SVKM's Narsee Monjee Institute of Management Studies
Mukesh Patel School of Technology Management & Engineering

Program: B. Tech. Integrated (Civil Engineering)				**Semester :** III	
Course/Module: Construction Materials				**Module Code:** BTICI03001	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks- 100 in Question Paper)**
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Outcomes:
After completion of this course, students would be able to:

- Differentiate various building materials in terms of their types, properties, defects, processes and uses
- Describe various manufacturing processes of various building materials.
- Justify the applications of different building materials in construction

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Requirements of Building Materials and Products:** Functional, Aesthetical and Economical. **Study of Properties of Materials:** Physical, Mechanical, Chemical, Biological and other Engineering Properties.	05
2.	**Materials for masonry work:** **Stones** - Types, Properties, Testing, Qualities of Good Stones, Quarrying, Surface Finishing, Preservative Treatments. **Brick and concrete blocks** - manufacturing process, qualities, properties, Testing and uses. **Miscellaneous materials** – Siporex blocks, fly ash blocks, (manufacturing process, properties and civil engineering uses) etc.	07
3.	**Binder Material:** Lime, Cement – types, properties, manufacturing process, testing and Manufacturing Process, Mortar and concrete - Ingredients, Types and Uses, Grouts.	07
4.	**Steel:** Types – mild steel, cast iron, wrought iron, stainless steel, TOR steel, galvanised iron, etc. Different forms of steel used in construction – bars, flats, structural steel sections, hot rolled, cold formed, etc.	05

5.	**Timber**: General, classification, structure, qualities of good timber, defects in timber, strength of timber, decay of timber, preservative treatment and wood composites	08
6.	**Flooring and Roofing Materials:** Types of floor finishes, suitability, Types of Roofing materials, suitability.	02
7.	**Paints and Varnishes**: Types, constituents, methods, defects and uses	02
8.	**Construction Chemicals:** Water proofing and termite proofing materials, Chemicals for concrete Repairs, Concrete Admixtures, Sealants	04
9.	**Miscellaneous Materials**: Glass: types and uses, plastic, fibre-reinforced concrete, asphalt, bitumen, micro silica, PVC, Plaster of Paris, non-ferrous metals	05
	Total	**45**

Text Book:

1. S. K. Duggal, "Building Materials", *New Age International, 2009*

Reference Books:

1. P.C. Varghese, "Building Materials", *PHI Leaning Pvt. Ltd.*,2005.
2. S.C. Rangawala, "Engineering Materials", *Charotar Publishing House Pvt. Ltd.,2012.*

Any other information: NIL

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term work:
Term work should consists of the following:

1. Minimum eight assignments covering the prescribed syllabus.
2. Report of minimum six experiments performed from the list given below:
   - Physical tests on cement (Fineness, consistency, setting time, compressive strength, soundness test)
   - Tests on bricks (Compressive strength test and water absorption test)
   - Tests on siporex block (Compressive strength test and water absorption test)

- Tests on concrete block (Compressive strength test and water absorption test)
- Tests on timber (Compressive strength test parallel to grains and perpendicular to grain, moisture content test, flexural strength test)
- Tests on tile (Flexural strength test, water absorption test)
- Tests on fine aggregates (Bulking, silt content, water absorption, specific gravity)
- Tests on course aggregates (Water absorption, specific gravity)

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Program: B. Tech. Integrated (Civil Engineering)				Semester : III	
Course/Module: Construction Engineering				Module Code: BTICI03002	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks – 50)	Term End Examinations (TEE) (Marks- 100 in Question Paper)
3	0	2	4	Marks Scaled to 50	Marks Scaled to 50

Objectives:

- To impart the knowledge of various construction processes
- To know the manufacturing processes of various building materials
- To impart knowledge about application of building materials in construction

Outcomes:

After completion of this course, students would be able to:

1. Differentiate various building materials in terms of their types, properties, defects, processes and uses
2. Describe various manufacturing processes of various building materials.
3. Justify the applications of different building materials in construction

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Types of Structures:** Load bearing & Framed structures, their suitability and economic aspects, introduction to building components	04
2.	**Foundations:** Functions, Requirements, Types – strip footings, columns footings, isolated and combined, raft foundations, pile foundations, well foundation and cessions.	08
3.	**Masonry Constructions:** Stone Masonry - Types, Joints, Lifting appliances, Permissible loads, Supervision during construction, Maintenance Brick Masonry - Terminology, Art of brick laying, tools for brick works, Bonds, Junctions, Typical structural members in brickworks, columns/piers, footings, thresholds, jambs, window sills, corbels, Defects in brick masonry, Supervision of brick masonry works, Comparison of brick masonry and stone masonry Composite Masonry- Stone composite masonry, Brick-Stone composite masonry. Reinforced brick masonry and Concrete block masonry	12

	Masonry Finishes - Plastering, Pointing, Painting and Other Decorative finishes	
4.	**Reinforced Cement Concrete:** Grades of Concrete and steel, ingredients, mixing, types of mixers, transportation and placement, compaction, types of vibrators, curing, various methods for curing. Formwork – materials used, requirements and design considerations, centering and scaffolding, types and material used.	07
5.	**Floors and Roofs:** Floors - Construction of ground floor and Upper floors, floor finishing – types and methods. Roofs - Features of good roofs, Classification of roofs, wooden and steel trusses, Roof covering, Drainage	04
6.	**Doors and Windows:** Terminology, types, suitability, approximate sizes, fixtures and fittings.	04
7.	**Staircases:** Types, terminology, types, requirements, geometric design, Ramps, Escalators, Lifts	04
8.	**Shotcrete and grouting:** Process, equipment used	02
	Total	**45**

Text Book:

1. P.C. Varghese, "Building Construction", *PHI Leaning Pvt. Ltd., 2007.*

Reference Books:

1. Don Arthur Watson, "Construction Materials and Processes", *Tata McGraw Hill* , 2007.
2. S.C. Rangawala, "Building Construction", *Charotar Publishing House Pvt. Ltd., 2009.*

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Any other information: NIL

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term work:
Term work should consists of the following:

1. Minimum five assignments covering the prescribed syllabus.
2. Minimum eight A3 size drawing sheets indicating details of various building components

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Program: B. Tech. Integrated (Civil & Mechanical Engg.)				Semester : III	
Course/Module: Engineering Mechanics				Module Code: BTICI03003	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks – 50)	Term End Examinations (TEE) (Marks- 100 in Question Paper)
3	0	2	4	Marks Scaled to 50	Marks Scaled to 50

Outcomes:

After completion of this course, students would be able to:

- Determine moment of inertia for plane areas
- Analyse pin jointed frames
- Evaluate the velocity, acceleration and displacement of a moving body
- Analyse the forces developed on the moving body

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Moment of inertia of plane areas:** Moment of inertia of plane areas, parallel axis theorem. Introduction to polar moment of inertia, product of inertia and mass moment of inertia.	04
2.	**Analysis of pin jointed plane frames:** Perfect truss, method of joints, and method of section.	06
3.	**Forces in space:** Rectangular components of forces in space, resultant of concurrent forces, moment of a forces about a point and a given axis, resultant of general force system, Equilibrium of a particle in space.	07
4.	**Principle of virtual work:** Application to determine the reactions of determinate beams with/ without internal hinges	04
5.	**Kinematics of particle:** Motion along plane curved path, tangential and normal component of acceleration, simple harmonic motion. **Kinematics of rigid bodies:** Translation, pure rotation and plane motion of rigid bodies, instantaneous centre of rotation for the velocity for bodies in plane motion, link mechanisms (upto two links).	10
6.	**Kinetics of particles:** Newton's laws of motion, D'Alembert's principle, equation of dynamic equilibrium, linear motion, curvilinear motion. **Kinetics of rigid bodies:** D'Alembert's principle for bodies under translational motion, rotational motion about a fixed axis and plane motion Application to motion of bars, cylinders, spheres.	08

7.	**Energy and momentum principles:** Work done by a force, potential and kinetic energy, power, work energy equation, principle of conservation of energy, momentum, principle of conservation of momentum, impact of solid bodies, elastic impact, semi-elastic impact and plastic impact.	06
	Total	**45**

Text Book:

1. N. H. Dubey (2014), "Engineering Mechanics", *Tata McGraw Hill*
2. R. C. Hibbler (2004), ''Engineering Mechanics'', *McMillan Publishers*

Reference Books:

1. F. L. Singer (1954), "Engineering Mechanics", *Harper & Raw Publication* (Classic book)
2. Beer & Johnson (2011), "Engineering Mechanics", *Tata McGraw Hill*
3. D. S. Kumar (2009), ''Engineering Mechanics'', *Tata McGraw Hill*
4. Macklin & Nelson (2012), ''Engineering Mechanics'', *Tata McGraw Hill*
5. A. K. Tayal (2008), ''Engineering Mechanics'', *Umesh Publication*
6. E. W. Nelson, Charles L. Best, W.G. Mclean, Merle Potter (2010), "Schaum's outlines on Engineering Mechanics -Statics", *Tata McGraw Hill*

Any other information: NIL

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term work:
Term work should consists of the following:

1. Minimum eight assignments covering the prescribed syllabus.

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Program : B. Tech. Integrated (All Branches)				Semester : III	
Course/Module: Engineering Mathematics-I				Module Code : BTICI03004	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks – 50)	Term End Examinations (TEE) (Marks- 100 in Question Paper)
3	0	2	4	Marks Scaled to 50	Marks Scaled to 50

Objectives:

- To impart knowledge of complex numbers and its applications to solve Engineering problems.
- To provide an understanding of principles of vector algebra, single variable and multivariable calculus.

Outcomes:

After completion of this course, students would be able to:

- Understand the concepts of complex numbers, hyperbolic functions, Mean value theorems and vector products to solve Engineering problems.
- Express functions in series using Taylor's and Maclaurin's expansions, and evaluate limits of indeterminate forms using L' Höspital's Rule.
- Find partial derivatives of functions and carry out the knowledge to error and approximations, maxima and minima.
- Apply the concepts such as gradient, directional derivative, curl and divergence to solve real life problems.

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
8.	**Complex Numbers:** Introduction to complex numbers, modulus and amplitude of a complex number, Argand's diagram, cartesian, polar and exponential forms of a complex number. **Algebra of complex numbers:** equality, addition, subtraction, multiplication and division. De-Moivre's theorem, Roots of complex numbers, Euler's form of circular functions, Hyperbolic functions, relation between circular and hyperbolic functions.	12
9.	**Mean value theorems, Series expansion and Indeterminate forms:** Rolle's theorem, Lagrange's mean value theorem, Cauchy's mean value theorem.	10

	Taylor's formula, Maclaurin's series. **Indeterminate forms:** $\frac{0}{0}, \frac{\infty}{\infty}, 0\times\infty, \infty-\infty, 0^0, \infty^0, 1^\infty$ by L'Höspital's rule.	
10.	**Partial Derivatives and its applications:** Partial Derivatives of two and three variable functions, Partial derivative of composite function, Homogeneous functions in two or three variables, Euler's theorem, error and approximations, Maxima and Minima in 2 variables by second derivative test.	13
11.	**Vectors:** Scalar and vector triple products, Product of four vectors, curves in space, Differentiation of a vector function of a single scalar variable, Theorems on derivatives, concept of tangent vector, scalar and vector point functions, gradient, directional derivative, Curl and Divergence, Irrotational and Solenoidal Fields.	10
	Total	**45**

Text Book:

1. Erwin Kreyszig (2010),"Advanced Engineering Mathematics", *Wiley Eastern Ltd, 10th edition.*

Reference Books:

1. Andreescu Titu, Andrica Dorin (2014), Complex Numbers from A to ... Z, *Birkhäuser Basel Publishers, 2nd edition.*
2. Thomas, Calculus (2014), *Pearson Education, 7th edition.*
3. Howard Anton (2012), "Calculus", *Wiley, 10th edition.*
4. B. V. Ramana (2010), "Higher Engineering Mathematics", *Tata McGraw Hill, 1st edition.*
5. Alan Jeffrey (2003), Handbook of Mathematical Formulas and Integrals, *Academic Press, 3rd edition.*

Any other information: NIL

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term work: As per institute norms

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Program: B. Tech. Integrated (Mechanical, Civil, Computer & EXTC)				**Semester:** III	
Course/Module: Engineering Chemistry				**Module Code:** BTICI03005	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 50)**	**Term End Examinations (TEE) (Marks - 100 in Question Paper)**
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50

Objectives

1. To introduce basic principles of chemistry such as functional group identification, properties of solutions, and reaction stoichiometry.
2. To familiarize the concepts and applications of fuels, polymers, and e-waste management.

Outcomes:

After completion of the course, students would be able to:

1. Identify different functional groups of compounds and various organic reactions associated with it.
2. Identify the importance of various classes of polymers and applications in daily life.
3. Classify different types of fuels and lubricants based on their properties and applications;
4. Recognize the importance of e-waste management with respect to environment and health hazards and solve numerical problems based on atom economy and distinguish the various formula applied to different types of solutions; interpret reaction stoichiometry and solve numerical problems.

Detailed Syllabus: (per session plan)

Unit	Description	Duration
1.	**Organic Reactions:** Reactions of functional groups: those containing oxygen (-COOH, -OH, -CHO, -C=O); Nucleophilic substitution reaction, Elimination reaction Organic Name Reactions E.g. Aldol & related reactions.	06
2.	**Solutions and Stoichiometry:** Types of solutions and its characteristics, properties of aqueous solutions, different units for expressing concentration of solutions (ppm, ppb, normality, molarity, molality, mole fraction of solute, mass fraction of solute and solvent), empirical and molecular formula from elemental composition, numerical based on empirical formula, normality, molarity, molality molarity.	06
3.	**Fuels & Combustion:** Definition, Classification, characteristics. Calorific Value-Theoretical	06

	& Experimental (Bomb calorimeter). **Solid Fuels**: Coal, proximate and ultimate analysis, Numerical based on analysis of coal. (Dulong formula) and bomb calorimetry. **Liquid fuels**: Mining of Petroleum, Cracking, Reforming, Knocking in IC engines, anti-knocking agents (TEL and MTBE),	
4.	**Lubricants:** Definition, Mechanism of lubrication, Properties- viscosity, viscosity index, flash & fire, cloud & pour points, oiliness, saponification & acid value (numericals based on saponification and acid value)	04
5.	**Polymers:** Introduction and definition of important terms – monomer, polymer, polymerization, degree of polymerization, tacticity, and melting-glass transition temperature. Some commercially important polymers (PP, PVC). **Plastics**: Thermosetting & Thermoplastics, Compounding of plastics, Preparation, properties and applications of commercial plastics (Rubber, Phenol formaldehyde resin).	05
6.	**Environmental Aspects of Chemistry:** **i) Green Chemistry:** Principles of Green Chemistry with examples (Numerical Problems on Atom economy) **ii) E-waste management:** Definition, classification and management of e-waste.	03
	Total	**30**

Text Books:

1. Abhijit Mallick; Chemistry for Engineers, Viva books, 2nd Edition 2017.
2. Palanna.O.G., Engineering Chemistry, Tata McGraw Hill Education. Pvt. Ltd, 2nd Edition 2017.
3. Samir Sarkar; Fuels & Combustion, Orient Longman Pvt. Ltd 3rd Edition 2009.

Reference Books:

1. R.T. Morrison & R. N. Boyd, Organic Chemistry, Prentice Hall, 8th Edition 2016.
2. Johrie. R.; E-waste, TERI Press, 2009.
3. Paul C. Hiemenz & Timothy P. Lodge; Polymer Chemistry, CRC Press, 2nd Edition 2007.

Any other information: NIL

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term work:
Term work should consists of the following:
1. Minimum Eight Lab experiments to be taken.
2. Unit wise assignments to be taken.
3. Presentation/Viva-voce/Quiz to be conducted.

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Program: B. Tech. Integrated (All Branches)				Semester : III	
Course/Module: Constitution of India				Module Code : BTICI03006	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks – 50)	Term End Examinations (TEE) (Marks – -- in Question Paper)
2	0	0	0	Marks Scaled to 50	------

Objective:

- To understand the basic aspects of the constitution of India, the evolution, the directive principle & important provisions.
- To understand the implications of important constitutional provision on Business and Professionals.

Outcomes:

After completion of this course, students would be able to:

- Learn basic aspects of constitution of India.
- Apply Constitutional provision on Business and their Professionals.

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	The Constitution, its evolution and Preamble to the Constitution.	04
2.	Fundamental rights and duties, exceptions with examples, individual responsibilities and duties, application to business.	10
3.	Directive principles of State Policy, its emphasis and its impact as related to business.	04
4.	Indian Judiciary and LokAdalats.	06
5.	Emergency Provisions under Article 352 – 360.	04
6.	Voting behaviour in India and present political scene. Responsibility of Business in relation to the Constitution.	02
	Total	**30**

Text Books:

1. Durga Das Basu (2009), "Indian Constitution", *20th Edition.*

Reference Books:

1. N. A. Palkhiwala (2009), "We the People".
2. Justice Hidayatullah (2009), "Indian Constitution".

Any other information: NIL

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term work:
Term work should consists of the following:

1. Assignments / Case studies.
2. Two class tests.

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SVKM's Narsee Monjee Institute of Management Studies
Mukesh Patel School of Technology Management & Engineering

Program: B. Tech. Integrated (Civil Engineering)				**Semester :** IV	
Course/ Module: Strength of Materials				**Module Code :** BTICI04001	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical** (Hours per week)	**Tutorial** (Hours per week)	**Credit**	**Internal Continuous Assessment (ICA) (Marks – 50)**	**Term End Examinations (TEE) (Marks- 100 in Question Paper)**
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Outcomes:

After completion of this course, students would be able to:

1. Calculate the stresses produced in the deformable bodies
2. Determine the failure criteria when body is subjected to various stresses
3. Evaluate the deformations of the various determinate beams
4. Carry out testing of different metals and determine the material properties

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Tension, Compression and Shear:** Mechanical properties of materials such as elasticity, plasticity and creep, Linear Elasticity, Hooke's Law and Poisson's ratio, normal stress and strain, shear stress and strain, Allowable stresses and allowable loads, factor of safety, material constants.	04
2.	**Axially Loaded Members:** Changes in the length of members having uniform and non-uniform cross-section, statically indeterminate members, thermal effects, misfits and pre-strain, tri-axial state of stress.	08
3.	**Torsion:** Torsional deformation of a circular bar of linearly elastic materials, non-uniform torsion, transmission of power by circular shaft, statically indeterminate torsional members.	06
4.	**Shear Force and Bending Moments in beams:** Types of beams, loads and reactions, shear force and bending moments, relationships between loads, shear force and bending moments, shear force and bending moment diagrams for beams with and without internal hinges.	10
5.	**Stresses in beams:** Pure bending and non-uniform bending, curvature and longitudinal strains in beams, normal stresses in beams having linearly elastic materials, composite beams, shear stresses in beams, shear stress variation across the section for rectangular, circular, triangular, flanged sections having at least one axis of symmetry, design of beams for bending and shear.	10

6.	**Analysis of stresses:** Plane stress, stresses on inclined sections, principal stresses and maximum shear stresses, Mohr's circle for plane stress	07
	Total	**45**

Text Book:

1. James M. Gere, Barry J. Goodno, "Mechanics of Materials – SI Edition", *Cengage Learning, 2012*

Reference Books:

1. Andrew Pytel, Jaan Kiusalaas, "Mechanics of Materials – Second Edition", *Cengage Learning, 2011.*
2. Ferdinand P. Beer, E. Russell Johnston Jr., John T. DeWolf, "Mechanics of Materials – Third Edition", *Tata McGraw Hill*, 2008.
3. William Nash, Merle Potter, "Schaum's Outline of Strength of Materials, Fifth Edition", *McGraw Hill Professional, 2010*

Any other information: NIL

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term work:

1. Minimum five assignments covering the prescribed syllabus
2. Report of minimum six experiments performed in the laboratory as per below:
   - Tension test on mild steel rod.
   - Tension test on tor steel rod.
   - Bend and re-bend test on bars.
   - Transverse test on cast iron specimen.
   - Shear test on cast iron specimen.
   - Torsion test on mild steel / cast iron specimen.
   - Brinell hardness test on metal specimens.
   - Rockwell hardness test on metal specimens.
   - Charpy impact test on metal specimens.
   - Izod impact test on metal specimens.

