Smith
5. Design Structural Dynamics - Clough & Penzien
6. Introduction to Structural Dynamics - John M.Biggs
7. Dynamics and Vibration of Structures - Demeter G.Fertis
8. Elements of earthquake engineering - Jaikrishna & Chandrasekaran
9. IS 1893-2002
10. IS 13920- 1993

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Advanced Solid Mechanics

Sr. No	Course content
1.	Introduction: State of stress and strain at a point in two and three dimensions, stress and strain invariants, Hooke's law, plane stress and plane strain.
2.	Two dimensional problems in Cartesian & polar co-ordinates, solution by Airy's stress function, stress concentration, problems of torsion, curved elements, membrane analogy method, stress function of circular plates.
3.	Concept of stability, static dynamic and energy criterion of stability, flexibility and stiffness criteria, buckling, post buckling stages, stability of columns, beams, inelastic building, Beams – Column, Stability of frames, methods applied to stability problems.

Reference Books:

- | | |
|--|-----------------------------------|
| 1) Theory of elasticity | N. Filonenko – Borodich |
| 2) Theory of elasticity | S. P. Timoshenko and J.N. Goodier |
| 3) Buckling of bars, plates and shells | Don O. Brush and B. O. Almorth |
| 4) Theory of elastic stability | S. P. Timoshenko and J.M. Gere |
| 5) Principles of structural stability theory | Chajes |
| 6) Structural stability of plates and shells | N.G.R. Iyengar |
| 7) An introduction to elastic stability to structure | G.J. Siitses |

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Numerical Methods (Major Elective I)

Sr. No	Course content
1.	Error analysis, types of errors, accuracy & precision, stability in numerical analysis.
2.	Empirical laws and curve fitting.
3.	Interpolation & extrapolation, general, interpolation formulae, numerical differentiation & integration / solution of large systems of linear equations, use of software, solution of banded equations, transcendental equations.
4.	Solution of non – linear algebraic equations, Newton – Raphson iterative method, numerical solutions of ordinary differential equations and partial differential equations using finite difference technique, its applications to structural engineering problems.
5.	Solution of Eigen value problems, iterative methods & transformation methods. Use of software for transformation methods. Computer oriented algorithms.
6.	Laplace transform methods, Laplace equation - Properties of harmonic functions - Fourier transform methods for Laplace equation.
7.	Euler's equation - Functional dependant on first and higher order derivatives
8.	Correlation and regression, Principles of least squares

Reference Books:

- | | |
|---|-------------------|
| 1) Numerical methods in Engineering | Salvadori & Baron |
| 2) Numerical Methods in Finite Element Analysis | Bathe & Wilson |
| 3) Advanced Mathematics | Kresysig |
| 4) Numerical Analysis | Scarborough |

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Prestressed Concrete (Major Elective -I)

Sr. No	Course content
1.	Introduction: Principles of prestressing - types and systems of prestressing, need for High Strength materials, Loading stages, Determination of losses, deflection (short-long term), camber, cable layouts.
2.	Behavior under flexure - IS codal provisions, ultimate strength, Design of flexural members including large span slabs and beams.
3.	Design for Shear, bond and torsion. Design of End blocks
4.	Design of tension members - application in the design of prestressed pipes and prestressed concrete cylindrical water tanks.
5.	Design of compression members with and without flexure - its application in the design piles, flag masts and similar structures.
6.	Composite beams - analysis and design, ultimate strength - their applications. Partial prestressing - its advantages and applications.
7.	Application of prestressing in continuous beams, concept of linear transformation, Concordant cable profile and cap cables.
8.	Introduction to the special prestressed structures like prestressed folded plates, prestressed cylindrical shells, prestressed concrete poles.