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Program: B. Tech. Integrated (Civil Engineering)				Semester: IV	
Course/ Module: Surveying - I				Module Code : BTICI04002	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks – 50)	Term End Examinations (TEE) (Marks- 100 in Question Paper)
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Outcomes:

After completion of this course, students would be able to:

1. Describe the measurement techniques in different types of surveys
2. Take measurements for plotting the positions of distinctive features and carry out calculations from the observations of surveying
3. Operate different instruments used in surveying for carrying out basic surveying and levelling

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Introduction:** Definitions, principle, Various types of surveys – based on methods and instruments, classifications, uses, necessity and use of various scales and verniers. Different types of ranging, tapes, chains, Linear measurements, approximate, direct, optical and electronic methods, Chain surveying, minor instruments for setting out right angle.	08
2.	**Compass Surveying:** Definitions, Principle, Different Types- prismatic, surveyor, Bearings-whole circle, reduced, fore and back bearings, declination, local attraction, plotting of compass survey by different methods and their corrections, Errors, Precautions.	05

3.	**Levelling and Contouring:** Definitions, technical terms, uses, details of levels such as dumpy, tilting and auto levelling staff, Temporary and permanent adjustments of dumpy and auto level, corrections curvature, refraction, combine and sensitiveness, reciprocal levelling, collimation and rise & fall method, errors, precautions. Contour – definitions, objectives, contour interval, horizontal equivalent, uses and characteristics of contour lines, methods of plotting contours, direct and indirect methods of contouring, Contour gradient.	12
4.	**Computation of Area and Volume:** Area of a irregular figure by Trapezoidal rule, Mid-ordinate rule, average- ordinate rule, Simpson's rule, various coordinate methods, planimeter. Computation of volume by trapezoidal and prismoidal formula.	05
5.	**Theodolite Surveying:** Objective, various parts of transit theodolite, technical terms, temporary and permanent adjustments of a transit, measuring horizontal and vertical angles, methods of repetition and reiteration, computation of latitude and departure, balancing of traverse by Bow-Ditch's transit rule, third rule and modified transit rules, missing data problems, Precautions in using theodolite, errors in theodolite survey, use of latitude and departure for area calculation, Gales traverse table.	10
6.	**Plane Table Surveying:** Definitions, uses and advantages, Different methods of plane table surveying, Two point problem, Errors in plane table survey, use of telescopic alidade.	05
	Total	**45**

Text Book:

1. Kanetkar and Kulkarni, "Surveying and Levelling", Vol - I and II, *Pune Vidyarthi Griha, Pune* , 2011.
2. N. N. Basak,"Surveying and Levelling", *Tata McGraw Hill, 2010.*

Reference Books:

1. Dr. K. R. Arora, "Surveying" vol - I, II & III", *Standard Book House, New Delhi, 2009.*
2. Dr. B.C. Punmia, Ashok K. Jain, Arun K. Jain, "Surveying Vol. - I, II & III", *Laxmi Publications (P) Ltd., New Delhi, 2005.*

Any other information: NIL

Details of Internal Continuous Assessment (ICA)
Test Marks: 20

Term Work Marks: 30

Details of Term work:

Term work should consists of the following:

1. Minimum five assignments covering the prescribed syllabus
2. Report of minimum six experiments performed in the laboratory as per below:
   - Introduction to measuring instruments
   - Chain Survey- chain and cross staff survey
   - Compass survey
   - Levelling - By height of instrument and rise & fall method
   - Theodolite - Measurement of horizontal and vertical angle
   - Theodolite traversing
   - Plane table surveying
   - Various minor instruments used in surveying
   - Use of planimeter for measuring area of irregular figures

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SVKM's Narsee Monjee Institute of Management Studies
Mukesh Patel School of Technology Management & Engineering

Program: B. Tech. Integrated (Civil Engineering)				**Semester :** IV	
Course/ Module: Engineering Geology				**Module Code:** BTICI04003	
Teaching Scheme				**Evaluation Scheme**	
Lecture (Hours per week)	**Practical** (Hours per week)	**Tutorial** (Hours per week)	**Credit**	**Internal Continuous Assessment (ICA) (Marks – 50)**	**Term End Examinations (TEE) (Marks- 100 in Question Paper)**
3	2	0	4	Marks Scaled to 50	Marks Scaled to 50

Outcomes:

After completion of this course, students should be able to:

1. Explain the relevance of Geology in Civil Engineering
2. Differentiate various types of minerals, rocks with their suitability
3. Discuss the procedure for geological investigation for some of the Civil Engineering Projects

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Introduction:** Scope of Geology, Brief history of formation of earth and earth crust, internal constitutions of earth, relationship of geology to Civil Engineering **Physical Geology:** Introduction, Effect of natural agencies (wind, running water, sub surface water, lakes, oceans, glaciers, organisms, volcanoes, earth quakes) taking part in changing the surface of the earth, Earthquake Belts in India **Structural Geology:** Introduction, Causes of Development of Structures, Structural Elements - Folds, Faults, Joints, Unconformity, Dip, Strike, Outcrop Patterns, Outliers and Inliers, Importance of Structural Elements in Civil Engineering operations.	08
2.	**Mineralogy:** Introduction, Definition of Mineral and Crystal, Mode of Formation of Minerals, Common Rock-Forming Minerals and their Abundance, Different Methods of Study of Minerals, Significance of different Physical Properties in Mineral	10

	Identification, Diagnostic Physical Properties. **Study of Common Rock Forming Minerals:** Quartz Family, Feldspar Family, Augite, Hornblende, Biotite, Muscovite, Calcite, (Properties, Behaviour, Engineering Significance), Significance of Clay Minerals (Fundamentals of process of formation of ore minerals (Coal and Petroleum – Their Origin and occurrence in India)	
3.	**Petrology:** Introduction, Shell Structure of Earth, Definition of Rocks, Classification of Rocks, Sequence of Formation of Different Groups of Rocks, Rock Cycle, Civil Engineering Importance of Petrology. Igneous Rocks – Forms of Igneous Rocks- Plutonic & Hypabasal, Common Igneous Rocks and relation of their Constituent Minerals, Classification of Igneous Rocks, Structure and Textures, Suitability of Igneous Rocks for Building and Foundation, Megascopic Description of Common Igneous Rock Types, Descriptive Study of Common Sedimentary Rocks (Sandstone, Limestone, Shale, Conglomerate, and Breccias) Sedimentary Rocks – Introduction, Classification of Sedimentary Rocks, Common Structures and Textures of Sedimentary Rocks, Descriptive Study of Common Sedimentary Rocks (Granite, Syenite, Diorite, Dolomite, Gabbro, Pegmatite, Dolerite and Basalt. Metamorphic Rocks – Introduction, Metamorphism, Common Structures and Textures of Metamorphic Rocks, Classification of Metamorphic Rocks, Descriptive Study of Common Metamorphic Rocks (Quarzite, Marble, Slate, Thyllite, Gniess, Schist).	11
4.	**Stratigraphy:** Principle of stratigraphy and co-relation, geological time scale, physiographic divisions of India – study of formations occurring in peninsular India.	08
5.	**Ground water:** Sources and zones, water table, unconfined and perched, springs, Factors controlling water bearing capacity of rocks, pervious and impervious rocks, cone of depression and its use in civil engineering, Methods of artificial recharge of ground water,	08

	geology of percolation tank. **Geophysical Investigation:** Necessity, Methods of surface and sub-surface investigations, Importance of Electrical Resistivity Method, Seismic Refraction Method, Preliminary geological investigations, Use of aerial photographs and satellite imageries in civil engineering projects **Engineering Geology:** Geology of dam sites, reservoirs, roads, bridge sites and tunnels (broad outlines), Stability of hills slopes, landslides, their causes and precautions against them	
	Total	**45**

Text Book:

1. Singh Parbin, "Engineering and General Geology", *S. K. Kataria and Sons, 2012.*

Reference Books:

1. K. Mukherjee, "Textbook of Geology", *The World Press Pvt. Ltd.*, 2010.
2. P. C. Varghese, "Engineering Geology for Civil Engineer", *PHI Learning Private Limited,2012.*
3. N. Chenna Kesavullu, "Textbook of Engineering Geology", *Mac Millan Publisher India Ltd.,2009*

Any other information: NIL

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term work:
Term work should consists of the following:

1. Minimum five assignments covering the prescribed syllabus
2. Report of experiments performed in the laboratory as per below:
   - Study of physical properties of the minerals.
     a. Megascopic identification of rock forming minerals – crystalline, crypto-crystalline and amorphous silica and their varieties, Orthoclase, Microcline, Plagioclase, Muscovite, Biotite, Hornblende, Asbestos, Augite, Olivine, Tourmaline, Garnet, Natrolite, Actinolite, Calcite, Dolomite, Gypsum, Corundum, Talc, Fluorite, Kyanite, etc.
     b. Megascopic identification of ore forming minerals - Bauxite, Graphite,

Galena, Pyrite, Hematite, Magnetite, Chalcopyrite, Chromite, coal

- Identification of rocks –
  a. Megascopic identification of Igneous rocks : Granite and its varities, Synite, Dionite, Gabbro, Pegmatite, Porphyry, Dolerite, Rhyolite, Pumice, Trachyte, Basalt and its varieties, Volcanic Breccia, Volcanic Tuffs.
  b. Megascopic identification of Sedimentary rocks : Conglomerate, Breccia, Sandstone and its varieties, Shales, Limestone, Melliolite, Laterite,
  c. Megascopic identification of Metamorphic rocks: Slate, Phyllite, Mica, Schists, Hornblende schists, Granite gneiss and its varieties, Augen gneiss, Marbles and quartzite.
- Study of Structural geological maps

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SCHOOL OF TECHNOLOGY MANAGEMENT * MUKESH PATEL * SVKM'S NMIMS MUMBAI

Program : B. Tech. Integrated (All Branches)				Semester : IV	
Course/ Module: Engineering Mathematics-II				Module Code : BTICI04004	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks – 50)	Term End Examinations (TEE) (Marks- 100 in Question Paper)
3	0	2	4	Marks Scaled to 50	Marks Scaled to 50

Objectives:

- To provide an understanding of Matrices and differential equations in technical subjects.
- To impart knowledge of Beta & Gamma functions and double integrals, its applications to solve engineering problems.

Outcomes:

After completion of this course, students would be able to:

- Solve system of linear equations
- Evaluate problems using Beta and Gamma functions
- Analyse suitable method to solve differential equations
- Relate the concepts of double integral to solve engineering problems.

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Matrices:** Rank of a matrix, Rank by Normal form and Echelon form, Reduction of a matrix A to normal form PAQ, Linear dependence and independence of rows and columns of a matrix over real field. **Applications:** Solving system of linear homogeneous and non-homogeneous equations using Cramer's rule, matrix inversion method, reduction to echelon form.	12
2.	**Beta and Gamma functions:** Definition of Beta and Gamma functions and their properties; Relation between Beta and Gamma functions; Duplication formula.	08
3.	**Ordinary Differential Equations:** Definition of differential equation, order and degree of differential equation, formulation of differential equation. **Solution of differential equation of first order and first degree:** Variable separable method, reducible to variable separable method, Homogeneous differential equation, reducible to homogeneous differential equation, exact differential equation	15

	and those which can be reduced to exact form using integrating factor (four rules), Linear differential equations, Bernoulli's differential equation. **Solution of Linear differential equations of higher order with constant coefficients:** Complementary functions, Particular integrals of the differential equations of the type $f(D)y = X$ where $X = e^{ax}, \sin(ax+b), \cos(ax+b), x^m, e^{ax}V(x), xV(x)$. Applications of differential equations in modelling: First-order Equations, Free Mechanical Oscillations, Forced Mechanical Oscillations.	
4.	**Double Integration:** Double integration in cartesian and polar co-ordinates, evaluation of integrals over a given region, change of order of integration, change of co-ordinate system, application of double integration to compute area, mass of a lamina and volume.	10
	Total	**45**

Text Books:

1. Robert Wrede (2010), Murray Spiegel, *Schaum's Outline of Advanced Calculus, Third Edition.*
2. B. S. Grewal (2013), "Higher Engineering Mathematics", *Khanna Publishers.*

Reference Books:

1. Erwin Kreyszig (2010), "Advanced Engineering Mathematics", *Wiley Eastern Ltd, 10th edition.*
2. Howard Anton (2012), "Calculus", *Wiley, 10th edition.*
3. G. Birkhoff and G. C. Rota, Ordinary Differential Equations (2003), *4th Edition, Wiley Singapore Edition.*
4. Alan Jeffrey (2003), Handbook of Mathematical Formulas and Integrals, *Academic Press, 3rd edition.*

Any other information: NIL

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term work:
As per institute norms.

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Program: B. Tech. Integrated (All Branches)				Semester: IV	
Course/ Module: Engineering Physics				Module Code : BTICI04005	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks – 50)	Term End Examinations (TEE) (Marks- 100 in Question Paper)
2	2	0	3	Marks Scaled to 50	Marks Scaled to 50

Objectives

- To enable the students understand the basic principles of physics, making them meet the needs of engineering and technology.

Outcomes

After completion of this course, student would be able to:

- Apply the concept of interference, diffraction in various engineering applications.
- Understand the quantization effect in reduced dimensional materials and their consequences.
- Implement the concepts of clean energy for power generation.
- Illustrate the usage of nanomaterial in various applications.

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Optics:** Interference: Analytical treatment of interference. Interference in thin film in reflected system. Wedge shaped film. Newton's rings and applications. Diffraction: Fraunhoffer's diffraction at single slit, double slits, N Parallel slits (multiple slits). Diffraction grating, resolving power of grating, dispersive power of grating.	08
2.	**Quantum physics:** The origin of quantum theory, Blackbody radiation, Wein's law, Rayleigh- Jeans Law, Stefen's law, Plank's theory, dual nature of radiation. Wave nature of Matter: De Broglie's hypothesis, Davisson-Germer Experiment, the double slit experiment with particles, the need for a wave function, Born's interpretation of the wave function. Wave Packets and Uncertainty Principle: General statement of Heisenberg's Uncertainty Principle, Energy-Time and Position-momentum uncertainty relation and its applications.	08
3.	**Energy technology :** Need for clean energy, different methods for obtaining clean energy viz. nuclear energy (including basics of nuclear physics like	06

	fission and fusion etc.) solar cells (including conventional and Nano material based solar cells), hydrogen fuels and wind mills. Advantages and limitations of each method.	
4.	**Introduction to Nanotechnology:** Definition of nanotechnology, quantum confinement effect [how the material properties differ as the size is reduced: Coloumb Blockade, Surface plasmon resonance, some basic Nano materials like carbon nanotubes, graphene, quantum dots, applications of nanotechnology (scratch resistance coatings, clothing, antimicrobial applications, drug delivery, IC technology), Nano-toxicity (basic idea). Scanning and Transmission electron microscopes, Scanning Tunneling Microscope, Atomic Force Microscope.	08
	Total	**30**

Text Books:

1. Jenkins and White (2013), Optics, *MC Graw Hill.*
2. Arther Beiser (2009), Concept of Modern Physics, *Tata McGraw Hill, 6th edition.*

Reference Books:

1. Halliday and Resnick (2014), Fundamentals of Physics, *Wiley India, 10th edition.*
2. L. I. Schiff (1968), Quantum Physics, *McGraw Hills.*
3. V. V. N. Kishore (2009), Renewable Energy Engineering and Technology – A Knowledge Compendium, *TERI Press.*
4. Sulabha K. Kulkarni (2011), Nanotechnology: Principles and Practices, *Springer.*
5. Richard P. Feynman (2011), Feynman lectures on physics, *The New Millennium Edition.*
6. Dattu R Joshi (2010), Engineering Physics, *Tata McGraw Hill, 1st Edition.*

Any other information: NIL

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term work:
As per Institute norms.

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Program : B. Tech. Integrated (All Branches)				Semester : IV	
Course/ Module: Numerical Techniques				Module Code: BTICI04006	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks – 50)	Term End Examinations (TEE) (Marks- 100 in Question Paper)
3	0	2	4	Marks Scaled to 50	Marks Scaled to 50

Objectives:

- To bring awareness of various numerical techniques to solve Engineering problems.

Outcomes:

After completion of this course, students would be able to:

- Analyse error in numerical data.
- Solve algebraic, transcendental and system of linear equations using different numerical techniques.
- Understand the concept of interpolation and regression.
- Apply the techniques learnt in numerical differentiation and integration to solve engineering problems.
- Evaluate ordinary differential equation numerically.

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Introduction to Numerical Computing:** Introduction, Types of Errors: Absolute error, Relative error, Percentage error, Round-off error, Truncation error.	02
2.	**Roots of Equations:** Bisection Method, False Position Method, Newton-Raphson Method, Secant Method, Convergence of Numerical Methods.	10
3.	**Systems of Linear Algebraic Equations:** Gaussian Elimination Method, Gauss Jordan Method, Gauss Seidel Method, Jacobi Method.	06
4.	**Interpolation:** Finite Differences, Forward Differences, Backward Differences, Newton's Forward Interpolation, Newton's Backward Interpolation, Lagrange's Interpolation. Application of this technique to estimate data type such as income, distance, production etc.	07
5.	**Curve Fitting:** Method of Least Square to fit the straight line and the parabola.	03
6.	**Numerical differentiation & Integration:**	09

	Derivatives using Forward and Backward difference formula, Trapezoidal Rule for Numerical Integration, Simpson's 1/3 Rule, Simpson's 3/8 Rule. Application to estimate the distance covered in given time and volume of a solid.	
7.	**Solution to Ordinary differential equations:** Picard's method, Taylor series method, Euler's method, Fourth-Order Runge-Kutta method.	08
	Total	**45**

Text Books:

1. E. Balagurusamy (2008), Numerical Methods, *Tata-Mc Graw Hill.*

Reference Books:

1. S. S. Sastry (2007), Introductory methods of Numerical Analysis, *PHI, 5th edition.*
2. B. S. Grewal (2010), Numerical Methods in Engineering & Science with Programs in C & C+ +, *Khanna Publishers.*
3. John Heinbockel (2004), Numerical Methods for Scientific Computing, *Trafford Publishing.*

Any other information: NIL

Details of Internal Continuous Assessment (ICA)
Test Marks: 20
Term Work Marks: 30

Details of Term work:
As per institute norms.

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

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SVKM's Narsee Monjee Institute of Management Studies
Mukesh Patel School of Technology Management & Engineering

Program: B. Tech. Integrated (Civil Engineering)				**Semester :** V	
Course : Surveying - II				**Code :** BTICI05001	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours Per week	**Practical Hours Per week**	**Tutorial Hours Per week**	**Credit**	**Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)**	**Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)**
3	2	0	4	Scaled to 30 marks	Scaled to 70 marks

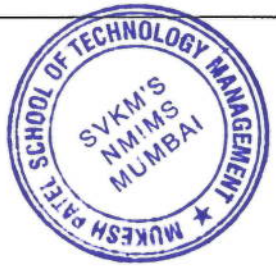
Outcomes:

After completion of this course, students would be able to:

- Determine the horizontal and vertical distances using tachometric survey
- Describe the procedure for setting up of curves in field
- Operate modern equipments for surveying
- Execute various special surveying techniques in the field projects

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Tacheometric surveying:** Principles and uses, advantages, stadia formula, different methods of tacheometer, subtense bar method, location details by tacheometer, stadia diagram and tables, error and accuracy in tacheometric survey.	12
2.	**Curves:** Definitions of different terms, necessity and types of curves, Simple circular curves and compound curves, linear methods of setting out of curves, Angular methods for setting out of curves, two theodolite and Rankine's deflection angle methods, Reverse and transition curves, their properties and their advantages, design of transition curves, shift, spiral angle, Composite curves , setting out of curve by angular method, composite curve problems, Vertical curves – definitions, geometry and types, tangent correction and chord gradient methods, sight distance on a vertical curve, difficulties in setting out curves and solutions for the same.	15



3.	**Modern Surveying instruments:** Electronics in surveying, general principles used in the instruments. Electronic distance measurements – types, principles, applications in surveying, corrections for field observations, Electronic digital theodolite – types, uses and application, Total Station, Use of computer in survey work for level computation and plotting contour plan ,Introduction to GPS	07
4.	**Precision Levelling:** Precise level and levelling staff, field procedure for precise levelling, field notes.	04
5.	**Setting out works:** General horizontal and vertical control, setting out the foundation plan for load bearing and framed structure, batter board, slope and grade stakes, setting out with theodolite, Setting out culvert, Setting out centre line for tunnel, transfer of levels of underground work, Project / route survey for bridge, dam and canal. Checking vertically of high rise structures.	07
	Total	**45**

Text Book:

1. Kanetkar and Kulkarni (2011),"Surveying and Levelling", Vol I and II, *Pune Vidyarthi Griha, Pune*
2. Dr. K.R. Arora (2009)," Surveying " vol.I, II & III", *Standard Book House, New Delhi*

Reference Books:

1. Dr. B.C. Punmia, Ashok K. Jain, Arun K. Jain (2005), "Surveying" Vol .I,II and III , *Laxmi Publications (P) Ltd., New Delhi*
2. N. N. Basak (2010),"Surveying and Levelling", *Tata McGraw Hill*

Term Work:

Term work should consists of the following

1. Minimum five assignments covering the prescribed syllabus
2. Report of minimum six experiments performed from the list given below

List of Experiments :

1. Determination of Tacheometric constants
2. Height and distance calculation using tacheometric formulae
3. To set out circular curves by linear method
4. To set out circular curve by angular method
5. Setting out a simple foundation plan in the field
6. Study of modern surveying instruments
7. Determination of RL and horizontal distance of object by one plane method
8. Determination of RL and horizontal distance by of object by two plane method

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

SVKM's Narsee Monjee Institute of Management Studies
Mukesh Patel School of Technology Management & Engineering

Program:	B. Tech. Integrated (Civil Engineering)			Semester : V	
Course :	Fluid Mechanics - I			Code : BTICI05002	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
2	2	0	3	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Illustrate the different properties of fluids
- Differentiate the concepts of fluid statics, kinematics and dynamics
- Calculate the flow using different flow measuring devices

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Properties of Fluids** Mass density, weight density, specific gravity, specific volume, viscosity, compressibility, bulk modulus, surface tension, capillary action, vapour pressure, types of fluids, basic concepts.	05
2.	**Fluid Statics** Pascal's Law, pressure variation in fluid at rest, absolute, atmospheric, gauge pressure, measurement of pressure and hydrostatic forces on plane and curved surfaces.	05
3.	**Buoyancy and Floatation** Archimedes principle, metacentre, metacentric height, equilibrium of floating and submerged bodies.	03
4.	**Fluid Kinematics and Dynamics** Description of fluid flow: Lagrangian method, Eulerian method, streamlines, pathlines, streaklines, and classification of fluid flows, continuity equation, rotational flow, rotation and vorticity, velocity and stream function, circulation, flow net, Euler's equation, Bernoulli's theorem and its application to real fluid.	07
5.	**Flow Measurement - I** Venturimeter, nozzle meter, pitot tube, rotameter. Orifices: hydraulic coefficients, small and large orifices, time of emptying of tank through orifices.	05

6.	**Flow Measurement - II** Mouthpieces: external, convergent, Borda's mouthpiece. Notches and weirs: rectangular, triangular, Cipolleti weirs, velocity of approach, end contraction.	05
	Total	30

Text Book:

1. Modi P.M. and Seth S.M. (2015), "Hydraulics and Fluid Mechanics", *Standard Book House*

Reference Books:

1. Victor Lyle Streeter, E. Benjamin Wylie (1985), "Fluid Mechanics", McGraw- Hill. (Classic Book)
2. Bansal R.K. (2015), "Hydraulics and Fluid Mechanics", *Laxmi Publications.*
3. Subramanaya K., (2010), "Theory and Applications of Fluid Mechanics", *Tata McGraw Hill.*

Term Work:

Term work should consist of the following

- Minimum five assignments covering the prescribed syllabus
- Report of minimum six experiments performed in the laboratory from the list given below.

List of Experiments:

1. Verification of Archimedes principle
2. Verification of Bernoulli's theorem
3. Calibration of Rotameter
4. Determination of metacentric height
5. Calibration of Orifice
6. Calibration of notches
7. Calibration of Venturimeter
8. Calibration of broad crested weir
9. Calibration of submerged weir
10. Calibration of Nozzlemeter

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Program: B. Tech. Integrated (Civil Engineering)				Semester : V	
Course : Concrete Technology				Code : BTICI05003	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	2	0	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Identify the properties of ingredients of concrete and its effect on the performance of the concrete
- Perform the mix design of concrete
- Determine different properties of fresh and hardened concrete with the help of different tests for concrete

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Properties of Aggregates:** Properties of coarse and fine aggregates and their influence on concrete, types of cement and their use, physical properties of 33 Grade, 43 Grade, 53 Grade ordinary Portland cement, Portland Pozzolana cement, rapid hardening Portland cement, hydrophobic cement, low heat Portland cement and Sulphate Resisting Portland cement as per relevant I.S. codes	08
2.	**Grades of Concrete:** Concrete for ordinary work, light weight concrete, high density concrete, workability, durability and strength requirements, effect of w/c ratio, acceptability criteria, laboratory testing of fresh and hardened concrete, concreting under special conditions, work in extreme weather conditions, under-water concreting.	07
3.	**Concrete Mix Design:** Mix design for compressive strength by I.S. methods, Road Note method and British method, mix design for flexural strength.	05
4.	**High Performance Concrete:** Constituents of high grade concrete, various tests and application of high performance concrete.	05

5.	**Admixtures:** Plasticizers, retarders, accelerators and other admixtures, test on admixtures, chemistry and compatibility with concrete.	05
6.	**Ready Mix Concrete:** Requirements of RMC, transit mixer details, mix design of RMC.	05
7.	**Concrete for Repairs and Rehabilitation of Structures:** Polymer concrete, fiber reinforced concrete, polymer impregnated concrete, polymer modified cement concrete/mortar and ferro-cement, different tests.	05
8.	**Non-Destructive Testing of Concrete:** Hammer test, ultrasonic pulse velocity test, load test, carbonation test, ½ cell potentiometer test, and corrosion test for steel, core test and relevant provision of I.S. codes.	05
	Total	**45**

Text Book:

1. A. M. Neville (2012), "Basic Structural Analysis - Second Edition", *Tata McGraw Hill*

Reference Books:

1. M. L. Gambhir (2006), "Concrete Technology - Third edition", *Tata McGraw Hill*
2. M. S. Shetty (2005), "Concrete Technology: Theory and Practice", *S. Chand*
3. A. R. Santhakumar (2006), "Concrete Technology", *Oxford University Press India*

Term Work:

Term work should consists of the following

1. Minimum five assignments covering the prescribed syllabus
2. Report of minimum eight experiments performed in the laboratory from the list given below

List of Experiments

1. Study of properties of fine and coarse aggregates
2. Physical properties of cement
3. Effect of w/c ratio on workability (slump cone, compaction factor, V-B test, flow table)
4. Effect of w/c ratio on strength of concrete
5. Mix design in laboratory
6. Non destructive testing of concrete – some applications (hammer, ultrasonic)
7. Secant modulus of elasticity of concrete & indirect tensile test on concrete
8. Study of admixtures & their effect on workability and strength of concrete
9. Modulus of rupture of concrete
10. Permeability test on concrete
11. Tests on polymer modified concrete/mortar
12. Tests on fiber-reinforced concrete

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

Program: B. Tech. Integrated (Civil Engineering)				Semester : V	
Course : Building Design and Drawing - I				Code: BTICI05004	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
1	4	0	3	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- draw the working plans of residential buildings
- illustrate principles of planning of residential buildings
- design residential buildings following various bye-laws

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Introduction** Types, importance and significance of building drawings, commonly used symbols, conventions and abbreviations, scales: definition, scales used for various types of drawings, title, margins and size of letters as per IS: sizes of various standard papers, Layout of various views on drawing paper.	02
2.	**Details of Building Drawing** Drawing of details: site plan, line plan, layout plan, detailed plan, services plan, elevation, section, structural plan, importance and purpose of preparing above drawings.	02
3.	**Principles of Planning** For residential buildings: principles of planning such as aspect, prospect, orientation, roominess, grouping, privacy, ventilation, access, circulation, economy, drainage etc.	03
4.	**Building Bye-laws** Building bye-laws for residential buildings, Following important bye-laws for plot area and built-up area, size of rooms, margins, F.S.I., F.A.R., heights, passages, ventilation, circulation, open space, water supply and sanitary, electrification, fire safety, general safety, lifts, environment approval procedure with respect to bye-laws	03

5.	**Planning Residential Buildings** Given situations & plot area; prepare detailed drawing of a double storied residential building (Load Bearing & RCC) i.e line plan, detailed plan, elevation and section, site plan, layout plan of the building Detailing of RCC members: foundation details, plinth level plan, floor level plan, terrace level plan	05
	Total	**15**

Text Book:

1. Shah M. G., Kale C. M., Patki S. Y. (2011), "Building Drawing", *Tata McGraw Hill*

Reference Books:

1. Dr. N Kumara Swamy and A. Kameswara Rao (2015), "Building Planning and Drawing", *Charotar Publishing House Pvt. Ltd.*
2. Bureau of Indian Standards (2005), "National Building Code of India", *BIS Publications*

Term Work:

Term work should consists of following

1. Planning and design of two residential buildings designed as
   - Load bearing structure having ground plus one floor with pitched roof
   - RCC framed structure having ground plus one floor
2. Minimum five A1 size drawing sheets - Working Drawing, drawn independently for the two structures designed as mentioned above, showing floor plans and sections and structural details.

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

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Program: B. Tech. Integrated (Civil Engineering)				Semester : V	
Course : Fundamentals of Structural Analysis				Code : BTICI05005	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
2	0	2	3	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- draw SFD, BMD for rigid jointed frames
- determine stresses developed in various structures
- evaluate the strain energy stored and deflections of structures

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1	**Axial Force, Shear Force and Bending Moment Diagrams for frames** AFD, SFD and BMD for statically determinate rigid jointed frames with and without internal hinges.	08
2.	**Deflections of Beams** Moment curvature relationship, deflection of cantilever, simply supported and overhanging beams for different types of loadings using double integration method and Macaulay's method.	08
3.	**Strain Energy** Strain energy in axially loaded members, members under bending, shear, circular members in torsion, stresses due to axial load & impact load, complementary energy, application to beams, rigid jointed frames and pin jointed frames.	04
4.	**Analysis of Structures Subjected to Axial Loads and Bending** Core of a section, determination of resultant stresses developed due to combined axial and bending, application to columns subjected to eccentric loads, chimneys, retaining walls, dams, etc.	06

5.	**Analysis of Thin Pressure Vessels** Stresses and strains in thin cylindrical and spherical shells subjected to internal pressure, cylindrical shells with hemispherical ends.	04
	Total	30

Text Book:

1. Andrew Pytel, Jaan Kiusalaas (2012), "Mechanics of Materials - Second Edition", *Cengage Learning*
2. C. S. Reddy (2010), "Basic Structural Analysis", *McGraw Hill*

Reference Books:

1. Ferdinand P. Beer, E. Russell Johnston Jr., John T. DeWolf (2013), "Mechanics of Materials - Third Edition", *Tata McGraw Hill*
2. William Nash, Merle Potter (2010), "Schaum's Outline of Strength of Materials, Fifth Edition", *McGraw Hill Professional*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

Signature
(Prepared by Concerned Faculty/HOD)

Signature
(Approved by Dean)

Program:	B. Tech. Integrated (All Branches)			Semester: V	
Course:	Engineering Mathematics-III			Code: BTICI05007	
Teaching Scheme				Evaluation Scheme	
Lecture Hours per week	Practical Hours per week	Tutorial Hours per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Objectives:

- To provide an understanding of matrices to solve Engineering problems.
- Impart knowledge of Laplace transforms and Fourier series.

Outcomes:

After completion of this course, the students would be able to:

- Apply Matrices, Laplace transforms, Fourier series to Engineering problems.
- Use the concepts of Matrices, Laplace transforms and Fourier series for solving problems.

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Matrices:** Characteristic equation, Eigen values and Eigen vectors of a square matrix, Cayley-Hamilton Theorem, Similar Matrices, Diagonalization, Functions of a Square Matrix, Quadratic Forms, Reduction of a quadratic form to canonical form using orthogonal transformation.	12
2.	**Laplace transform:** Definition, Laplace transform of $1, e^{at}, \sin at, \cos at, \sinh at, \cosh at, t^n$, Change of scale property, First shifting property, $L\{t^n f(t)\}, L\left\{\frac{f(t)}{t}\right\}, L\left\{\int_0^t f(u)du\right\}, L\{f^n(t)\}$, Inverse Laplace transform, Properties of Inverse Laplace transform, Inverse Laplace using partial fraction and Convolution Theorem. Laplace transforms of Periodic functions, Dirac delta functions, Unit step functions, Second shifting property. Application to solve initial and boundary value problems involving ordinary differential equations.	20

3.	**Fourier Series:** Orthogonality and orthonormality, Definition of Periodic function, Trigonometric Series, Dirichlet's conditions, Euler's formulae (Derivation of Fourier coefficients a_0, a_n, b_n is not expected), Fourier series for the interval $[\alpha, \alpha+2\pi]$ and $[\alpha, \alpha+2c]$, Even and Odd functions, Half range sine and cosine expansions, Parseval's identities.	13
	Total	**45**

Text Books:

1. Glyn James (2010), "Advance Modern Engineering Mathematics", *Pearson Education, 4th edition.*

Reference Books:

1. Erwin Kreyszig (2006), "Advanced Engineering Mathematics", *Wiley Eastern Ltd, 8th edition.*
2. Murray Spiegel (2005), "Schaum's Outline: Advanced Mathematics for Engineers and Scientists", *Tata McGraw Hill.*
3. B.V. Ramana (2010), "Higher Engineering Mathematics", *Tata McGraw Hill, 1st edition.*

Term Work:

As per institute norms.

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT SVKM'S NMIMS MUMBAI

Signature
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Program:	B. Tech. Integrated (Civil Engineering)			Semester : V	
Course :	Entrepreneurship and Management			Code : BTICI05008	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
2	0	0	0	Scaled to 50 marks	----

Outcomes:

After successful completion of this course, students should be able to

- Describe the entrepreneurship and management with its concepts and characteristics.
- Understand entrepreneur talent, work culture and finances.
- Get to know of current Indian entrepreneurship scenario.

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	Definitions of entrepreneurship, concept and characteristics of entrepreneur and entrepreneurship, an ideal entrepreneur, qualities of an entrepreneur, aspects of entrepreneurship, environment for entrepreneurship	04
2.	The entrepreneurial culture : elements of culture, business culture and culture of society, entrepreneurial culture, cultural change, socio-economic origins of entrepreneurship, barriers to entrepreneurship, factors affecting entrepreneurship	04
3.	Classification depending on type of business, technology, motivation, growth, stages of development. Entrepreneurial traits and motivation: initiative, entrepreneurial skills, entrepreneurship: sources of supply & motivation, Growth of entrepreneurs, entrepreneurial functions	04
4.	Project development :Project: stages of project, project development cycle, life cycle of project, ISO certification & its importance, search for an idea, preliminary screening, project identification, project Formulation, SWOT analysis, project report, Project appraisal: market, technical, financial and economical, social, ecological, organizational. Tools of analysis: time value of money, compounding & discounting, break-even analysis, payback period, net present value, social cost-benefit analysis Sources & types of finance	05

5.	Present scenario of Indian industry and entrepreneurs, government policies promoting entrepreneurship, institutions in aid of entrepreneurs, finance for entrepreneurs, sources and types of finance, small scale industries related to civil engineering, steps for starting a small scale industry, safety rules & regulations for construction industries, selection of type of own organization, ownership types: sole proprietorship, partnership, private company, public limited company	04
6.	Project accounting: generally accepted accounting principles, book keeping, double entry system and ledger, preparation of income statement and balance sheet	04
7.	Management: concept of management, objectives, basic functions of management, emergence of management thought, brief description of contributions by Fredrick Taylor, Henry Fayol, Elton Mayo and Gilbreth, Principles of organization, forms of organization: line, line & staff, functional and matrix	05
	Total	**30**

Text Book:

1. R. Hisrich & M. P. Peters (2008), "Entrepreneurship", *Tata Mc Graw Hill*
2. Colombo plan Staff College for Technical Education (2012), "Entrepreneurship Development", *Tata Mc Graw Hill*

Reference Books:

1. Vasant Desai (2002), "Dynamics of Entrepreneurial Development & Management", *Himalaya Publishing House*
2. Prasanna Chandra (2001), "Finance Sense", *Tata Mc Graw Hill*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT SVKM'S NMIMS MUMBAI

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SVKM's Narsee Monjee Institute of Management Studies
Mukesh Patel School of Technology Management & Engineering

Program: B. Tech. Integrated (Civil Engineering)				**Semester :** VI	
Course : Geotechnical Engineering - I				**Code :** BTICI06001	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours Per week	**Practical Hours Per week**	**Tutorial Hours Per week**	**Credit**	**Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)**	**Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)**
3	2	0	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Identify the soils and their engineering behavior
- Conduct different tests for assessing soil parameters
- To interpret the engineering behavior of soil from the test results

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Introduction** Definitions: soils, soil mechanics, soil engineering, rock mechanics, Geotechnical Engg: scope of soil engineering, comparison between soil & rock, Formation of Soil: Residual Soils and their zones, Transported soil and its Types	02
2.	**Basic definitions & relationship** Soil as three phase system in terms of weight, volume, void ratio, porosity, Definitions: moisture content, densities, unit weights, degree of saturation, void ratio, porosity, specific gravity, mass specific gravity etc. Relationship between volume-weight, void ratio-moisture content, unit weight-percent air voids, saturation-moisture content, moisture content-specific gravity etc., Determination of various parameters such as moisture content by Oven Dry Method, Sand Bath Method, Radio Active method, Specific gravity by Pycnometer method, Unit weight by core cutter method and sand replacement method.	06
3.	**Plasticity characteristics of soil** Introduction to definitions of: plasticity of soil, consistency limits - liquid limit, plastic limit, shrinkage limit, plasticity, liquidity and consistency indices, flow & toughness indices, sensitivity of clay, Determination of: liquid limit, plastic limit, shrinkage limit, Use of consistency limits.	03

4.	**Classification of soils** Introduction of soil classification:, MIT Classification, Textural Classification, Unified Soil Classification, Indian standard soil classification system, Sieve and sedimentation analysis, particle size distribution- its use and interpretation, Identification: field identification of soils, general characteristics of soils in different groups.	05
5.	**Permeability of soils** Introduction to hydraulic head, Darcy's law, Discharge velocity and seepage velocity and relation between them, factors affecting permeability of soil, Determination of coefficient of permeability, Laboratory methods: constant head method, falling head method, Field methods: pumping-in test, pumping- out test, Permeability of stratified soils.	04
6.	**Seepage analysis** Introduction, stream and potential functions, characteristics of flow nets, graphical method to plot flow nets, use of flow nets, piping failure only introduction	03
7.	**Effective stress principle** Introduction, effective stress principle, nature of effective stress, effect of water table, Fluctuation of effective stress, effective stress in soils saturated by capillary action, seepage pressure, critical hydraulic gradient, quick sand condition.	03
8.	**Compaction of soils** Introduction, theory of compaction, laboratory determination of optimum moisture content and maximum dry density. Standard and Modified Compaction Tests, Factors affecting compaction, Compaction in the field, compaction specification and field control.	03
9.	**Consolidation of soils** Introduction, comparison between compaction & consolidation, initial, primary & secondary consolidation, Terzaghi's spring analogy for mechanism of consolidation, consolidation test results, basic definitions, Terzaghi's theory of consolidation, final settlement of soil deposits, consolidation settlement: one-dimensional method, secondary consolidation.	06

10	**Shear strength** Coulomb's Theory, Principal planes and principal stresses, Mohr's circle, important characteristics of Mohr's circle, Mohr-Coulomb theory, types of shear tests, direct shear test, merits & demerits of direct shear test , tri-axial compression tests, drainage conditions of UU, CU and CD tests, unconfined compression test, vane shear test.	05
11	**Soil Exploration** Introduction, methods of investigation, methods of boring, soil samplers and sampling, number and disposition of borings, borehole logs	05
	Total	**45**

Text Books:

1. VNS Murthy,(2011) "Text Book of Soil Mechanics and Foundation Engineering", *CBS Publishers and Distributers Pvt. Ltd.*
2. Dr.Alam Singh, (2004) "Basic Soil Mechanics and Foundations", *CBS Publishers and Distributers Pvt. Ltd.*

Reference Books:

1. C. Venkatramaiah, (2012) "Geotechnical Engineering", *New age international Ltd.*
2. Gopal Ranjan & A. S. RAO, (2004) "Basic & Applied Soil Mechanics", *New age international Ltd.*

Term Work:

Term work should consists of

1. Minimum five assignments covering the prescribed syllabus
2. Experiments covering syllabus (Minimum six) from the following List of Experiments

List of Experiments:

1. Field density by core cutter method
2. Sand replacement method
3. Sieve analysis and particle size determination
4. Hydrometer analysis
5. Specific gravity determination by Pycnometer
6. Determination of Liquid Limit
7. Determination of Plastic Limit
8. Determination of Shrinkage Limit
9. Determination of co-efficient of permeability by Constant Head
10. Determination of co-efficient of permeability Variable Head Permeameter
11. Direct Shear Test
12. Free Swelling Index Test
13. Measurement of Swelling Pressure of Soil

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

Program:	B. Tech. Integrated (Civil Engineering)			Semester : VI	
Course :	Fluid Mechanics - II			Code :	BTICI6002
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
2	0	2	3	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- analyse the behaviour of liquids in acceleration
- analyse laminar flow
- explain the concepts of dimensional analysis and ideal flow

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Liquids in Relative Equilibrium** Uniform linear acceleration, liquid container subjected to constant horizontal and vertical acceleration, constant rotation with vertical axis.	06
2.	**Laminar Flow - I** Reynold's experiment, critical velocity, steady laminar flow through circular pipes, annulus.	05
3.	**Laminar Flow - II** Parallel plates: stationary and moving, kinetic correction factor, momentum correction factor, Dash pot.	04
4.	**Dimensional Analysis** Dimensional homogeneity, Buckingham's π theorem, Rayleigh's method, dimensionless groups.	05
5.	**Similitude and Model Studies** Similitude, model studies, distorted & undistorted models.	04
6.	**Ideal Fluid Flow** Uniform flow, source and sink, free vortex flow, superimposed flow, doublet, flow past half bodies, Rankine's body and cylinder only.	06
	Total	**30**

Text Book:

1. Modi P.M. and Seth S.M. (2015), "Hydraulics and Fluid Mechanics", *Standard Book House*

Reference Books:

1. Victor Lyle Streeter, E. Benjamin Wylie (1985), "Fluid Mechanics", McGraw-Hill. (Classic Book)
2. Bansal R.K. (2015), "Hydraulics and Fluid Mechanics", *Laxmi Publications.*
3. Subramanaya K., (2010), "Theory and Applications of Fluid Mechanics", *Tata McGraw Hill.*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT
SVKM'S NMIMS MUMBAI

Signature
(Approved by Dean)

Program: B. Tech. Integrated (Civil Engineering)				Semester : VI	
Course : Construction Equipment and Techniques				Code : BTICI06003	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Determine the optimal use of the equipment, owning, operating and maintenance & repair costs of the equipments
- Select the appropriate equipment based on construction activity
- Describe the tunneling process and machinery involved in detail.