Reference Books:

1. Prestressed concrete - Krishna Raju
2. Design of Prestressed Concrete Structures - T.Y.Lin
3. Fundamentals of Prestressed Concrete - N.C.Sinha & S.K.Roy S.Chand & Co., 1985.
4. Prestressed Concrete- Design and Construction - Leonhardt.F., Wilhelm Ernst and Shon, Berlin
5. Prestressed Concrete - Freyssinet
6. Prestressed Concrete, and Hall - Evans, R.H. and Bennett, E.W., Chapman

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Fracture Mechanics (Major Elective -I)

Sr. No	Course content
1.	Fundamentals of Fracture Mechanics, Mechanisms of fracture and crack growth
2.	Cleavage fracture, ductile fracture, fatigue cracking, Environment assisted cracking
3.	Service failure analysis, linear elastic fracture mechanics, Griffith's criteria, stress intensity factors, crack tip plastic zone, Erwin's plastic zone correction, R curves, compliance, J Integral
4.	Concept of CTOD and CMD, Material models, crack models, band models, models based on continuum damage mechanics

Reference Books :

1. Elementary engineering fracture mechanics – David Broek – Sijthoff & Noordhoff – Alphen aan den Rijn – Netherlands
2. Fracture mechanics of concrete structures – Theory and applications – Rilem Report – Edited by L. Elfgreen – Chapman and Hall – 1989.
3. Fracture mechanics – applications to concrete – Edited by Victor, C. Li, & Z.P. Bazant – ACI SP 118.

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name CASAD Lab - I

Sr. No	Course content
Students are required to carry out following in laboratory hours,	
1.	Programming: Analysis of structures using C++
2.	Application : Excel spread sheets for the design of (1) Structural elements like slabs, beams, columns, isolated, combined and raft footings, steel connections and members (2) Structures like water tank, retaining walls, Portal frame, Gantry girder, Plate girder etc
3.	Software Usage: Modelling, analysis and design using professional software like STAAD, STRAP, STRUDS, RISA 3D
4.	Drafting : Application of Drafting software like AutoCAD, CadLAB, Microstation

Reference Books :

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|--|--------------------|
| 1. Programming in C++ | - E. Balaguruswamy |
| 2. Teach yourself C++ | - Herbert Schildt |
| 3. Object Oriented programming in Turbo C++ | - Robert Lafore |
| 4. Introduction to Computer Aided Drafting | - Voisinet |
| 5. Mastering AutoCAD | - George Omura |
| 7. Computer programming and engineering analysis | - Syal & Gupta |

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Cement and Concrete Lab

Sr. No	Course content
Students are required to carry out following in laboratory hours,	
1.	Concrete Mix design: Study of the effect of water/cement ratio on workability and strength of concrete, Effect of aggregate/cement ratio on strength of concrete, Effect of fine aggregate/coarse aggregate ratio on strength and permeability of concrete
2.	Study of stress-strain curve of concrete - correlation between cube strength, cylinder strength, split tensile strength and modulus of rupture
3.	Non-Destructive testing of concrete
4.	Study of behavior of Beams under flexure – Under Reinforced, Balanced and Over-reinforced beams
5.	Study of Shear- Effect of Shear Span to Depth ratio

Reference Books :

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|------------------------|---------------|
| 1. Concrete technology | - Nevelli |
| 2. Concrete Technology | - M.S. Shetty |
| 3. Concrete Technology | - Orchard |

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Finite Element Method

Sr. No	Course content
1.	Introduction: Principles of discretization, Element stiffness mass formulation based on direct, variational and weighted residual techniques.
2.	Finite element displacement approach: Shape functions & numerical integrations, convergence criteria, Computation of element properties using generalized co-ordinates & natural co-ordinates.
3.	Analysis of Structures – 2D and 3D truss elements, beam elements. Analysis of plane stress/strain and axisymmetric solids. Triangular, quadrilateral and isoparametric elements. Analysis of plate bending and shells.
4.	Analysis of Thermal and fluid flow Problems and application.
5.	Dynamic analysis: Free vibration analysis of truss bars with two D.O.F.- considering lumped mass and consistent mass formulations. Flexural vibration of beam elements
6.	Pre- processors for FEA modelling. FEA software packages and Applications.