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Construction equipment:** Standard types of equipment, special equipment, cost of owning and operating equipment, depreciation costs, economic life, factors affecting selection of construction equipment, balancing of equipment. Study of equipments with reference to available types and their capacities, operations and factors affecting their performance	06
2.	**Earthmoving and hauling equipment:** Earthmoving and hauling equipment: tractors and attachments, dozers and rippers, scrapers, shovels, draglines, trenching machines, clamshell, hoes, trucks and wagons, dumpers, dozers, trenching machines, rollers and compactors. Builder's hoists, forklifts, cranes, belt-conveyors, cableways, ropeways	08
3.	**Drilling and blasting equipment, Pile driving equipment and Stone crushing equipment:** • Bits, jackhammers, drifters, drills, blasting material, firing charge, safety fuse, electric blasting caps, drilling patterns, transporting and handling of explosives • Types, pile driving hammers: single acting and double acting, differential acting hammers, hydraulic and diesel hammers, vibratory pile drivers • Jaw, gyratory and cone crushers, hammer mills, roll crushers, rod and ball crushers, aggregate screens and screening plants, portable plants	07

4.	**Tunnelling:** Selection of alignment, methods of tunnelling in soft soils and in hard rock, tunnel boring machines, mucking, ventilation of tunnels, dust control, types of tunnel supports and sequence of lining operation.	08
5.	**Soil stabilization techniques:** Soil stabilization techniques: sand drains, stone columns, use of geotextiles and chemicals, diaphragm wall, rock anchors, foundation grouting.	06
6.	**Concrete:** Mass concreting, vacuum concrete, forms for concrete construction: slip forms, collapsible forms, forms for cantilevers, concrete mixers	08
7.	**Different types of cladding:** Fixing and maintenance arrangements	02
	Total	**45**

Text Book:

1. Peurifoy, Schexnayder, and Shapira (2010), "Construction Planning, Equipment and Methods", *McGraw Hill.*
2. S C Sharma (2002), "Constrution Equipment and Its Management", *Khanna Publications*

Reference Books:

1. C. B. Navalkar (2005), "Textbook on Explosive Engineering – Blasting Technology & Explosive Applications, Basics, State of the Art & Instrumentation", *SEMCONS Consultants*
2. S Seetharaman, Umesh (2000), "Construction Engineering & Management", *S Chand, New Delhi*

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

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(Approved by Dean)

Program: B. Tech. Integrated (Civil Engineering)				Semester : VI	
Course : Building Design and Drawing - II				Code : BTICI06004	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
1	4	0	3	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- plan and develop the drawings of public buildings
- explain the concept of town planning

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Introduction** Planning & design of public buildings such as • Buildings for education: schools, colleges, institutions, libraries • Buildings for health and hospitality: hospitals, health centres, dispensaries, maternity homes, sanatoriums • Hostels, hotels, boarding houses, rest houses	08
2.	**Architectural planning** Massing and composition, concept of built environment and its application in planning, principles of modular planning, planning as recommended by National Building Organization.	04
3.	**Town Planning** Objectives and principles, master plan, road systems, zoning, green belt, slums development, introduction to green buildings DC rules for local authorities.	03
	Total	**15**

Text Books:

1. Shah M. G., Kale C. M., Patki S. Y. (2011), "Building Drawing", *Tata McGraw Hill*
2. Rangwala (2015), "Town Planning", Charotar *Publishing House Pvt. Ltd.*

Reference Books:

1. Dr. N Kumara Swamy and A. Kameswara Rao (2015), "Building Planning and Drawing", *Charotar Publishing House Pvt. Ltd.*
2. Bureau of Indian Standards (2005), "National Building Code of India", *BIS Publications*
3. Development Control Rules (2012)

Term Work:

- Term work shall consist of minimum five A1 size drawing sheets using details of minimum two different types of public buildings.
- The drawings should include following details: floor plans, elevation, typical section, roof plan, foundation plan, site plan, layout plan with drainage lines and any other typical details.

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

Signature
(Approved by Dean)

Program: B. Tech. Integrated (Civil Engineering)				Semester : VI	
Course : Structural Analysis - I				Code : BTICI06005	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- determine internal forces developed in arches, cables and columns
- evaluate the deflections of beams and frames
- draw ILD for beams

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1	**General Theorems** Theorems relating to elastic structures, principle of virtual work. Castigliano's theorem, Betti's and Maxwell's reciprocal theorems, principle of superposition.	03
2.	**Deflection of Statically Determinate Structures** Deflection of cantilevers, simply supported and overhanging beams for different types of loadings using following methods: Moment area method, conjugate beam, principle of virtual work (unit load method) and Castigliano's theorem, deflection of determinate pin jointed and rigid jointed frames by principle of virtual work (unit load method) and Castigliano's theorem, deflection due to temperature changes, application to beams, pin jointed frames and rigid jointed frames.	16
3.	**Three Hinged Arch** Determination of normal thrust, radial shear force and bending moment for three hinged parabolic and circular arches.	06
4.	**Cables and Suspension Bridges** Simple suspension cable, minimum and maximum tensions in the cable supported at same and at different levels, anchor cable, cable supports, suspension cable with three hinged stiffening girder, shear force and bending moments at any section of the stiffening girder.	06

5.	**Columns and Struts** Short and long/slender columns, concept of buckling in slender columns subjected to axial loads, Euler's and Rankine's design formulae for columns with different support conditions, struts with eccentric loads, lateral loads, struts with initial curvature.	08
6.	**Influence Lines for Statically Determinate Structures** Influence lines for cantilevers, simply supported, overhanging beams and pin jointed truss, criteria for maximum shear force and bending moment at a section, absolute maximum shear force and bending moment under moving loads (UDL and series of point loads) for simply supported beams.	06
	Total	**45**

Text Book:

1. C. S. Reddy (2010), "Basic Structural Analysis", *McGraw Hill*

Reference Books:

1. G. S. Pandit, S. P. Gupta (2008), "Structural Analysis – A Matrix Approach",
   Tata McGraw Hill
2. John Benson Wilbur, Charles Head Norris (2012), "Elementary Structural Analysis", *Literary Licensing*
3. R. C. Hibbeler (2008), "Structural Analysis – Second Edition", *Pearson*
4. Aslam Kassimali (2015), "Matrix Analysis of Structures – Second Edition", *Cengage Learning*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT SVKM'S NMIMS MUMBAI

Signature
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Signature
(Approved by Dean)

Program:	B. Tech. Integrated (All Branches)			Semester:	VI
Course:	Engineering Mathematics-IV			Code:	BTICI06007
Teaching Scheme				Evaluation Scheme	
Lecture Hours per week	Practical Hours per week	Tutorial Hours per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Objectives:

- To provide the understanding and use of Complex variables.
- Acquire knowledge of statistical methods and linear programming problems.

Outcomes:

After completion of this course, the students would be able to:

- Solve problems involving functions of complex variables, random variables, probability distribution, Testing of Hypothesis and operations research.
- Identify the suitable methods of complex variables, random variables, probability distribution, Testing of Hypothesis and operations research to solve real life problems.
- Apply knowledge of complex variables, random variables, probability distribution, Testing of Hypothesis and operations research to Engineering problems.

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Complex Variables :** Functions of Complex Variables Analytic Function, Cauchy-Riemann Conditions for Analytic Functions, Harmonic Functions, Milne-Thompson method to determine analytic function when it's real or imaginary or its combination is given. Conformal transformation: Standard transformations such as translation, rotation and magnification, inversion and reflection. Bilinear transformation, cross ratio, fixed points.	12
2.	**Random Variables:** Discrete and continuous random variables, probability density function, cumulative distribution function, mean, variance, moments and moment generating functions. Relation between raw moments and central moments.	8

3.	**Probability Distribution:** Discrete Probability Distribution: Binomial Distribution, Poisson Distribution, Continuous Probability Distribution: Normal Distribution, Mean and Variance of the above distributions.	8
4.	**Testing of Hypothesis:** Large Sample Tests: tests for mean. Small sample tests: Student's t-test, F- test.	8
5.	**Introduction to Operations Research:** Linear Programming Problems: Problem Formulation, Graphical method, Simplex method, Big-M method.	9
	Total	**45**

Text Books:

1. H. K. Dass (2008) "Advanced Engineering Mathematics", *S. Chand & Co., 18th edition.*
2. J. K. Sharma (2010), "Operations Research Theory and Applications", *Macmillan, 4th Edition.*

Reference Books:

1. Glyn James (2010), "Advance Modern Engineering Mathematics", *Pearson Education, 4th edition.*
2. S. P. Gupta (2007), "Statistical Methods", *Sultan Chand & Sons, 35th Edition.*
3. Erwin Kreyszig (2010), "Advanced Engineering Mathematics", *Wiley Eastern Ltd, 10th Edition.*
4. T. Veerarajan (2008), "Probability, Statistics and Random Processes", *Tata McGraw Hill, 2nd Edition.*
5. V. K. Kapoor (2007), "Operations Research", *Sultan Chand & Sons, 4th Edition.*

Term Work:

As per institute norms.

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SCHOOL OF TECHNOLOGY MANAGEMENT * SVKM'S NMIMS MUMBAI * MUKESH PATEL

Signature
(Approved by Dean)

Program : B. Tech. Integrated (Civil Engineering)				Semester : VI	
Course : Presentation and Communication Techniques				Code : BTICI06008	
Teaching Scheme				Evaluation Scheme	
Lecture Hours per week	Practical Hours per week	Tutorials Hours per week	Credit	Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (------)
2	0	2	0	Scaled to 50 marks	----

Objectives:

- The student will demonstrate an understanding of the cardinal concepts of business communication.
- The student will be able to identify the barriers in organizational communication and proactively overcome them.
- The student will recognize the attributes that devise an effective presentation.
- The student will be able to infer and apply the various strategies in the creation and delivery of presentations especially in a formal set up.
- The student will be able to extend the learning of models and strategies of interviews, meetings and conferences to the professional scenario.

Outcomes:

After completion of the course, students would be able to :

- Employ the postulates of technical writing in a formal set–up.
- Write well-structured resume and application letters based on fundamentals of business correspondence.
- Assess group dynamics and apply leadership skills for effective team building in an organization.
- Analyze the context and select appropriate communication techniques for effective interpersonal communication especially during an interview.

Detailed Syllabus

Unit	Description	Duration
1.	**Communication in a Business Organization** : Internal & External Communication; Channels of Communication. Types of meetings, strategies for conducting successful business meetings, documentation (notice, agenda, minutes, resolutions) of meetings.	06
2.	**A. Advanced technical writing: Report writing** Definition and importance of reports, qualities of reports, language and style in reports, types of reports, formats (letter, memo, project, reports). Methods of compiling data for preparing report. A computer aided presentation of a technical project report based on survey, based or reference based topic. The topics are	10

	to be assigned to a group of 8-10 students. The written report should not exceed 20 printed pages. **B. Presentation Skills**: Elements of an effective presentation, Structure of a presentation, Presentation tools, Audience analysis. Language: Articulation, Good pronunciation, Voice quality, Modulation, Accent and Intonation	
3.	**Interpersonal Skills**: Team Building, Goal Setting and Decision making, Time-Management, Leadership skills.	06
4.	**Career Skills:** Preparing resumes and cover letters. Types of Resumes. Interview techniques: Preparing for job interviews, facing an interview, verbal and non-verbal communication during interviews, observation sessions and role-play techniques to be used to demonstrate interview strategies (mock interviews)	04
5.	**Group Discussion**: Group discussion as part of selection process. Structure of a group discussion, Dynamics of group behavior, techniques for effective participation, Team work and use of body language.	04
	Total	**30**

Text Books:

1. Fred Luthans : Organizational behavior, *McGraw Hill* **[Twelfth Edition, 2013 (Indian edition)]**
2. R. C. Sharma & Krishna Mohan: Business Correspondence & Report writing, *Tata McGraw Hill Publications.* **[Fourth Edition, 2010]**
3. Dr. Meenakshi Raman & Dr. Sangeeta Sharma: Technical Communication: Principles and Practice. *Oxford University Press* **[Second Edition, 2012]**

Reference Books:

1. Rai Urmila, Rai S. M. Business Communication, *Himalaya Publishing House* **[Second Edition, 2013]**
2. Effective Technical Communication : Ashraf Rizvi, *McGraw Hill* **[2010]**
3. Business Communication K. K. Sinha, Taxmann **[Fourth Edition, 2012]**
4. Kitty O Locker, Stephen Kyo Kaczmarek : Business Communication : Building Critical Skills, *McGraw Hill Higher Education* **[Sixth Edition, 2013]**.

Term Work:

Report & Journal Work

1. Three assignments on report writing
2. Three assignments on interpersonal skills
3. Two assignments on career skills (Practical sessions)
4. Practical sessions on Group Discussion topics
5. One assignment on Technical Paper presentation

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

Program:	B. Tech. Integrated (Civil Engineering)			Semester : VII	
Course :	Hydraulic Engineering			Code :	BTICI07001
Teaching Scheme				Evaluation Scheme	
Lecture Hours per week	Practical Hours per week	Tutorial Hours per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	2	0	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- explain the flow through pipes
- analyse the flow network
- explain the flow through open channels

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1	**Flow through Pipes I** Loss of head through pipes, Darcy Weisbach equation, minor losses, total energy line, hydraulic energy line, pipes in series, pipes in parallel, equivalent pipes.	08
2	**Flow through Pipes II** Siphons, power transmission through pipes, power transmission through nozzles, water hammer in pipes.	07
3	**Pipe Network** Hardy cross method, branching of pipes, three reservoir problem.	08
4	**Flow through Open Channel** Classification of channels, Uniform flow, Chezy's formula, Manning's formula, Prismatic and non-prismatic channels, hydraulically efficient channel cross-section, Velocity distribution in open channels, pressure distribution in open channels, Applications of Bernoulli's equation to open channel flow.	08
5	**Non - Uniform Open Channel Flow I** Specific energy and discharge curve, applications of specific energy, momentum principle, application to open channel flow, specific force.	08
6	**Non - Uniform Open Channel Flow II** Small waves and surges in open channels, gradually varied flow, and control section, hydraulic jump, location of hydraulic jump.	06
	Total	**45**

Text Books:

1. Modi P.M. and Seth S.M. (2015), "Hydraulics and Fluid Mechanics", *Standard Book House*
2. Subramanaya K. (2015), "Flow in Open Channels", *Tata McGraw Hill.*

Reference Books:

1. Bansal R.K. (2016), "Hydraulics and Fluid Mechanics", *Laxmi Publications.*
2. Subramanaya K., (2010), "Theory and Applications of Fluid Mechanics", *Tata McGraw Hill.*

Term Work:

Term work should consists of the following

1. Minimum five assignments covering the prescribed syllabus
2. Report of minimum six experiments performed in the laboratory from the list given below.

List of Experiments

1. Losses in pipes due to sudden contraction
2. Losses in pipes due to sudden expansion
3. Losses in pipes due to bends
4. Losses in pipes due to valves
5. Major losses in pipes
6. Study of gradually varied flow
7. Hydraulic jump
8. Calibration of standing wave flume

MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT SVKM'S NMIMS MUMBAI

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Program: B. Tech. Integrated (Civil Engineering)				Semester : VII	
Course : Geotechnical Engineering - II				Code : BTICI07002	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Identify the failure patterns of slopes
- Design shallow and deep foundations
- Analyze the stability of braced cuts and underground conduits

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Stability of Slopes** Introduction, different factors of safety, analysis of finite and infinite slopes, types of slope failures, wedge failure, Swedish circle method, friction circle method, stability numbers and charts.	06
2.	**Lateral Earth Pressure Theories** Introduction: applications of earth pressure theories, different types of earth pressures - at rest, active and passive pressures, Rankine's earth pressure theory: Rankine's earth pressure theory, active earth pressure and passive earth pressure for horizontal and inclined backfill,Earth Pressure for cohesionless and cohesive soils, Coulomb's wedge theory: Coulomb's active pressure in cohesionless soils, expression for active pressure, Coulomb's passive earth pressure.	08

3.	**Bearing capacity of shallow foundations** Definitions of ultimate bearing capacity, gross, net and safe pressures, allowable bearing pressure, types of shallow foundations, modes of failures, Terzaghi's Bearing capacity Theory, concept behind derivation of equation, general bearing capacity equation, bearing capacity equations for square and circular footings, factors influencing bearing capacity, performance of footings in different soils, Vesic's chart, ultimate bearing capacity in case of local shear failure. Plate load test in detail with reference to IS 1888 and its applications and estimation of settlements, bearing capacity based on standard penetration test.	12
4.	**Axially loaded pile foundations** Introduction to pile foundations, necessity of pile foundation, classification of piles, construction methods of bored piles, concrete bored piles, driven cast in-situ piles, Pile capacity based on static analysis, piles in sand, piles in clay, dynamic methods and their limitations, in-situ penetration tests and pile load test as per IS 2911 specifications, negative skin friction, Pile groups, ultimate capacity of groups, settlement of pile groups in sand and in clays as per IS 2911 and critical depth method.	08
5.	**Underground conduits** Classes of underground conduits, load on a ditch conduit, settlement ratio, ditch condition and projection condition, imperfect ditch conduit.	04
6.	**Braced Cuts** Lateral Earth Pressure Distribution, Apparent pressure diagrams, deep cuts in sand, saturated clay, Bjerrum and Eide Method of Analysis	04
7.	**Reinforced soil** The mechanism, reinforcement (elements), reinforced-soil interaction, applications, reinforced soil embankments, simple problems.	03
	Total	**45**

Text Books:

1. VNS Murthy (2011), "Text Book of Soil Mechanics and Foundation Engineering", *CBS Publishers and Distributers Pvt. Ltd,*
2. Dr.Alam Singh (2004), "Basic Soil Mechanics and Foundations", *CBS Publishers and Distributers Pvt. Ltd.*

Reference Books:

1. Gopal Ranjan& A. S. RAO (2004), "Basic & Applied Soil Mechanics", *New age international Ltd.*
2. Hsai-Yang Fang (2002), "Foundation Engineering Hand Book", *Kluwer Academic Publishers*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

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Program:	B. Tech. Integrated (Civil Engineering)			Semester : VII	
Course :	Transportation Engineering - I			Code :	BTICI07003
Teaching Scheme				Evaluation Scheme	
Lecture Hours per week	Practical Hours per week	Tutorial Hours per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	2	0	4	Scaled to 30 Marks	Scaled to 70 Marks

Outcomes:

After completion of this course, students would be able to:

- describe the process of planning of highway and harbours
- explain traffic characteristics, control devices and intersection design
- describe tunnel alignment, shafts, lining and safety measures
- design the highways

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1	**Introduction to Highway Engineering** Road development plans, recent developments, highway finance – BOT (Build-operate-transfer), BOOT (Build-own-operate-transfer), Annuity, PPP and DBFO. **Highway Planning:** Geometric design of highways, testing and specifications of paving materials, design principles of flexible and rigid pavements.	13
2	**Traffic Engineering:** Traffic characteristics, traffic flow characteristics, theory of traffic flow, traffic control devices and its design, accident studies.	08
3	**Highway Construction**: Highway materials, WMM roads, bituminous roads-BC, SDBC, DBM; concrete roads-DLC, PQC; soil stabilized road, MORTH specifications. Highway Drainage: Necessity, surface and subsurface drainage, maintenance and repairs.	08
4	**Docks and Harbour Engineering** Introduction to water transport in India, natural phenomena, erosion, beach drift, littoral drift, sand bars, coast protection, classification of ports and harbours, sites selection, break waters, jetties, wharves, piers, facilities required, types of Dock,	08

	navigational Aids, terminal buildings and light house, Harbour Maintenance	
5	**Introduction of Bridge Engineering** Functions of various parts of bridge, classification and types of bridge, requirement of an ideal bridge, bridge site characteristics, factor affecting the selection of bridge sites, scour, afflux, runoff, economic span, clearance and freeboard. Methods of erection of different types of bridges, maintenance of bridges	08
	Total	**45**

Text Books:

1. Khanna S.K. and C.E.G. Justo (2015), "Highway Engineering", *Nem Chand & Bros., Roorkee*
2. Hasmukh P. Oza and Gutam H. Oza (2013), "Dock and Harbor Engineering", *Charotar pub. House*
3. Ponnuswamy S. (2008), "Bridge Engineering", *Tata McGraw Hill*

Reference Books:

1. Gurcharan Singh (2004), "Highway Engineering", *Standard Publishers Distributors*
2. IRC: 37 (2012), "Tentative Guidelines for Structural Strength Evaluation of Rigid Airfield Pavements", *IRC, New Delhi*
3. Srinivasan (2015), "Harbor, Dock and Tunnel Engineering", *Charotar pub. house*
4. Horonjeff Robert (2010), "The Planning and Design of Airports", *Tata McGraw Hill.*
5. Rangwala Ketki (2012), "Railway, bridge and Tunnel Engineering", *Charotar Publishing House.*

Term Work:

Term work should consists of the following

1. Minimum five assignments covering the prescribed syllabus
2. Report of minimum six experiments performed in the laboratory from the list given below.

List of Experiments

1. Impact test on aggregates
2. Abrasion test on aggregates
3. Crushing test on aggregates
4. Shape test on aggregates
5. Penetration test on bitumen
6. Ductility test on bitumen
7. Softening point test on bitumen
8. Viscosity test on bitumen
9. California Bearing ratio test
10. Marshal stability test for bituminous mix

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

Program: B. Tech. Integrated (Civil Engineering)				Semester : VII	
Course : Theory of Reinforced Concrete and Prestressed Concrete				Code : BTICI07004	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Objectives:

- To impart the knowledge of basic procedure for designing reinforced Concrete section using working stress method
- To develop skill for analysing different prestressed concrete sections

Outcomes:

After completion of this course, students would be able to:

- Analyse and design the beams using working stress method
- Analyse and design the columns using working stress method
- Design RCC Slabs
- Analyse the prestressed concrete sections

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	Concept of reinforced concrete, working stress method of design for reinforced concrete, permissible stresses as per IS-456-2000, stress strain curve of concrete and steel, characteristics of concrete and steel reinforcement.	03
2.	Analysis and design of singly reinforced and doubly reinforced rectangular, Tee, Ell-beams for flexure by WSM, balanced, under reinforced and over reinforced sections.	06
3.	Design for shear and bond by WSM.	06
4.	Analysis and Design of rectangular and circular columns subjected to axial and bending by WSM.	06
5.	Design of one way and two way slab by WSM	06

6.	Prestressed Concrete: Basic principles of prestressed concrete, materials used and their properties, methods and systems of pre-stressing, concept of bonded and unbounded cables, losses in pre-stress, analysis of various types of sections subjected to pre-stress and external loads.	08
7.	General design principles: Concepts of centre of compression, kern of a section, efficiency of the section, pressure line and safe cable zone, principal tension in prestressed concrete members. Simple Design of prestressed concrete beams (no end block design)	10
	Total	**45**

Text Book:

1. S. N. Sinha (2007), "Reinforced Concrete Design", *Tata McGraw Hill*
2. N. Krishna Raju (2008),"Prestressed Concrete", *Tata McGraw Hill.*
3. H. J. Shah (2008), "Reinforced Concrete I & II", *Charotar Publishing House Pvt. Ltd..*

Reference Books:

1. Lin T. Y. (2008), "Prestressed Concrete", *John Wiley*
2. IS 456 (2000), "Code of Practice for Plain and Reinforced Concrete ", *BIS Publication*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

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Program:	B. Tech. Integrated (Civil Engineering)			Semester :	VII
Course :	Structural Analysis - II			Code :	BTICI07005
Teaching Scheme				Evaluation Scheme	
Lecture Hours per week	Practical Hours per week	Tutorial Hours per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Evaluate the indeterminacy of beams and frames
- Analyse indeterminate structures and evaluate internal forces developed in beams and frames.
- Determine plastic moment capacity of beams

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1	**Introduction** Types of structures occurring in practice and their classification. Stable and unstable structure, static and kinematic determinacy and indeterminacy of structure, symmetric structure, symmetrical and anti-symmetrical loads, distinction between linear and non-linear behavior of material and geometric nonlinearity.	04
2	**Analysis of Indeterminate Structures by Force Method** Flexibility coefficients and their use in formulation of compatibility equations, theorem of three moments, Castigliano's theorem of least work, application of above methods to propped cantilevers, fixed beams, continuous beams, simple pin jointed frames including effect of lack of fit for members, effect of settlement of support, simple rigid jointed frames and two hinged parabolic arches.	17
3	**Analysis of Indeterminate Structures by Displacement Method** Stiffness coefficients for prismatic members and their use for formulation of equilibrium equations, direct stiffness method, slope deflection method, moment distribution method, application of the above methods to indeterminate beams and simple rigid jointed frames, rigid jointed frames with inclined member but having only one translational degree of freedom in addition to	17

	rotational degree of freedom including the effect of settlement of supports.	
4	**Plastic Analysis of Steel Structures** Stress strain curve, plastic moment and plastic modulus, shape factor, load factor, mechanism of failure, method of analysis – statistical method and mechanism method, application to beams.	07
	Total	**45**

Text Book:

1. C. S. Reddy (2011), "Basic Structural Analysis", *McGraw Hill*

Reference Books:

1. G. S. Pandit, S. P. Gupta (2008), "Structural Analysis – A Matrix Approach", *Tata McGraw Hill*
2. John Benson Wilbur, Charles Head Norris (2012), "Elementary Structural Analysis", *Literary Licensing*
3. R. C. Hibbeler (2016), "Structural Analysis", *Pearson*
4. Aslam Kassimali (2015), "Matrix Analysis of Structures", *Cengage Learning*
5. L.S. Negi and R.S. Jangid (1997), "Analysis of Structures", *Tata McGraw-Hill* (Classic Book)

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

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SVKM'S NMIMS MUMBAI

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Program:	B. Tech. Integrated (Civil Engineering)	Semester:	VII
Course :	Advanced Construction Techniques	Code :	BTICI07006

Teaching Scheme				Evaluation Scheme	
Lecture Hours per week	Practical Hours per week	Tutorial Hours per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 Marks	Scaled to 70 Marks

Outcomes:
After completion of this course, students would be able to:

- understand modern construction techniques for substructure, superstructure and special structures
- understand demolition techniques and rehabilitation techniques

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1	**Substructure Construction** Box jacking, pipe jacking, under water construction of diaphragm walls and basement, tunnelling techniques, piling techniques, driving well and caisson, sinking cofferdam, cable anchoring and grouting, driving diaphragm walls, sheet piles, laying operations for built up offshore system, shoring for deep cutting, large reservoir construction, well points, dewatering for underground open excavation.	12
2	**Superstructure Construction** Vacuum dewatering of concrete flooring, concrete paving technology, techniques of construction for continuous concreting operation in tall buildings of various shapes and varying sections, erection techniques of tall structures, large span structures, launching techniques for heavy decks, in-situ prestressing in high rise structures, post tensioning of slab, , handling and erecting lightweight components on tall structures.	12
3	**Construction of Special Structures** Erection of lattice towers, rigging of transmission line structures, construction sequence in cooling towers, silos, chimney, sky scrapers, bow string bridges, cable stayed bridges, launching and pushing of box decks, construction of jetties and break water structures, construction sequence and methods in domes, support	15

	structure for heavy equipment and machinery in heavy industries, erection of articulated structures and space decks.	
4	**Demolition** Demolition techniques, demolition by machines, demolition by explosives, advanced techniques using robotic machines, demolition sequence, dismantling techniques, safety precaution in demolition and dismantling.	06
	Total	**45**

Text Books:

1. Sankar, S.K. and Saraswati, S (2008), "Construction Technology", Oxford University Press, New Delhi.

Reference Books:

1. Robertwade Brown (2005), "Practical Foundation Engineering Hand Book", Mcgraw Hill Publications
2. Patrick Powers. J. (2015), "Construction Dewatering and Groundwater Control", John Wiley & Sons.

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT SVKM'S NMIMS MUMBAI

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Program: B. Tech. Integrated (Civil Engineering)				Semester : VII	
Course : Computer Aided Building Drawing				Code : BTICI07007	
Teaching Scheme				Evaluation Scheme	
Lecture Hours per week	Practical Hours per week	Tutorial Hours per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (----)
1	2	0	0	Scaled to 50 Marks	----

Outcomes:

After completion of this course, students would be able to:

- plan and develop the drawings of residential and public buildings using available software
- prepare a perspective drawing of a simple structure

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1	Drafting of residential building (G+3 storey) using software	05
2	Drafting of School, office, hostel, health centres, institutional buildings, etc. using software	05
3	Perspective drawing: one point and two point perspective using software	05
	Total	**15**

Text Book:

1. Shah M. G., Kale C. M., Patki S. Y. (2012), "Building Drawing", *Tata McGraw Hill*

Reference Books:

1. Dr. N Kumara Swamy and A. Kameswara Rao (2015), "Building Planning and Drawing", *Charotar Publishing House Pvt. Ltd.*
2. S. S. Bhavikatti, M. V. Chitawadagi (2014), "Building Planning and Drawing", *Charotar Publishing House Pvt. Ltd.*

Term Work:

Term work should consists of the following

1. Project on generating drawings with use of software for a residential RCC building which includes typical floor plans, elevation, typical section, roof plan, foundation plan, site plan, layout plan with drainage lines and any other typical details
2. Project on generating drawings with use of software for any one public building which includes floor plans, elevation, typical section
3. Perspective drawing of simple structures

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

Program: B. Tech. Integrated (Civil Engineering)				Semester : VIII	
Course : Environmental Engineering				Code : BTICI08001	
Teaching Scheme				Evaluation Scheme	
Lecture Hours per week	Practical Hours per week	Tutorial Hours per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 Marks	Scaled to 70 Marks

Outcomes:

After completion of this course, students would be able to:

- identify and describe various elements of the water supply, sewerage, solid waste and air & noise pollution
- use and apply knowledge of various types of pollutions with their sources, effects on environment and quantifications
- analyse various types of pollution with their plans to control /treatment measures
- design and compare sewerage systems and storm water drains

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Water** Water Supply systems: Need for planned water supply schemes, Sources of Water, Water demand and Potable, industrial and agricultural water requirements, Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design.	06
2.	**Sewage** Sewage: Domestic and Storm water, Quantity of Sewage, Sewage flow variations. Conveyance of sewage: Sewers, shapes design parameters, operation and maintenance of sewers, Sewage pumping; Sewerage , Sewer appurtenances, Design of sewerage systems Storm Water: Quantification and design of Storm water; Sewage and Sullage, Pollution due to improper disposal of sewage, National River cleaning plans, recycling of sewage – quality requirements for various purposes.	09

3.	**Air** Composition and properties of air. Quantification of air pollutants, Monitoring of air pollutants, Air pollution - Occupational hazards, Urban air pollution: automobile pollution, Chemistry of combustion, Automobile engines, quality of fuel, operating conditions and interrelationship. Air quality standards, Control measures for Air pollution, construction and limitations.	08
4.	**Noise** Basic concept, measurement, effects and various control methods	07
5.	**Solid waste management** Municipal solid waste: Composition and various chemical and physical parameters of MSW, MSW management: Collection, transport, treatment and disposal of MSW. Special MSW: waste from commercial establishments and other urban areas, solid waste from construction activities, biomedical wastes, Effects of solid waste on environment: effects on air, soil, water and health hazards. Disposal of solid waste: segregation, reduction at source, recovery and recycle Disposal methods; Integrated solid waste management.	09
6.	**Hazardous waste** Types and nature of hazardous waste as per the HW Schedules of regulating authorities. Government authorities and their roles along with the legal aspects related to water supply, sewage disposal, solid waste management and monitoring and control of environmental pollution	06
	Total	**45**

MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT SVKM'S NMIMS MUMBAI

Text Books:

1. P.N. Modi (2010), "Sewage Treatment & Disposal and Waste Water Engineering (Environmental Engineering –I)", *Standard Book House*
2. P.N. Modi (2010), "Water Supply Engineering (Environmental Engineering –I)", *Standard Book House*
3. Punmia B.C. (2011), "Environmental Engineering (vol.-I), Water Supply Engineering", *Laxmi Publications*
4. Garg S.K. (2011), "Environmental Engineering (vol.-I), Water Supply Engineering", *Khanna Publications*
5. P.Aarne Vesilind, Susan M. Morgan, Thompson / Brooks/Cole (2011) "Introduction to Environmental Engineering", *Cengage Learning*

Reference Books:

1. E.W. Steel (1991), "Water Supply and Sewerage", *McGraw Hill Publication*
2. CPHEEO Manual on Water Supply & Treatment
3. Manual on Water Supply and Treatment, (latest Ed.), Ministry of Works & Housing, New Delhi
4. Tchobanoglous, Theissen & Vigil (1993), "Integrated Solid Waste Management", *McGraw Hill Publication*
5. IS 10500: 2012 Drinking Water – Specification
6. IS 3025 Method of Sampling and Test (Physical and Chemical) For Water and Waste Water
7. IS 656: 2006 Hazard Identification and risk analysis
8. IS: 2296-1982 Tolerance Limits for Inland Surface waters subject ed to pollution. (Surface water quality standards)
9. IS 14489:1998 - Occupational health and safety audit

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

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Signature
(Approved by Dean)

Program: B. Tech. Integrated (Civil Engineering)				Semester : VIII	
Course : Design of Steel Structures				Code : BTICI08002	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Design the steel beams using single or built-up sections using limit state method
- Design columns and their bases
- Design steel trusses subjected to live load and wind load
- Design the various end connections for beams and trusses

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	Introduction to types of steel, mechanical properties of steel, advantages of steel as structural material, design philosophies of Working Stress Method (WSM) and Limit State Method (LSM)	02
2.	Limit state method, limit state of strength and serviceability (deflection, vibration, durability, fatigue, fire), characteristics and design loads, Classification of cross section- plastic, compact, semi-compact and slender, limiting width to thickness ratio.	06
3.	Design of tension members with welded / bolted end connections using single and double angle sections by LSM, design strength due to- yielding of gross section, rupture of critical section and block shear.	04
4.	Design of compression members with welded / bolted end connections using single and double angle by LSM, design strength, effective length of compression members.	04

5.	Design of columns with single and built-up sections, design of lacing and batten plates with bolted and welded connections using LSM, column buckling curves, effective length, slenderness ratio, limiting values of effective slenderness ratio, buckling class of various cross sections.	04
6.	Design of slab base and gusseted base using bolted and welded connection by LSM, Effective area of a base plate.	04
7.	Design of members subjected to bending by LSM, design strength in bending, effective length, laterally supported and unsupported beams, single and built-up rolled steel sections using bolted and welded connections, shear lag effect, design for shear, web buckling and web crippling	06
8.	Introduction to bolted and welded connections by LSM, beam to beam and beam to column connections, design of framed, un-stiffened and stiffened seat connections.	09
9.	Truss: Determinate truss, imposed load on sloping roof, wind load on sloping roof and vertical cladding including effect of permeability and wind drag, analysis of pin jointed trusses under various loading cases, computation of forces in members, design and detailing of connections and supports, wind bracing for roof system, supported on columns.	06
	Total	**45**

Text Book:

1. N. Subramanian (2008), "Design of Steel Structures", *Oxford*
2. IS800 (2007), "General Construction in Steel - Code of Practice Third Revision", *BIS Publication*
3. IS 875 (1987), "Code of Practice for Design Loads Other Than Earthquake Loads", *BIS Publication*

Reference Books:

1. S. K. Duggal (2009), "Design of Steel Structure - 3rd Edition", *Tata McGraw-Hill Education*
2. S. S. Bhavikatti (2009), "Design Of Steel Structures (By Limit State Method As Per IS: 800 2007)", *I. K. International Pvt Ltd.*
3. Pasala Dayaratnam (2008), "Design Of Steel Structures", *S Chand*

Term Work:

The Term work shall consist of a Design report and detailed drawings drawn in pencil only on minimum of A – 1 (imperial) size drawing sheets on two projects as indicated below

i. Roofing system including details of supports
ii. Flooring system including Columns

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT
SVKM'S NMIMS MUMBAI

Program: B. Tech. Integrated (Civil Engineering)				Semester : VIII	
Course : Hydraulic Machinery				Code : BTICI08003	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	2	0	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Illustrate the impact of jet on stationary and moving plates
- Explain the working principle of reciprocating pumps, centrifugal pumps and turbines
- Differentiate between the pumps and other hydraulic machines

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Impact of jets and jet propulsion:** Jet striking- stationary, moving, inclined and perpendicular flat plates, hinged flat plates, impact on stationary curved vane, series of curved vanes, jet propulsion of ships.	08
2.	**Turbines:** General layout of hydro-electric power plant, heads and efficiencies of turbine, classification, Pelton wheel, reaction turbine, Francis turbines, Kaplan turbine, draft tube theory, specific speed, unit quantities, characteristics curves, Governing of turbines, cavitations.	12
3.	**Centrifugal pumps:** Work done, heads and efficiencies, minimum speed series and parallel operation. Multistage pumps, specific speed, model testing, priming, characteristic curves, cavitation.	12
4.	**Reciprocating pumps:** Operating principle, slip, Variation of velocity and acceleration, Indicator diagram	08
5.	**Miscellaneous pumps and machines:** Gear pumps, air lift pumps and submersible pumps, Hydraulic press, hydraulic ram, hydraulic lift, hydraulic crane	05

	Total	45

Text Book:

1. Modi P.M. and Seth S.M. (2011), "Hydraulics and Fluid Mechanics", *Standard Book House*

Reference Books:

1. Bansal R.K. (2011), "Hydraulics and Fluid Mechanics", *Laxmi Publications*
2. Subramanaya K., (2008), "Theory and Applications of Fluid Mechanics", *Tata McGraw Hill*

Term Work:

Term work should consists of the following

1. Minimum five assignments covering the prescribed syllabus
2. Report of minimum six experiments performed in the laboratory from the list given below

List of Experiments :

1. Impact of jet on flat plate
2. Impact of jet on flat inclined plate
3. Impact of jet on curved plate
4. Performance of Pelton wheel turbine – full and half gate opening
5. Performance of Francis turbine
6. Performance of Kaplan turbine
7. Performance of Centrifugal pump
8. Performance of Gear pump
9. Performance of Reciprocating pump

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

Program:	B. Tech. Integrated (Civil Engineering)	Semester : VIII
Course :	Transportation Engineering - II	Code : BTICI08004

Teaching Scheme				Evaluation Scheme	
Lecture Hours per week	Practical Hours per week	Tutorial Hours per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 Marks	Scaled to 70 Marks

Outcomes:

After completion of this course, students would be able to:

- explain components of airport, railways and bridges
- design runways and taxiways
- prepare geometric design of railways