Reference Books :

1. Finite Elements Procedures in Engineering analysis - Bathe, Wilson
2. Finite Element for Structural Analysis - Weaver & Johnston
3. The Finite Element Methods - Zienkiewicz
4. Introduction to Finite Elements in Engineering - Chandrupatla, R.T. & Belegundu, A.D
5. Finite Element Programming - Hinton & Owen
6. Finite Elements Methods - C.S.Krishnamurthy

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Behaviour of Reinforced Concrete

Sr. No	Course content
1.	Limit State Design Philosophy applicable to Reinforced Concrete, Various stress- strain models for concrete, Behavior of concrete under uniaxial and combined actions, Effect of confinement, Stress-strain curve of different types of steels
2.	Behavior of RC elements under flexure: Basic assumptions and its implication on design, response of RC elements under uniaxial and biaxial bending, Moment curvature relationship, Ductility of unconfined and confined RC sections under flexure, Flexural deformation,
3.	Behavior of RC elements under axial force: Basic assumptions and its implication on design, Effect of slenderness, Analysis of RC section under axial force (compression or tension) with uniaxial or biaxial moments
4.	Behavior of RC elements under shear: Concept of shear stress, Resisting mechanism of RC elements with and without shear reinforcement, Truss model, Interface shear transfer, Interaction between shear and axial force, Behavior of deep beams and corbels.
5.	Behavior of RC elements under torsion: Stresses due to torsion, Effective tubular section, combined shear and torsion, combined torsion and bending
6.	Bond stress and anchorages: Mechanism of resistance, factors affecting bond and anchorages
7.	Deflection of flexural members: Long and short term deflections, governing factors
8.	Yield lines: Concept and various theories to analyze slab elements

Reference Books :

1. Reinforced Concrete Structures – Park and Pauley, John Wiley and Sons
2. Reinforced concrete: mechanics and design – MacGregor & Wight, Prentice-Hall
3. Reinforced and prestressed concrete structures – Kong and Evans, ELBS
4. Reinforced Concrete Structure Structural Elements:
Behavior, Analysis and Design – Purushothaman, Tata McGraw Hill
5. Reinforced Concrete Design – S N Sinha, Tata McGraw Hill

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Advanced Foundation Engineering(Major Elective II)

Sr. No	Course content
1.	Critical study of different bearing capacity theories [Mayerhof, IS, Skempton's]. Foundations on different soil deposits having significant characteristics & settlement study. Foundations on non-uniform soils.
2.	Types of rafts, conventional rigid design of raft.
3.	Nature & complexities of soil structures interaction problems, subgrade modulus of soils. Application of advanced technique of analysis of beams & rafts using FEM.
4.	Concept, analysis & design of pier, abutment, cap, pile & well foundation with settlement considerations
5.	Study of natural frequency of machine foundation - soil system – dynamic soil properties. Types of machines and machine foundation – IS code of practice for design and construction of block foundation for reciprocating & impact machine and framed foundation for high speed rotary machines.
6.	Introduction to reinforced earth structures & geotextiles use of geotextiles & geogrids, elements of soil anchors.

Reference Books :

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|---|----------------------|
| 1. Analysis and design of foundation | - J. Bowles |
| 2. Foundation design | -Teng |
| 3. Soil mechanics & foundation engg. vol-II | - V.N.S. Murthy |
| 4. Principles of foundation Engg. | - Braj Das |
| 5. Pile foundation | - M.J. Tomlinson |
| 6. Handbook of foundation Engg. | - Fang & Winker Korn |

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Analysis And Design of Bridges (Major Elective – II)