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1	**Introduction to Airport Engineering** Terminology, airport classification ICAO, components of an aircraft, aircraft characteristics, Airport Planning: Airport surveys, site selection, airport obstructions, layouts, zoning laws, environmental considerations	12
2	**Air Traffic Control** VFR, IFR, Visual aids, airport lighting and marking	03
3	**Airport Design** Runways: orientation, wind rose, basic runway length, geometric design, airport capacity, runway patterns. Taxiways: Layout, geometrical standards, exit taxiways Terminal Buildings: Site selection, facilities, aprons ,parking Systems	10
4	**Railway Engineering** Advantages, classification, gauges, railway track, components & their functions, cross-section, stresses, coning of wheels, wear &creep of rails, failure, joints, fittings and fixtures, ballast, sleepers and drainage. Introduction to monorails and metro-rail with reference to metropolitan cities, case studies	12

5	**Geometric Design** Alignments, gradient &grade compensation, super elevation & negative super elevation, equilibrium cant & cant deficiency, horizontal curves, and transition curves, points and crossing, stations and yards, signalling and interlocking, tractions and tractive resistance, construction and maintenance.	08
	Total	**45**

Text Books:

1. Virendra Kumar, Satish Chandra (2014), "Air Transportation: Planning and Design", *Galgotia Publications Pvt. Ltd.*
2. Saxena S.C. & Arora S.P. (2012), "A Text Books of Railway Engg.", *Dhanpat Rain & Sons*

Reference Books:

1. Horonjeff Robert (2010), "The Planning and Design of Airports", *Tata McGraw Hill*
2. Rangwala Ketki (2012), "Railway, Bridge and Tunnel Engineering", *Charotar Publishing House.*
3. M. Ramachandran (2011), "Metro Rail Projects in India: A study in Project Planning", *Oxford*

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

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Program: B. Tech. Integrated (Civil Engineering)				Semester : VIII	
Course : Building Utilities and Services				Code : BTICI08005	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	0	3	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Identify different Building Services & Utilities required for smooth functioning of the buildings
- Explain the various Technical Processes involved in building up of these Building Services
- Discuss the rules and regulations controlling the provisions of these Building Services

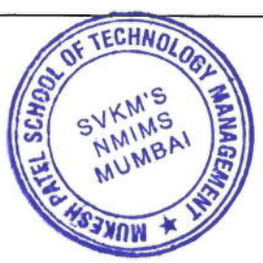
Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Fire Safety Installation:** Causes of fire in buildings, Safety regulations, NBC- Planning considerations in buildings like non-combustible materials, construction, staircases and lift lobbies, fire escapes and A.C. systems. Heat and smoke detectors, Fire alarm system, snorkel ladder, Fire fighting pump and water storage, Dry and wet risers, Automatic sprinklers, fire chutes	08
2.	**Electrical Systems in Buildings:** Basics of electricity - Single / Three phase supply, Protective devices in electrical installations, Earthing for safety, Types of earthing, Types of wires, wiring systems and their choice, Planning electrical wiring for building, Main and distribution boards, Transformers and switch gears, Layout of substations	08

3.	**Principles of Illumination & Design:** Visual tasks, Factors affecting visual tasks, Modern theory of light and colour, Synthesis of light, Additive and subtractive synthesis of colour, Luminous flux, Candela, Solid angle illumination, Utilisation factor, Depreciation factor, MSCP, MHCP, Laws of illumination, Classification of lighting, Artificial light sources, Spectral energy distribution, Luminous efficacy, Colour temperature, Colour rendering, Design of modern lighting, Lighting for stores, offices, schools, hospitals and house lighting.	06
4.	**Air conditioning and HVAC systems:** Conventional system and its types, HVAC System- Ventilation, energy efficiency, air filtration and cleaning, Introduction to HVAC industry standards, Heating for comforts – boilers and furnaces.	06
5.	**Lifts:** Lift Act, Construction and Essential features of lifts, passenger traffic requirements, incoming, two way and outgoing traffic. **Escalators:** Essential features and components of escalators. Difference between lifts and escalators	05
6.	**Plumbing Systems in Building:** Plumbing services: Water distribution system, Storage tanks, types of pipes based on materials and their suitability, testing of pipes – hydraulic, odour, smoke tests, Service connection - size of service pipe, Water meter – size and installation, Valves – types and suitability, miscellaneous plumbing fixtures, pressure valves and pressure tanks in high rise buildings. Drainage system: different types of pipes and traps with their suitability, System of plumbing, Septic tank, Soak pit.	12
	Total	**45**

Text Books:

1. S. M. Patil (2008), "Building Services", *Prof. S. M. Patil and Mrs. Savita S. Patil*
2. V. K. Jain (2007), "Fire Safety in Building", *New Edge International Publication, New Delhi*



Reference Books:

1. George R. Strakosch (1998), "The Vertical Transportation Handbook", *John Willey and Sons*
2. Derek Philips (2000), Lighting modern buildings, *Architectural Press*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus
2. Report on advanced construction activities based on site visit/available literature

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Program:	B. Tech. Integrated (Civil Engineering)			Semester : VIII	
Course :	Irrigation Engineering			Code :	BTICI08006
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	0	3	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Explain the different methods and parameters related to irrigation
- Describe crop management systems from irrigation perspective
- Evaluate reservoir capacity and yield of reservoir
- Design the canal in alluvial and non alluvial soils
- Discuss different outlet structures and energy dissipation devices

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Introduction:** Irrigation, water resources in India, need of irrigation in India, development of irrigation in India, impact of irrigation on human environment, irrigation systems: minor and major, command area development. Irrigation systems and its classification, Irrigation methods(surface and sub-surface), factors affecting choice of method	04
2.	**Water requirement of crops:** Crops and crop seasons in India, cropping pattern, duty and delta, Quality of irrigation water. Soil water relationship: soil characteristics significant from irrigation considerations, root zone soil water, infiltration, consumptive use, irrigation requirement, frequency of irrigation. Methods of applying water to the fields: surface, sub-surface, sprinkler and drip irrigation. Waterlogging: causes, effects and remedial measures.	08
3.	**Distribution systems:** Canal systems, alignment of canals, canal losses, estimation of design discharge. Lining of canals: economics of lining. Canal regulation works. Cross drainage works. Bandhara irrigation, inundation irrigation Drainage of irrigated land: necessity, methods.	10

4.	**Irrigation channels (silt theories):** Kennedy's theory, Kennedy's methods of channel design, silt supporting capacity according to Kennedy's theory, drawbacks in Kennedy's theory, Lacey's regime theory, Lacey's theory applied to channel design, comparison of Kennedy's and Lacey's theory, defects in Lacey's theory.	10
5.	**Dams and reservoirs:** Capacity of reservoirs, yield of reservoirs, reservoir regulation, classification of dams, design considerations and forces acting on gravity dams	08
6.	**Introduction to Spillways and energy dissipaters** Types of spillways and crest gates, energy dissipaters	05
	Total	**45**

Text Book:

1. Garg S.K. (2011), "Irrigation Engineering and Hydraulic Structures", *Khanna Publishers*

Reference Books:

1. Modi P.N.(2008), "Irrigation water resources and water power engineering", *Standard Book House*
2. Punmia B.C. (2011), "Hydraulics and Fluid Mechanics", *Laxmi Publications.*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

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Program:	B. Tech. Integrated Civil Engineering			Semester :	VIII
Course :	Engineering Economics			Code :	BTICI08007
Teaching Scheme				Evaluation Scheme	
Lecture Hours per week	Practical Hours per week	Tutorial Hours per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (----)
2	0	0	0	Scaled to 50 Marks	----

Outcomes:

After completion of this course, students would be able to:

1. understand basic economic principles and their application to the problems in engineering
2. understand basic finance and marketing functions with respect to an organisation

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
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 of demand, price elasticity, income elasticity, cross elasticity.	06
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, economies of 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 problems	06
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.	06

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	06
5	**Funds** 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.	06
	Total	**30**

Text Books:

1. R. Paneerselvam (2014), "Engineering Economics", *PHI Publication*
2. N Gregory Mankiw (2015), "Principles of Economics", *Thomson Learning*
3. Neeraj Hatekar (2010), "Principles of Economics" , *SAGE Publications*

Reference Books :

1. D. N. Dwiwedi (2013), "Principles of Economics", *Vikas Publishing House*
2. Kotler- Keller- Koshy- Jha (2016), "Marketing Management", *Pearson*
3. Prasanna Chandra (2012), "Fundamental of Financial Management", *Tata McGraw Hill*

Term Work:

1. Minimum six assignments covering the syllabus

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Program : B. Tech. Integrated (Civil Engineering)				Semester : IX	
Course : Limit State Design of Reinforced Concrete Structures				Code : BTICI09001	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Describe basic design philosophies of reinforced concrete structures
- Design the beams of rectangular and flanged sections
- Design simply supported one way, two way and cantilever slabs
- Design columns and isolated column footings subjected to axial loads and moments

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Ultimate Load Method:** Brief introduction to fundamentals of ultimate strength theory: curved stress distribution, compressive stress block, simplified rectangular stress block as per Whitney's approach, ultimate moment of resistance of singly reinforced section and doubly reinforced sections.	05
2.	**Limit State Method:** Introduction to limit state method of design as per IS 456 (latest edition): concepts of probability and reliability, characteristic loads, characteristic strength, partial safety factors for loads and materials, introduction to various limit states.	04
3.	**Limit State of Collapse - Flexure:** Limit state of collapse in flexure, shear and Limit state of serviceability in deflection and cracking , design of singly and doubly reinforced rectangular and T sections for flexure, design of members in shear and bond, design of beam subjected to bending and torsion. Requirements governing reinforcement detailing.	12
4.	**Design of Slabs:** Design of simply supported one way, two way and cantilever slabs.	06
5.	**Limit State of Collapse - Compression:** Limit state of collapse compression for short and slender column. Members subjected to combined axial and uni-axial as well as biaxial bending. Development of interactive curves and their use in column design.	08

6.	**Design of Foundations:** Isolated square and rectangular footings subjected to axial load and moments.	10
	Total	**45**

Text Book:

1. Shah & Karve (2010), "Illustrated Reinforced Concrete Design", *Structure Publication, Pune*
2. IS456 (2000), "Code of Practice for Plain and Reinforced Concrete", *BIS Publication*

Reference Books:

1. Shah & Karve (2010), "Limit State Design - Reinforced Concrete", *Structure Publication, Pune*
2. Dayaratnam P (2008), "Limit State Design of Reinforced Concrete Structures", *Oxford & IBH*
3. Jain A K (2007), "Limit State design - Reinforced Concrete", *New Chand*
4. H.J. Shah (2008), "Reinforced Concrete Design", *Charotar Publisher*
5. Sinha & Roy (2013), "Fundamentals of Reinforced Concrete", *Charotar Publisher*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

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Program: B. Tech. Integrated (Civil Engineering)				Semester : IX	
Course : Water and Wastewater Engineering				Code : BTICI09002	
Teaching Scheme				Evaluation Scheme	
Lecture Hours per week	Practical Hours per week	Tutorial Hours per week	Credit	Internal Continuous Assessment (ICA) As per Institute Norms (50 Marks)	Theory (3 Hrs, 70 Marks)
3	2	0	4	Scaled to 30 Marks	Scaled to 70 Marks

Outcomes:

After successful completion of this course, students should be able to

- impart knowledge of water and waste water treatment scheme
- design various units of water and waste water treatment system

Detailed Syllabus:

Unit	Description	Duration
1.	**Water** Man's environment: Importance of environmental sanitation. Quality of water: Wholesomeness and palatability; physical, chemical, bacteriological standards. Treatment of water; impurities in water-processes for their removal typical flow-sheets. Sedimentation: factors affecting efficiency, design values of various parameters, tube settlers. Coagulation and flocculation: mechanisms, common coagulants, rapid mixing and flocculating devices, G and GT values, Jar test, coagulant aids - polyelectrolyte etc. Filtration: classification, slow and rapid sand filters, dual media filters, sand, gravel and underdrainage system, mode of action, cleaning, limitations, operational difficulties, performance, basic design consideration, pressure filters: construction and operation.	09
2.	**Water softening** Lime soda and Base Exchange methods, principle reactions, design considerations, sludge disposal. **Miscellaneous treatments** Removal of iron and manganese, taste, odour and colour, principles and methods; de-fluoridation, reverse osmosis. **Disinfection** chlorination, chemistry of chlorination, kinetics of disinfection, chlorine demand, free and combined chlorine, break point chlorination, super chlorination, de-chlorination, chlorine	09

	residual, use of iodine, ozone, ultraviolet rays and chlorine dioxide as disinfectants, well water disinfection **Introduction to advanced treatment methods** Reverse osmosis, electro – dialysis, floatation, microfiltration, ultra-filtration, Nano filtration.	
3.	**Sewage** Characteristics of sewage: composition, chemistry of sanitary sewage, B.O.D., C.O.D., aerobic and anaerobic decomposition. Sewage Disposal: discharge of raw and treated sewage on land and water, standards for disposal of raw and treated sewage on land and water, limits of dilution. Self-purification of streams: oxygen economy, sewage farming.	08
4.	**Sewage treatment** Aims, methods of treatment and various flow-sheets for preliminary, primary, secondary and tertiary treatment, screens, grit chambers, primary and secondary clarifiers, disposal of screenings and grit. **Biological treatment methods** principles, trickling filter operation, re-circulation, activated sludge process and its modifications, hydraulic design of trickling filter and activated sludge process, sludge volume index, operational problems in activated sludge process and trickling filters, stabilization ponds. **Sludge digestion** principles of anaerobic digestion, quantity and characterizations of sludge, design of sludge digestion tanks, disposal of digested sludge, drying beds	11
5.	**Low cost sanitation** Septic tanks and Anaerobic Filter - principles, operation and suitability, design values, disposal of treated effluent. Tertiary Treatment methods – general description	08
	Total	**45**

Text Books:

1. P.N. Modi (2010), "Sewage Treatment & Disposal and Waste Water Engineering (Environmental Engineering –I)", *Standard Book House*
2. P.N. Modi (2010), "Water Supply Engineering (Environmental Engineering – I)", *Standard Book House*
3. Punmia B.C. (2011), "Environmental Engineering (vol.-I), Waste Water Engineering", *Laxmi Publications*
4. Garg S.K. (2011), "Environmental Engineering (vol.-I), Water Supply Engineering", *Khanna Publications*

5. Garg S.K. (2011), "Environmental Engineering (vol.-II), Sewage Disposal and air pollution Engineering", *Khanna Publications*

Reference Books:

1. E.W. Steel (1991), "Water Supply and Sewerage", *McGraw Hill Publication*
2. Metcalf & Eddy (2002), "Waste Water Engineering, Treatment & Reuse", *McGraw Hill Publication*
3. J.W.Clark (1965) ,"Water supply & pollution control", *International Textbook Company*
4. CPHEEO Manual on Water supply and treatment.
5. CPHEEO Manual on Sewerage and sewage treatment (2005).

Term Work:

Term work should consists of the following

1. Minimum five assignments covering the prescribed syllabus
2. Report of minimum six experiments performed in the laboratory from the list given below.

List of Experiments:

1. Alkalinity
2. Hardness
3. pH
4. Turbidity
5. Jar test
6. Residual chlorine
7. Chlorides
8. Solids: suspended solids, dissolved solids, total solids, volatile solids
9. Dissolved oxygen
10. Chemical oxygen demand (COD)
11. Biochemical oxygen demand (BOD)

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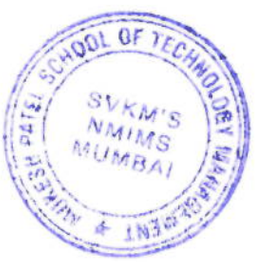

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Program: B. Tech. Integrated (Civil Engineering)				Semester : IX	
Course : Quantity Surveying, Estimation and Valuation				Code : BTICI09003	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Give estimate for buildings and its components
- Work out rate analysis for various items of civil works
- Prepare tender documents and its preparation
- Valuate any civil works or property

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Estimates:** Various types, their relative importance, factors to be considered, complete set of Estimate. Approximate estimates: importance, purpose, different methods. Use of CBRI Equations for the same. Methods of preparation of estimates for projects such as i) Building R.C.C., Load bearing ii) Road iii) Cross drainage work iv) Factory shed including steel truss	08
2.	**Methods of Building Estimate:** General Items of Works, Principle units of various items of work, General Items of works, Unit of measurement for different items of works and materials, different methods for estimating building works, Principle of estimating single and two roomed building, Estimate of an underground water tank, estimate of parapet wall applying three different methods of estimate .	08
3.	**Measurements for various items**: Use of relevant Indian Standard Specifications for the same, taking out quantities from the given requirements of the work, comparison of different alternatives, Bar bending schedules, Mass haul Diagrams **Material survey:** Approximate estimates of requirement of various materials for building works, percentage breakup of the cost, cost sensitive index, market survey of basic materials	08

4.	**Specifications:** types, requirements and importance, detailing of specifications for various items **Rate analysis:** purpose, importance and necessity of the same, factors affecting, task work.	08
5.	**Tender:** preparation of tender documents, importance of inviting tenders, contract types, relative merits, Prequalification. general and special conditions, termination of contracts, extra work and items, penalty and liquidated charges, Settlement of disputes, R.A. Bill & Final Bill, Payment of advance , insurance, claims, price variation, etc.	08
6.	**Valuation:** different terms used, the role of a valuer, purpose and necessity of the same. Capitalized Value, Years purchase ,sinking fund, depreciation, types of values, Purpose of valuation Different methods of valuation for i. open plots. ii. open plots with existing residential & commercial structures iii. lease hold properties Use of valuation tables and formulae	05
	Total	**45**

Text Book:

- M Chakraborty (2010), " Estimating, Costing, Specification and Valuation in Civil Engineering", *By Author - M. Chakraborty, Kolkata*

Reference Books:

- B. N. Dutta (1998), "Estimating, Costing, in Civil Engineering", *UBS Publishers' Distributors Pvt. Ltd.*
- B. S. Patil (2006), "Civil Engineering Contracts and Estimates", *Universities Press (India) Pvt. Limited*

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Program: B. Tech. Integrated (Civil Engineering)				Semester : IX	
Course : Project – I				Code : BTICI09004	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (-----)
0	0	6	3	Scaled to 50 marks	----

Outcomes:

After completion of this course, students would be able to:

- Apply the use of knowledge of basic Civil Engineering subjects
- Carry out literature review for the seminar topic
- Develop presentation and communication skills

Detailed Syllabus: (Per session plan)

Each student will select a topic in the area of civil engineering and related area in the state of art area and technical development, The topic will be decided by the student, guide and departmental research committee. The students will prepare the brief report on the project topic by literature survey / self study under the guidance of the faculty & submit the report along with the presentation.

The report will cover the following:

1. Relevance & importance of the topic
2. Basic Principals / Concepts / Definitions
3. Applications- Advantages & Limitations
4. Discussion of related issues
5. Future scope
6. References

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Program: B. Tech. Integrated (Civil Engineering)				Semester : IX	
Course : Elective-I (Advanced Structural Analysis)				Code : BTICI09005	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Analyse the indeterminate structures using advanced methods of analysis
- Plot the influence lines diagram for indeterminate beams
- Analyse the portal frames using approximate methods

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	Introduction to Stiffness Method in Matrix Form: Basic concepts of stiffness coefficients, member stiffness matrix for member of plane truss, member of rigid jointed plane frame, member of plane grid and member of space frame. Properties of stiffness matrix, co-ordinate transformation matrix, stiffness matrix in local and global co-ordinate axes system, assemblage of structural stiffness matrix and application of boundary conditions. Joint loads, Equivalent joint loads, method of solution for displacements and computation of internal forces in members. Application of stiffness method to beams, pin jointed trusses, rigid jointed plane frames and simple plane grid structures.	13
2.	Conventional Form of Stiffness Method, Modified Moment Distribution Method: Symmetric structure, Symmetric and anti-symmetric loads, Modification of stiffness and carryover factors for symmetric and anti-symmetric loads both for sway and non-sway cases for frames with different support conditions. Application to frames involving side sways.	07

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3.	Flexibility Method in Matrix Form: Review of concepts of flexibility coefficients, Selection of primary structure, concept of structure flexibility matrix, compatibility equations, solution for redundant forces, computational of internal forces, and joint displacements. Application to pin jointed trusses and rigid jointed plane frames for different loading including the effect of settlement of support, temperature changes and elastic supports.	06
4.	Conventional Form of Flexibility Method: Elastic Center Method and its application to rectangular box, rigid jointed portal frames and fixed arches. Column Anology Method and its application to analysis of non prismatic beams, simple rectangular frames, determination of stiffness coefficients and carry over factors for non prismatic beam members.	08
5.	Influence Line Diagrams for Indeterminate Structures: Muller Breslau's Principle for drawing influence line diagrams for statically indeterminate structures. Influence Lines Diagrams for propped cantilevers, fixed beams and continuous beams.	06
6.	Approximate Methods for Analysis of Building Frames: Approximate methods for gravity loads: Substitute frame and equivalent frames. Approximate methods for lateral loads: Portal and cantilever method.	05
	Total	**45**

Text Book:

1. Reddy C. S. (2007), "Basic Structural Analysis – Second Edition", *Tata McGraw Hill*

Reference Books:

1. G. S. Pandit, S. P. Gupta (2007), "Structural Analysis – A Matrix Approach", *Tata McGraw Hill*
2. John Benson Wilbur, Charles Head Norris (2012), "Elementary Structural Analysis", *Literary Licensing*
3. R. C. Hibbeler (2008), "Structural Analysis – Second Edition", *Pearson*
4. Aslam Kassimali (2011), "Matrix Analysis of Structures – Second Edition", *Cengage Learning*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

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Program: B. Tech. Integrated (Civil Engineering)				Semester : IX	
Course : Elective – I (Advanced Structural Mechanics)				Code : BTICI09006	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Determine the internal forces developed in various structures subjected to various loads
- Calculate the stresses at failure applying the concepts of theories of failure.
- Analyse deep beams and beams on elastic foundation

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Unsymmetrical Bending and Shear Centre:** bending of symmetrical and non-symmetrical (about both axis) sections, shear centre for thin walled open sections	06
2.	**Bending of beams with large initial curvature loaded in their plane of curvature:** Application to analysis of hooks, circular closed rings, chain links with straight length and semi-circular ends.	07
3.	**Beams on elastic foundation:** Analysis of beams of infinite length subjected to concentrated force/moment and semi-infinite length subjected to concentrated load/moment at one end. Semi-infinite beam hinged at one end (origin) & subjected to UDL throughout.	07
4.	**Beams curved in plan:** Analysis of beams loaded perpendicular to their own plane, simply supported, fixed and continuous beams.	06
5.	**Theories of Failure:** Maximum principal stress theory, Maximum principal strain theory, Maximum shear stress theory, maximum total strain energy theory.	06
6.	**Analysis of deep beams:** Determination of deflection. Determination of shear correction factor for various sections rectangular solid and hollow section and circular solid and hollow section and I-section	06
7.	**Torsion in non-circular sections:** Torsion of solid section rectangle, triangular and hexagon section	07
	Total	**45**

Text Book:

1. James M. Gere, Barry J. Goodno (2012), "Mechanics of Materials – SI Edition", *Cengage Learning*
2. Subramanian(2010), "Strength of Materials", *Oxford University Press*

Reference Books:

1. Andrew Pytel, Jaan Kiusalaas (2011), "Mechanics of Materials – Second Edition", *Cengage Learning*
2. Ferdinand P. Beer, E. Russell Johnston Jr., John T. DeWolf (2008), "Mechanics of Materials – Third Edition", *Tata McGraw Hill*
3. William Nash, Merle Potter (2010), "Schaum's Outline of Strength of Materials, Fifth Edition", *McGraw Hill Professional*
4. Arthur p. Boresi and Omar M. Sidebottom (1993), "Advanced Mechanics of Materials", *Wiley & Sons* (Classic Book)

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

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Program: B. Tech. Integrated (Civil Engineering)				Semester : IX	
Course : Elective - I (Soil Dynamics)				Code : BTICI09007	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Know basic concepts & principles and define basic terminologies related to vibration
- Explain the properties of dynamically loaded soils and analyse those properties
- Measure and judge the dynamic bearing capacity of foundations and to summarise the conclusions of foundation design

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Fundamentals of Vibration:** Nature & Type of dynamic loading on soils, Importance of soil dynamics, fundamentals of vibration, Degree of freedom, Analysis of system with one degree of freedom, Free & forced vibration of spring- mass system, Harmonic vibration , uniform circular motion natural frequency, free vibration with viscous damping, steady state forced vibration with viscous damping, rotating mass type excitation, determination of damping ratio, vibration measuring instrument	10
2.	**Waves in elastic medium**: Stress-strain, Hook's Law, Elastic Stress waves in a bar, stress waves in an infinite elastic medium, stress waves in elastic half space	05
3.	**Properties of Dynamically Loaded Soils:** Laboratory Cyclic Tests of different types for evaluating Shear & deformation characteristics of soil, Field Test Measurements- Reflection and Refraction of Elastic Body Waves- Fundamental Concepts, Refraction & Reflection Survey, Sub-Soil Exploration by steady state vibration, Co-relation for shear modulus and damping ratio, Test procedures for moduli and damping characteristics	07

4.	**Foundation Vibration:** Vertical Vibration of circular Foundation resting on elastic half-space, analog solutions for vertical vibrations, calculation procedure for foundation response, comparison of footing vibration test with theory, comments on Mass-Spring-Dashpot Analog used for solving foundation vibration problems, Vibration of foundations for impact machines, vibration screening- active & passive isolation for open trenches, passive isolation by use of piles	07
5.	**Liquefaction of soils**: Definition, Criterion and factors affecting liquefaction of soil, laboratory and field studies on liquefaction, liquefaction studies in oscillatory simple shear, evaluation of liquefaction potentials, liquefaction of clay	08
6.	**Dynamic Bearing Capacity of Shallow Foundations:** Ultimate Dynamic Bearing Capacity, behaviour of foundations under transient load, seismic bearing capacity & settlement in granular soil, bearing capacity in clay	04
7.	**Machine Foundations on Piles:** Piles subjected to vertical vibration, end bearing & friction piles, Sliding Rocking & Torsional Vibration	04
	Total	**45**

Text Book:

1. Braja M. Das (2010), "Principles of Soil Dynamics", *Cengage Learning*

Reference Books:

1. Robert W. Day (2012), "Geotechnical Earthquake Engineering", *Mcraw-Hill Professional*
2. Steven L. Kramer (1996), "Geotechnical Earthquake Engineering", *Prentice Hall*
3. *ShamsherPrakash (1981), "Soil Dynamics", McGraw-Hill*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

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Program: B. Tech. Integrated (Civil Engineering)				Semester : IX	
Course : Elective-I (Water Distribution Systems)				Code : BTICI09008	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Design the key components of a water supply system
- Describe methods to assess and reduce water loss
- Describe the operation of pumps and valves
- Optimize the water distribution system

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	General Hydraulic Principles, Head loss formulae- Darcy-Waisbach formula, Hazen – Williams formula, Modified Hazee-Williams formula, Series and Parallel connection of Pipes, Equivalent Pipes, Analysis of branched Water Distribution Networks.	08
2.	Formulation of Equations for looped Water Distribution Networks, Analysis of flow in looped networks using Hardy Cross, Newton-Raphson and Linear Theory method, Introduction of Gradient method and other methods of analysis.	10
3.	Reservoirs, Pumps and Valves (check valve, flow control valve and pressure reduces valve) in Water distribution systems. Flow dependent analysis of multi-reservoir systems, Introduction to head-dependent analysis	10
4.	Node flow analysis of water distribution networks:- Node head – discharge relationships, Direct and Indirect methods, Application of NFA technique to serial networks.	08
5.	Design of water distribution networks using Critical path method, Formulation of optimization model, Application of Cost-head loss ratio method and linear programming technique to optimal design of branched networks.	05
6.	Determining number of branching configuration for a looped network, Use of path concept and minimum spanning tree concept, Application of critical path method for design of looped networks.	04
	Total	**45**

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Text Book:

1. Bhave, P.R. and Gupta R. (2003), "Analysis of water distribution Networks", *Nawas Publishing Co, New Delhi.*
2. Bhave P.R. (2003), "Optimal Design of Water Distribution Networks", *Narosa Publishing Co, New Delhi.*

Reference Books:

1. Jeppson R.W. (2007), "Änalysis of flow in pipe", *Ann Arbon Science Aun Arbox Michigan USA*
2. Walksi T-M (2009), "Analysis of water distribution System ", *Van Nostand Reinheld G, New York USA,1984*
3. Mannual on Water Supply and Treatment, CPHEEO, *Ministry of Urban Development*

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

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Program: B. Tech. Integrated (Civil Engineering)				Semester : IX	
Course : Elective – I (Finite Element Analysis in Civil Engineering)				Code : BTICI09009	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Describe the basic concept and applications of FEM in civil engineering
- Solve one dimensional problems by FEM
- Analyse the beam, frame and truss elements by FEM
- Solve two dimensional equations by FEM

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Overview of Finite element analysis:** Basic concepts, Types of governing equations, numerical modelling, General applications of FEM, General description and comparison with other analysis methods, brief history of FEM, Merits and demerits of FEM,	08
2.	**Different approaches in FEM:** Direct approach, variational, energy and Weighted Residual approach, Isoparametric elements, Eigen values	06
3.	**One dimensional finite element analysis:** 1D torsion of a circular shaft, 1D steady state heat conduction, 1D flow through porous media, 1D ideal flow through pipes, Linear spring, Flow network analysis, Electrical network analysis	12
4.	**Application to solid mechanics problems:** Analysis of beam element, frames and trusses (based on minimum potential energy approach)	12
5.	**Two dimensional analysis:** Galerkin's method for time dependent and time independent approach for two dimensional equations (Laplace, parabolic equations).	07
	Total	**45**

Text Book:

1. Desai Y.M., Eldho T.I., Shah A.H. (2011), "Finite Element Method with Applications in Engineering", *Pearson*.

Reference Books:

1. Reddy J.N. (2005), "An introduction to the Finite Element Method", *Tata McGraw Hill.*
2. Rao S.S. (2010), "The Finite Element Method in Engineering", *Elsevier.*

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus
2. Solution of minimum five problems using computer software

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Program: B. Tech. Integrated (Civil Engineering)				Semester : IX	
Course : Elective – I (Analysis of Transportation System)				Code : BTICI09010	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Describe the fundamental concepts of urban transportation modelling system
- Explain the role of models in urban planning
- Identify the strengths and limitations of the systems approach to planning

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	Introduction to transportation systems, transportation innovations, social and economic impacts of transportation, decision makers and their options	7
2.	Demand modelling and predictions, modelling transportation technologies, analysis of network flows, transportation network, network theory	12
3.	a) Wardrops external principle of traffic assignments, evaluation of impacts, basic physics of transportation, concepts in transportation models and location models, analysis of utility maximizing systems such as transportation systems by entropy concepts b) Major transportation technologies, urban and metropolitan transportation and economic policy	14
4.	Mathematical programming and other models for selecting network investments and operation planning, case studies	12
	Total	**45**

Text Book:

1. Ortúzar, J. de D. and Willumsen, L. G. (2001), "Modelling Transport, Third Edition", *Willey, New York*
2. Meyer M.D. and Miller E.J. (2001), "Urban Transportation Planning, Second Edition", *McGraw Hill*

Reference Books:

1. Krueckeberg, D.A. and Silvers, A.L. (1974), "Urban Planning Analysis: Methods and Models", *JohnWiley and Sons*

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

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Program: B. Tech. Integrated (Civil Engineering)				Semester : IX	
Course : Elective- II (Pavement Subgrade and Materials)				Code : BTICI09011	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Explain the different properties and functions of subgrade
- Describe the grading requirements, soil survey procedure and ground improvement techniques
- Calculate stresses in soil

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Subgrade:** Functions, Importance of subgrade soil properties on pavement performance, subgrade soil classification for highway engineering purpose soils as per PRA system, revised PRA system, Burmister system, Compaction system.	08
2.	Grading requirements for aggregate, selection of bases and subbase material (including stabilized materials), selection of different grade of bitumen, types of bituminous surfaces, skid qualities, bituminous mix design, Marshall stability test, design aspect of paving concrete. Experimental characteristics of road aggregate.	06
3.	**Soil Survey:** Soil Survey Procedure for Highway and Ground Water Investigation. Identification and Significance of soil Characteristics, effect of water in soil Swelling/shrinkage, cohesion, plasticity in soil. Soil Moisture movement- ground water, gravitational water, held water, soil suction.	07
4.	**Storm water Drainage**: General principles, subsoil Drainage. Frost action soil: Frost susceptible soils, depth of frost penetration, loss of strength during frost melting. Compaction of soils, field and laboratory method of soil compaction, equipments used in field compaction. Design of surface and subsurface drainage system, pumping system, water body, holding ponds.	08

5.	**Stress in soil:** Theories of elastic and plastic behaviour of soils, Methods of reducing settlement, estimation of rate of settlement due to consolidation in foundation of road embankment., static and cyclic triaxial test on subgrade soils, resilient deformation, resilient strain, resilient modulus. CBR test, effect of lateral confinement on CBR and E – value of Subgrade soil. Static and cyclic plate load test, estimation of modulus of subgrade reaction, correction for plate size, correction for worst moisture content.	08
6.	**Ground Improvement Technique:** Different method of soil stabilization, use of geo-textile, geogrid and fibres in highway subgrade. Vertical sand drain: design criteria, construction and uses	08
	Total	**45**

Text Book:

1. L. R. Kadiyali and Dr. N. B. Lal (2011), "Principles and Practices of Highway Engineering", *Khanna Publication, New Delhi*

Reference Books:

1. Khanna & Justo, (2011), "Highway Engineering", *New Chand & Brothers, Roorkee*
2. Yoder, E. J., (1975), "Principles of Pavement Design, Second edition", *John Wiley & Sons, Inc., New York*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

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Program: B. Tech. Integrated (Civil Engineering)				Semester : IX	
Course : Elective – II (Urban Transportation Systems Planning)				Code : BTICI09012	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Describe the urban transportation planning
- Develop the four stage travel demand model
- Describe the effect of land use pattern on travel demand

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Introduction:** Transport and Socioeconomic Activities; Historical Development of Transport; Transportation in the Cities; Freight Transportation; Future Developments	03
2.	**Urban Transportation System Planning - Conceptual Aspects**: Transport Planning Process, Problem Definition, Solution Generation, Solution Analysis, Evaluation and Choice, Implementation, Sequence of Activities Involved in Transport Analysis.	04
3.	**Trip Generation Analysis**: Trip Production Analysis; Category Analysis; Trip Attraction Modelling.	05
4.	**Mode Choice Modelling**: Influencing Factors, Earlier Modal Split Models, Trip-End Type Modal Split Model, Trip-Interchange Modal Split Model, Disaggregate Mode-Choice Model, Logit Model of Mode-Choice, Binary Choice Situations, Multinomial Logit Model, Model Calibration, Case Studies.	07
5.	**Trip Distribution Analysis**: Presentation of Trip-Distribution Data, PA Matrix to OD Matrix, Basis of Trip Distribution, Gravity Model of Trip Distribution, Calibration of Gravity Model, Growth Factor Methods of Trip Distribution, Uniform Factor Method, Average Factor Method, Fratar Growth-Factor Method, Disadvantage of Growth Factor Methods.	07
6.	**Route Assignment**: Description of Transport Network, Route Choice Behavior, The Minimum Path, Minimum Path Algorithm, Route Assignment Techniques, All-or-Nothing Assignment, Multipath Traffic Assignment, Capacity-Restrained Traffic Assignment.	05

7.	**Transportation Survey and Land use model:** Definition of Study Area Zoning, Types of Movements, types of Surveys, development of Land-use Models, The Lowry Model, and Application of Lowry Model.	08
8.	**Urban Structure:** Urban Activity Systems, Urban Movement Hierarchies, Types of Urban Structure **Urban Goods Movement:** Classification of Urban Goods Movements. Methodology of Approach to Analysis of Goods Movement. Modelling Demand for Urban Goods Transport.	06
	Total	**45**

Text Book:

1. Papacostas, C.S., and Prevedouros, P.D. (2002), " Transportation Engineering and Planning", *3rd Edition, Prentice - Hall of India Pvt Ltd.*

Reference Books:

1. John W.Dickey. (1975), "Metropolitan Transportation Planning." *Mc Graw Hill Book Company, New York.*
2. Adib Kanafani (1983), "Transportation Demand Analysis", *Mc Graw Hill Series in Transportation, Berkeley.*
3. Hutchinson, B.G. (1974),"Principles of Urban Transport Systems Planning", *Mc Graw Hill Book Company, New York*

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

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Program: B. Tech. Integrated (Civil Engineering)				Semester : IX	
Course : Elective – II (Planning and Design of Environmental Facilities)				Code : BTICI09013	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Design of Integrated water supply and sanitation utilities
- Discuss integrated management of Solid Waste generated

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Environmental Engineering hydraulic design**: Water distribution systems- Design of distribution systems- Hydraulic analysis – Distribution system components – Storage tanks -Analysis – Hardy Cross method – Equivalent Pipe method – Computer Programmes, Pumps – Design of water and waste water pumping system for various Infrastructure Projects: Industrial Areas, Socio-Economic Zones, Residential Developments (clusters), Commercial Development (clusters), Institutional Premises, Airports, Public Places with (High Human Traffic) etc.	08
2.	**Types of sewerage system** – Hydraulics of sewers –Design of various sewer appurtenances - Design of sanitary and storm water sewers – Structural requirement of sewer under various conditions – Design of surface and subsurface drainage – Roadways and Airport drainage and for various Infrastructure Projects: Industrial Areas, Socio-Economic Zones, Residential Developments (clusters), Commercial Development (clusters), Institutional Premises, Airports, Public Places with (High Human Traffic) etc.	08

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3.	**Design of water treatment units** – Design of various units of Water Treatment plant (Aeration, Sedimentation, Coagulant aided Sedimentation, Demineralization, Desalination, Ion-Exchange, Ozone Treatment, UV Treatment etc.), depending upon the quality requirements of the project for various Infrastructure Projects: Industrial Areas, Socio-Economic Zones, Residential Developments (clusters), Commercial Development (clusters), Institutional Premises, Airports, Public Places with (High Human Traffic) etc.	08
4.	**Design of waste water treatment units** – Design of various units of Water Treatment plant (Preliminary Treatment, Primary Treatment, Secondary Treatment, Biological Treatment, Tertiary Treatment, Advanced Biological Treatment etc.) depending upon the quality requirements of various Infrastructure Projects: Industrial Areas, Socio-Economic Zones, Residential Developments (clusters), Commercial Development (clusters), Institutional Premises, Airports, Public Places with (High Human Traffic) etc.	08
5.	Design of Solid Waste and Hazardous Waste Management for various projects depending upon the characteristics, quantity and availability of resources and options of various Infrastructure Projects: Industrial Areas, Socio-Economic Zones, Residential Developments (clusters), Commercial Development (clusters), Institutional Premises, Airports, Public Places with (High Human Traffic) etc.	08
6.	**Planning of Environmental Management Systems of various Infrastructure Projects:** Industrial Areas, Socio-Economic Zones, Residential Developments (clusters), Commercial Development (clusters), Institutional Premises, Airports, Public Places with (High Human Traffic) etc.	05
	Total	**45**

Text Books:

1. S.K. Garg (2009), "Environmental Engineering – Vol. I & II", *Khanna Publication*

Reference Books:

1. Chris Binnie, Martin Kimber, and George Smethurst (2003), "Basic Water Treatment", *IWA Publishing*
2. American Water Works Association (2010), "Principles and Practices of Water Supply Operations Water Treatment", *American Water Works Association*
3. Metcalf & Eddy, Inc., George Tchobanoglous, H. David Stensel, Ryujiro Tsuchihashi, Franklin Burton (2013), "Wastewater Engineering: Treatment and Resource Recovery", *Mc-Graw Hill*

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

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(Prepared by Concerned Faculty/HOD)

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SVKM'S NMIMS MUMBAI

Program: B. Tech. Integrated (Civil Engineering)				Semester : IX	
Course : Elective – II (Air Quality Management)				Code : BTICI09014	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Describe Metrological aspect of air pollutant dispersion
- Discuss sources and effects of sir pollution along with its sampling and measurement
- Describe Effects of Air Pollution in Global Aspect

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Meteorological aspects of air pollutant dispersion** – Temperature lapse rates and stability, wind velocity and turbulence, plume behaviour, dispersion of air pollutants, solutions to the atmospheric dispersion equation, The Gaussian plume model.	08
2.	**Air pollution** – sources and effects – Definition and concentrations, classification and properties of air pollutants, emission sources, major emissions from global sources, importance of Anthropogenic sources, behaviour and fate of air pollutants. Photochemical smog, Effects of air pollution on health, vegetation and materials damages.	08
3.	**Air pollution sampling and measurement** – Types of pollutant sampling and measurement, ambient air sampling, collection of gaseous air pollutants, collection of particulate pollutants, stack sampling, analysis of air pollutants – sulphur dioxide, nitrogen oxides, carbon monoxide, oxidants and ozone, hydrocarbons, particulate matter.	08
4.	**Air pollution control methods and equipment** – Control methods, source correction methods, cleaning of gaseous effluents, particulate emission control – gravitational settling chambers, cyclone separators, fabric filters, electrostatic precipitators, wet scrubbers, selection of a particulate collector, control of gaseous emissions, absorption by liquids, adsorption by solids, combustion, biological methods	08

5.	**Control of specific gaseous pollutants** – Control of sulphur dioxide emission, de-sulphurisation of flue gases, Dry methods, wet scrubbing methods, control of nitrogen oxides, Modification of operating conditions, modification of design conditions, effluent gas treatment methods, Carbon monoxide control, control of hydrocarbons, mobile sources. Air pollution laws and standards.	08
6.	**Global Effects of Air Pollution** – Green House Effect and Global Warming, Acid Rain, Nuclear Fallout, Ozone Depletion Air Pollution Disasters and its Management.	05
	Total	**45**

Text Book:

1. M.N. Rao and H.V.N Rao (2007), "Air Pollution", *Tata McGraw Hill*
2. Daniel Vallero (2014), " Fundamentals of Air Pollution", *Academic Press*

Reference Books:

1. Abhishek Tiwary and Jeremy Colls (2010), " Air Pollution: Measurement, Modelling and Mitigation", *Routledge*
2. Stephen T Holgate, Jonathan M Samet, Hillel S Koren and Robert L. Maynard (1999), "Air Pollution and Health", *Academic Press*

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

Signature
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Signature
(Approved by Dean)

MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

Program: B. Tech. Integrated (Civil Engineering)				Semester : IX	
Course : Elective-II (Green and Intelligent Buildings)				Code : BTICI09015	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Carry out a preliminary assessment of a building as per different standards to assess its energy efficiency
- Suggest primary improvements for increasing energy efficiency of a building
- Identify material and systems for green buildings
- Outline the key elements of Design of a green building

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	Green Building Fundamentals and Background	4
2.	Green Building Assessment , Process and Design	10
3.	Green Building Systems:- Sustainable sites, Landscaping and Heat Island Mitigation	6
4.	High Performance Energy Strategies, Smart Buildings, Energy Optimisation Techniques	6
5.	Green Building Implementation:: Construction Operations and Building Commissioning	6
6.	Green Building Systems::- Building Hydrology, Material Selection and Indoor Environmental Quality	5
7.	Economic Analysis of Green Buildings, Innovative Advances in Green Buildings	8
	Total	**45**

Text Books:

1. Jeffrey Beard, Michael Loulakis, Edward Wundrum (2001), "Design Build: Planning Through Development", *McGraw Hill*
2. Charles J. Kibert (2013) Third Edition, "Sustainable Construction:- Green Building, Design and Delivery", *John Wiley and Sons Delhi.*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

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Program: B. Tech. Integrated (Civil Engineering)				Semester : IX	
Course : Elective – II (Construction Safety)				Code : BTICI09016	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Describe the various safety measures and safety issues in construction.
- Describe the various safety regulations and fire prevention.