Sr. No	Course content
1.	Classification, investigations and planning, choice of type of bridges
2.	I.R.C. and other international live load specifications for road bridges, Various forces acting on bridges
3.	Load distribution theories: Courbon's Method, Hendry Jaeger Method, Grillage analogy, Pigeaud's curves
4.	Superstructure: General design considerations, analysis and design of reinforced concrete slab culverts, tee beam and slab bridges, Design principles of prestressed bridges, continuous bridges, box girder bridges, balanced cantilever bridges.
5.	Substructure : Various parts of substructures, Various types of substructures, Loads acting on substructures, Design of pier and pier cap, Design of piles, Design of wells and sinking of wells

Reference Books :

1. Raina V.K. "Concrete Bridge Practice" , Tata McGraw Hill Publishing Company, New Delhi, 1991.
2. Krishnaraju, N., "Design of Bridges" Oxford and IBH Publishing Co., Bombay, Calcutta, New Delhi, 1988
3. Bakht, B. and Jaegar, L.G., "Bridge Analysis simplified", McGraw Hill, 1985.
4. Ponnuswamy, S., "Bridge Engineering", Tata McGraw Hill, 1989
5. Derrick Beckett, "An introduction to Structural Design of Concrete Bridges", Surrey University Press, Henley Thames, Oxford Shire, 1973.
6. Taylor, F.W., Thomson, S.E., and Smulski E., "Reinforced Concrete Bridges", John Wiley and Sons, New York, 1955.
7. Edwin H.Gaylord Jr., Charles N.Gaylord, James, E.,Stallmeyer "Design of Steel Structures" McGrew Hill International Editions, 1992.

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Disaster Resistant Structures (Major Elective - III)

Sr. No	Course content
1.	Introduction: Philosophy for design to resist earthquake, cyclone and flood - National and International codes of practice - By-Law of urban and semi-urban areas - Traditional and modern structures.
2.	Response of dams, bridges, buildings - Strengthening measures - Safety analysis and rating – Reliability assessment.
3.	Testing and evaluation - Classification of structures for safety point of view - methods of strengthening for different disasters - qualification test.
4.	Use of modern materials and their impact on disaster reduction - Use of modern analysis, design and construction techniques optimisation for performance.
5.	Damage surveys - Maintenance and modifications to improve hazard resistance - Different types of foundation and its impact on safety - Ground improvement techniques.

Reference Books :

1. Concrete and Reinforced Concrete
- Deterioration and Protection
- V.Moskvin ,Mir Publishers
-Moscow 1980.
2. Repair of Concrete Structures
- R.T.Allen and S.C.Edwards Blakie
and Sons, U.K 1987.
3. Learning from failures Deficiencies in Design
-Raiker R.N. R & D Center (SDCPL)
4. Construction and Service
Raiker Bhavan, Bombay , 1987.

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Rehabilitation and Retrofitting of Buildings (major elective III)

Sr. No	Course content
1.	Durability of concrete: Factors affecting durability of concrete, Corrosion of reinforcements in concrete, Carbonation, Chloride ingress, Alkali-silica reaction, Freeze-thaw effects, Chemical attack, Abrasion, erosion and cavitation, Weathering and efflorescence
2.	Defects and deterioration in buildings, Survey and assessment of structural conditions in RCC structures, Masonry buildings and Steel structures
3.	Non-destructive testing of concrete quality, Non-destructive testing of connections in steel, Corrosion assessment in reinforcements in RCC elements and components in steel structures
4.	Materials for repairs, rehabilitation and retrofitting processes, Methods for repairs, rehabilitation and retrofitting including surface preparation, Study of failures of buildings and lesson learnt, Role of quality control in construction as Preventive measures Maintenance of buildings, Strengthening of Earthquake-damaged buildings, Introduction to Push-over analysis

Reference Books :

1. Concrete Microstructures, properties and materials - P Kumar Mehta and Paulo J. M. Monterio
2. Properties of concrete - A. M. Neville
3. Materials for construction - Lai, James, S.
4. Structural condition assessment - Robert T. Ratay
5. Handbook of retrofitting earthquake damaged buildings

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Advanced Steel Structure Design (Major Elective - III)

Sr. No	Course content
1.	Introduction: Design requirements and design process, Material behavior, mechanical properties under static load, fatigue failure under repeated load, brittle fracture under impact load, Dead loads, imposed loads, wind loads, earthquake load, earth or ground water load, indirect forces and combination of loads.
2.	Multi storey building : Introduction, loading, Analysis for gravity loads, computer analysis of rigid frame, advanced structural forms
3.	Cold form steel: Introduction, advantages of cold formed sections, load buckling, beam, axially compressed column, combined bending & compression, Tension members, Design on the basis of testing, empirical method & examples.
4.	Bridges : Introduction, steel used in bridges, classification of steel bridges load & load combination, Analysis of girder bridge, plate girder bridges, truss bridges, connection gusset

Reference Books :

1. Plastic Design of Low -rise frames, Horne, M.R., and Morris, L.J., Granada Publishing Ltd., 1981.
2. Steel Structure -Design and Behaviour, Salmon, C.G., and Johnson, J.E. Harper and Row, 1980.
3. Design of Steel Structure, Dayarathnam, P., A.H.Wheeler, 1990.
4. Steel Design for Structural Engineers, Kuzamanovic,B.O. and Willems,N., Prentice Hall, 1977.
5. Cold-formed Steel Structures, Wie - Wen Yu., McGraw Hill Book Company, 1973.
6. Steel Structures, William McGuire, Prentice Hall, Inc., Englewood Cliffs, N.J.1986.
7. Guidelines to design cold form section by Tata Steel

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Marine Structures (Major Elective - III)

Sr. No	Course content
1.	Wave Mechanics: Wave generation process, small and finite amplitude wave theories.
2.	Wind forces: Wave forces on vertical, inclined cylinders, structures - current forces and use of Morison equation.
3.	Different types of offshore structures, foundation modelling, structural modelling, Static method of analysis, Foundation analysis, Dynamics analysis of offshore structures, Design of platforms, Jacket tower and mooring cables and pipe lines.

Reference Books :

1. Hydrodynamics of Offshore Structures
 2. Offshore Structural Engineering
 3. Recommended Practice for Planning, Designing and Constructing Fixed Offshore Platforms
 4. Oceanographical Engineering
 5. Dynamic Analysis of Offshore Structures,
 6. Offshore Structures, Vol.1,
 7. Florida, 1991.
- Chakrabarti, S.K. Computational Mechanics Publications, 1987.
 - Thomas H. Dawson, Prentice Hall Inc Englewood Cliffs, N.J. 1983
 - API, American Petroleum Institute Dalls, Tex. Publication, RP2A,
 - Wiegel, R.L., Prentice Hall Inc, Englewood Cliffs, N.J. 1964.
 - Brebia, C.A.Walker, S., Newnes Butterworths, U.K. 1979.
 - Reddy, D.V. and Arockiasamy, M., Krieger Publishing Company, Malabar,

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Interdisciplinary Elective – II

Each PG course will float one interdisciplinary course and students will opt one among them except the one floated by the mother course.

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Casad lab - II

Sr. No	Course content
Students are required to carry out following in laboratory hours,	
1.	Programming: Analysis, design and other structural applications using Visual C. Basic concepts of Expert System, Genetic Algorithms, Artificial Intelligence, Artificial Neural Network & their scope in structural engineering.
2.	Software Usage: FEM Modelling and analysis using professional softwares like ANSIS, Etabs, SAP etc., Applications of STAAD, STRAP, STRUDS, RISA 3D etc.

Reference Books :

1. Practical VC++ 6.0 - Bates & Tompkins
2. Introduction of Artificial Intelligence & expert system - Patterson D. W.
3. Artificial Intelligence - Rich E.
4. Genetic Algorithm in search, optimization machine learning - Goldberg D. E.
5. Fuzzy sets & systems - Zadeh L. A.
6. Artificial Neural Network - Rao & Rao
7. Formax configuration processing in Structural Engineering - Nooshin H.

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 2

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Structural Design Project

Sr. No	Course content
Students are required to carry out following in laboratory hours,	
1.	Overview of various structural forms, idealization of various structural systems, loading and relevant standards and structural detailing
2.	Designs: Overhead Water Tank, Earthquake & Wind resistant design of RCC High-rise building, Industrial Shed

Reference Books :

1. Earthquake Resistant Design - Manish Shrikhande & Pankaj Agrawal
2. Plain & Reinforced Concrete Vol. II - Jain & Jaikrishna
3. Advanced reinforced concrete design - P. C. Verghese
4. Design of Steel Structures - Arya A. S
5. Structural Analysis and Design of Tall Buildings - Bungale S.Taranath
6. IS-456(2000), IS-800(2007), IS-875(1987), IS-1893(2002), IS-13920(1993), IS-3370, SP-16, SP-34.
7. IITK-GSDMA guidelines for design of water retaining structures

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester: 1

**Interdisciplinary Electives Offered by
Applied Mechanics Department**

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Basics of Reinforced Concrete and Masonry Construction
(Interdisciplinary Elective - I)

Sr. No	Course content
1.	Concrete ingredients, testing and standards
2.	Concrete mix: Nominal mixes and design mixes, criteria of mix design
3.	Form work: types, usage and their suitability
4.	Concreting: Mixing, transporting, compacting, associated tests, Curing, Sampling, Cube tests and acceptance criteria
5.	Use of admixtures, ready mixed concrete, vacuum concrete, Cellular Concrete, Light weight concrete, Smart Concrete, Fibre Reinforced Concrete, Ferrocement, Polymer Concrete Composites, Self-Compacting Concrete, Fly Ash Concrete, High Performance Concrete.
6.	Steel: Types, tests and standards, binding, welds, bolts, rivets
7.	Masonry: Bricks, stone and hollow concrete blocks masonry, mortars, relevant tests, Earthquake resistant features of masonry
8.	Distress in structure: Causes and precautions, damage assessment of structural elements, repairing techniques and repairing materials.

List of Experiment:

Following shall be carried out in laboratory

1. Tests on cement
2. Tests on concrete
3. Tests on bricks
4. Non-destructive tests on concrete

Reference Books :

1. Concrete Microstructures, properties and materials - P Kumar Mehta and Paulo J. M. Monterio
2. Properties of concrete - A. M. Neville
3. Materials for construction - Lai, James, S.
4. Structural condition assessment - Robert T. Ratay
5. Handbook of retrofitting earthquake damaged buildings

GUJARAT TECHNOLOGICAL UNIVERSITY

M.E Semester : 2

Interdisciplinary Electives Offered by
Applied Mechanics Department

Civil Engineering (Computer Aided Structural Analysis & Design)

Subject Name Advanced Computing In Engineering (Interdisciplinary Elective - II)

Sr. No	Course content
1.	Visual C++ Programming : Introduction of Microsoft foundation classes, use of Application Wizard options, Fundamentals of Developers Studio, creation of workspace for windows based application, file view, resource view & class view, building window based application using dialog box & view commands controls.
2.	Artificial Intelligence: Introduction, Over view of AI's major topics.
3.	Expert system: Overview, knowledge acquisition, knowledge representations, expert system development tools.
4.	Artificial Neural Network: Introduction, various learning algorithms, training, testing of network, network topology, network parameters, suitability of ANN for various engineering problems.
5.	Introductions and basic concepts of fuzzy logic and genetic algorithms
6.	CAD packages and their applications.

Reference Books :

1. Practical VC++ 6.0 - Bates & Tompkins
2. Introduction of Artificial Intelligence & expert system - Patterson D. W.
3. Artificial Intelligence - Rich E.
4. Genetic Algorithm in search, optimization & machine learning - Goldberg D. E.
5. Fuzzy sets & systems - Zadeh L. A.
6. Artificial Neural Network - Rao & Rao
7. Formax configuration processing in Structural Engineering - Nooshin H.