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Construction Safety Management:** Role of various parties, duties and responsibilities of top management, site managers, supervisors etc. role of safety officers, responsibilities of general employees, safety committee, safety training, incentives and monitoring. Writing safety manuals, preparing safety checklists and inspection reports.	07
2.	**Reporting, Recording and Investigation:** Investigation of Injuries, Diseases and Dangerous Occurrences, Principles of Accident Prevention , Accident definitions ,Incidents 'Hazard', 'Danger' and 'Risk' , Accident prevention strategies , Safe systems of work Safety monitoring systems ,Accident and ill-health rates , Risk assessment , The role of the health and safety practitioner	08
3.	**Human Factors:** Behavioural safety, Human error, Planned motivation schemes. The application of ergonomics in working situations, Principles of ergonomic design, Controls and displays , Display screen equipment , Manual handling injuries and conditions , Management action Stress at Work, Post-traumatic stress disorder (PTSD)	05
4.	**Occupational Health:** Occupational Diseases and Conditions, Occupational health, Occupational diseases, The Employment Medical Advisory Service (EMAS), Occupational health schemes, Benefits of occupational health services, Sickness absence control, Sickness absence procedure, Sickness absence monitoring	06
5.	**Selection of work equipment:** Principles of machinery safety, Other hazards associated with machinery operation, Machinery guards, Machinery safety devices, Planned maintenance, Lifting operations and lifting equipment, Machinery safety assessment etc., safety of scaffolding and working platforms.	08

6.	**Fire Prevention:** The fire triangle, Causes of fire spread, Safety while using electrical appliances, Explosives, Fire extinction, Fire appliances, Colour coding of fire appliances, Fire protection systems, Legal requirements	05
7.	**Safety Regulations:** Labour laws, legal requirement and cost aspects of accidents on site. Study of safety policies, methods, equipment, and training provided on any ISO approved construction company	06
	Total	**45**

Text Books:

1. Phil & Ferrett, Ed(2011), "Introduction to Health and Safety in Construction :The Handbook for the NEBOSH National Certificate in Construction, *Health and Safety / Hughes*
2. R. K. Mishra (2013),"Construction Safety", *AITBS Publication*

Reference Books:

1. Stranks, Jeremy (2010), "Health and Safety at Work: An Essential Guide for Managers", *9th Edition*
2. Girimaldi and Simonds (2004)," Safety Management", *AITBS Publication*

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

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(Prepared by Concerned Faculty/HOD)

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Signature
(Approved by Dean)

Program: B. Tech. Integrated (Civil Engineering)				Semester : IX	
Course : Elective – II (Construction Economics and Finance Management)				Code : BTICI09017	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- know the concepts in economics and finance in constructions
- analyse investment alternatives and manage construction funds
- know the fundamentals of accounting

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Basic Principles:** Time Value of Money – Cash Flow diagram – Nominal and effective interest- continuous interest. Single Payment Compound Amount Factor (P/F,F/P) – Uniform series of Payments (F/A,A/F,F/P,A/P)– Problem time zero (PTZ) - equation time zero (ETZ). Constant increment to periodic payments – Arithmetic Gradient(G), Geometric Gradient (C)	08
2.	**Comparing Alternative Proposals:** Comparing alternatives- Present Worth Analysis, Annual Worth Analysis, Future Worth Analysis, Rate of Return Analysis (ROR) and Incremental Rate of Return (IROR) Analysis, Benefit/Cost Analysis, Break Even Analysis.	09
3.	**Evaluating Alternative Investments:** Real Estate - Investment Property, Equipment Replace Analysis, and Depreciation – Tax before and after depreciation – Value Added Tax (VAT) – Inflation.	09
4.	**Fund Management:** Project Finance – Sources of finance - Long-term and short -term finance, Working Capital Management, Inventory valuation, Mortgage Financing - International financial management foreign currency management.	09
5.	**Fundamentals of Management Accounting:** Management accounting, Financial accounting principles- basic concepts, Financial statements – accounting ratios - funds flow statement – cash flow statement	10
	Total	**45**

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Text Book:

1. Blank, L.T., and Tarquin,a.J (2011), " Engineering Economy", *7th Edition Mc-Graw Hill Book Co.*
2. Patel, B M (2000), "Project management- Strategic Financial Planning, Evaluation and Control", *Vikas Publishing House Pvt. Ltd. New Delhi.*

Reference Books:

1. Collier C. and GlaGola C. (1998), "Engineering Economics & Cost Analysis", *3rd Edn. Addison Wesley Education Publishers.*
2. Shrivastava,U.K., (2000), "Construction Planning and Management",*2nd Edn. Galgotia Publications Pvt. Ltd. New Delhi.*
3. Steiner, H.M. (1996), "Engineering Economic principles", *2nd Edn. Mc-Graw Hill Book, New York*

Term Work:

Term work should consists of the following:

1. Minimum eight assignments covering the prescribed syllabus

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(Approved by Dean)

SVKM's Narsee Monjee Institute of Management Studies
Mukesh Patel School of Technology Management & Engineering

Program:	B. Tech. Integrated (Civil Engineering)			Semester : X	
Course :	Advanced Design of Concrete Structures			Code : BTICI10001	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Design the flooring system including the staircase
- Design combined footings and simple raft foundations
- Design cantilever and counterfort type retaining wall
- Design water tanks resting on ground and underground tanks

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	Design of Foundations: (limit state method of design) Design of combined footings, design of simple raft subjected to symmetrical loading	08
2.	Design of staircases: (limit state method of design) Design of Dog legged, Open well type staircase.	06
3.	Design of Flooring one way and two way System (limit state method of design)	12
4.	Design of retaining walls: (limit state method of design) Design of cantilever and counterfort type retaining wall.	08
5.	Design of water tanks: (working stress method) Circular and rectangular, at ground level, underground both by IS coefficient and - approximate methods.	11
	Total	**45**

Text Book:

1. Shah & Karve (2010), "Illustrated Design of G+3 Building", *Structure Publication, Pune*
2. IS456 (2000), "Code of Practice for Plain and Reinforced Concrete", *BIS Publication*
3. IS3370 (2009), "Code of Practice - Concrete Structures for Storage of Liquids", *BIS Publication*

Reference Books:

1. Shah & Karve (2010), "Limit State Design - Reinforced Concrete", *Structure Publication, Pune*
2. Shah & Karve (2010), "Illustrated Reinforced Concrete Design", *Structure Publication, Pune*
3. Dayaratnam P (2008), "Limit State Design of Reinforced Concrete Structures", *Oxford & IBH*
4. Jain A K (2007), "Limit State design - Reinforced Concrete", *New Chand*
5. H.J. Shah (2008), "Reinforced Concrete Design", *Charotar Publisher*
6. Sinha & Roy (2013), "Fundamentals of Reinforced Concrete", *Charotar Publisher*

Term Work:

The term work shall consist of detailed design report and at least four A1 (Full imperial) size drawings sheets for three projects covering the above syllabus shall be submitted as term work. All drawing work is to be done in pencil only.

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

Program:	B. Tech. Integrated (Civil Engineering)			Semester : X	
Course :	Construction Project Management and Finance			Code : BTICI10002	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

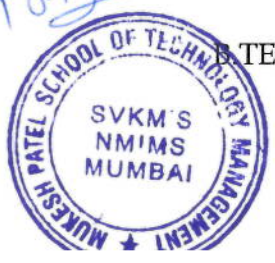
Outcomes:

After completion of this course, students would be able to:

- describe the management of a construction project
- illustrate the sources of funds and its disbursement required for the project
- describe industrial and Labour Act

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1	**Introduction to project management**: Project Management definition, stakeholders, project lifecycle phases, basic forms of organization with emphasis on Project and matrix structures; review of project life cycle, planning for achieving time, cost, quality, safety requirements of projects, project feasibility study based on scope of work, project clearance, project planning, project scheduling, network and non network analysis and scheduling.	08
2.	**Construction project management**: Importance of geotechnical investigation, Site mobilization, , various resources allocation, leveling and management, coordinating communicating reporting technique, application of Management information System (MIS) to construction, monitoring and control mechanisms, training of construction managers	08
3.	**Decision Analysis in Projects**: Selection of vendors & contractors, weighted rating & negotiation, decision tree analysis, AHP	05
4.	**Introduction to project finance:** Determining the funds required for a construction job, preparing cash flow statements, cash inflow and outflow during contract period, project expectations and performance models	07
5.	**Project Control:** Information monitoring, internal and external project control, cost accounting systems for project control, control process, NPV, IRR, payback period performance analysis, variance limits, issues in project Management Software (MS Project) EVM	07



6.	**Industrial Act And Labor Laws**: Industrial Dispute Acts, payment of wages act, Minimum Wages Act, Indian Trade Union Act, and Workmen's Compensation Act	06
7.	**Project Closure:** Project reviews and reporting, closing the contract. EVM Exercise	04
	Total	**45**

Text Book:

1. Chitkara K. K.(2010), "Construction Project Management: Planning, Scheduling and controlling", *Tata McGraw Hill*
2. Gahlot P.S. and Dhir B.M. (2007)," Construction Planning and Management", *New Age International*

Reference Books:

1. Dennis Lock (2013), "Project Management", *Gower*
2. John M Nicholas (2008), "Project Management for Business and Technology(Principle and Practice)", *Pearson Edition.*
3. C. Gray, E. Larson (2011), "Project Management: The Managerial Process", *Mc Graw Hill.*

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

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Signature
(Approved by Dean)

Program: B. Tech. Integrated (Civil Engineering)				Semester : X	
Course : Project - II				Code : BTICI10003	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (100 Marks)	Term End Examinations (TEE) Theory (----)
0	0	12	6	Scaled to 100 marks	----

Outcomes:

After completion of this course, students would be able to:

- Demonstrate the use of knowledge of basic Civil Engineering subjects
- Develop the methodology of analysing the given topic based on the literature survey
- Develop presentation and communication skills

Detailed Syllabus: (Per session plan)

Each student will continue to work on the topic assigned in semester – VII. The students will prepare the detailed report on the project topic by literature survey / self study under the guidance of the faculty & submit the report along with the presentation.

The report will cover the following:

1. Relevance & importance of the topic
2. Basic Principals / Concepts / Definitions
3. Applications- Advantages & Limitations
4. Discussion of related issues.
5. Future scope
6. References

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Program: B. Tech. Integrated (Civil Engineering)				Semester : X	
Course : Elective – III (Structural Dynamics)				Code : BTICI10004	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Determine the dynamic properties of vibratory structures.
- Describe the response of a structures subjected to dynamic loads and base excitation

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	Introduction: Introduction to structural dynamics, definition of basic problem in dynamics, static v/s dynamic loads, different types of dynamic loads.	02
2.	Single degree of Freedom (SDOF) systems: Undamped vibration of SDOF system, natural frequency and period of vibration, damping in structures, viscous damping and coulomb damping, effect of damping on frequency of vibration and amplitude of vibration, logarithmic decrement. Forced vibration, response to harmonic forces, periodic loading, dynamic load factors, response of structure subjected to general dynamic load, Duhamel's integral, numerical evaluation of dynamics response of SDOF systems subjected to different types of dynamic loads. Introduction to frequency domain analysis, response of structure in frequency domain subjected to general periodic and non-periodic / impulsive forces of short duration, use of complex frequency response function. Use of Fourier Series for periodic forces, introduction to vibration isolation. Distributed mass system idealized as SDOF system, use of Rayleigh's method, response of SDOF system subjected to ground motion.	18

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	Generiilized Single-Degree of Freedom System: Generalized properties, assemblages of rigid bodies, systems with distributed mass and elasticity, expressions for generalized system properties.	06
4.	Lumped mass multi degree of freedom (MDOF) system: Coupled and uncoupled systems, direct determination of frequencies of vibration and mode shapes, orthogonality principle, vibration of MDOF systems with initial conditions, approximate methods of determination of natural frequencies of vibration and mode shapes-vector iteration methods, energy methods and use of Lagrange's method in writing equations of motions. Decoupling of equations of motion, modal equation of motion, concept of modal mass and modal stiffness, forced vibration of MDOF system, modal analysis, application to multi storey rigid frames subjected to lateral dynamic loads.	13
5.	Structure with distributed mass system: Use of partial differential equation, free vibration analysis of single span beams with various boundary conditions, determination of frequencies of vibration and mode shapes, forced vibration of single span beams subjected to the action of specified dynamic loads.	06
	Total	**45**

Text Books:

1. Anil K. Chopra (2007), "Dynamics of Structures 3rd Edition", *Prentice Hall India*

Reference Books:

1. Craig R.R. (2006), "Fundamentals of Structural Dynamics 2nd Edition", *John Wiley & Sons*
2. Cloguh & Penzein (2010), "Dynamics of Structures", *Computers and Structures*
3. John M. Biggs (2011), "Structural Dynamics", *Tata McGraw Hill*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

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Program:	B. Tech. Integrated (Civil Engineering)	Semester :	X
Course :	Elective – III (Earthquake Engineering)	Code :	BTICI10005

Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Determine the response of SDOF and MDOF systems subjected to base excitation
- Analyze the structure using IS code method and response spectrum
- Illustrate the codal provisions of detailing of RC structures

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**SDOF systems:** Definitions of basic problems in dynamics, static v/s dynamic loads, different types of dynamic loads, undamped vibration of SDOF system, natural frequency and periods of vibration, damping in structure. Response to periodic loads, response to general dynamic load, response of structure subject to ground motion, use of Fourier series for periodic forces.	10
2.	**MDOF systems:** Direct determination of frequencies and mode shapes, orthogonality principle, approximate methods for determination of frequencies and mode shapes. Forced vibration of MDOF system, modal analysis, applications to multistoried rigid frames subject to lateral dynamic loads including ground motion	06
3.	**Seismological background:** Seismicity of a region, earthquake faults and waves, structure of earth, plate tectonics, elastic-rebound theory of earthquake, intensity and magnitude of earthquake, measurement of ground motion, seismogram, earthquake frequency, local site effects, seismotectonics and Seismicity of India.	06
4.	**Characterization of ground motion:** Earthquake response spectra, factors influencing response spectra, design response spectra for elastic systems, peak ground acceleration, response spectrum shapes, deformation, pseudo-velocity, pseudo-acceleration response spectra. peak structural response from the response spectrum, response spectrum characteristics, construction site specific response spectra.	06

5.	**Deterministic earthquake response:** Types of earthquake excitation, lumped SDOF elastic systems. translational excitation, lumped MDOF elastic systems, translational excitation, time history analysis, multistoried buildings with symmetric plans, multi storied buildings with un symmetric plans, torsional response of symmetric plan building, distributed - parameter elastic systems, translational excitation, combining maximum modal responses using mean square response of a single mode, SRSS and CQC combination of modal responses.	06
6.	**IS code method of seismic analysis:** Seismic co-efficient method and its limitation, response spectrum method, IS 1893-2002 provisions for seismic analysis of buildings and water towers, seismic evaluation and retrofitting, types of structural system used in building to resist earthquake loads.	06
7.	Review of damages during past earthquakes and remedial measures, seismic design considerations, allowable ductility demand, ductility capacity, reinforcement detailing for members and joints as per IS 13920	05
	Total	**45**

Text Books:

1. Anil K. Chopra (2007), "Dynamics of Structures 3rd Edition", *Prentice Hall India*
2. Pankaj Agarwal, Manish Shrikhande (2006), "Earthquake Resistant Design of Structures", *Prentice Hall India*

Reference Books:

1. Craig R.R. (2006), "Fundamentals of Structural Dynamics 2nd Edition", *John Wiley & Sons*
2. Cloguh & Penzein (2010), "Dynamics of Structures", *Computers and Structures*
3. John M. Biggs (2011), "Structural Dynamics", *Tata McGraw Hill*
4. IS1893 (2002), "Criteria for design of earthquake Resistant Structures", *BIS Publications*
5. IS13920 (2009), "Ductile Detailing of Reinforced Concrete Structures Subjected to Seismic Forces - Code Of Practice" *BIS Publications*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

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Program:	B. Tech. Integrated (Civil Engineering)			Semester : X	
Course :	Elective – III (Rock Mechanics)			Code : BTICI10006	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- understand the basic principles of rock mechanics
- classify rocks based on various classification methods predict the behaviour of rock mass under application of loads
- analyse stability of rocks slopes
- determine bearing capacity of rocks

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Elements of structural geology:** Elements of Structural geology, geological site investigations in rocks and engineering characteristics of rock masses, mapping of joints.	03
2.	**Engineering classification of rocks and rock masses:** Classification of intact rocks, rock mass classifications {rock quality designation, rock structural rating, geomechanics classification (RMR)}, strength and modulus from classifications, classification based on strength and modulus, Geoengineering, classification, Deere and Miller's Engineering classification.	08
3.	**In-situ stress measurement in rocks and Rock testing:** **a) In-situ stress measurement in rocks:** Flat Jack method, Bore-hole deformation method, Core discing method, Hydraulic Fracturing method. **b) Rock testing:** 1. **Laboratory testing:** Compression test, Effect of L/D ratio, Determination of Modulus of Elasticity and Poisson's Ratio, Direct and Indirect (Brazilian) Tensile tests, Shear tests (including hollow cylinder test). 2. 2. **In-situ testing**: Plate load test, Block shear test, Cable Jacking test, Pressuremeter test.	09
4.	**Strength, modulus and stress-strain responses of rocks:** Factors influencing rock responses, strength criteria for isotropic intact rocks, modulus of isotropic intact rocks with confining pressure, uni-axial compressive strength of intact anisotropic rocks, strength due to induced anisotropy in rocks, compressive strength and modulus from SPT, stress-strain models (constitutive models, elastic stress-strain model, elasto-plastic stress-strain model,	05

	equivalent material concept), influence of intermediate principal stress	
5.	**Bearing capacity of rocks:** Estimation of bearing capacity (foundation on intact rock, heavily fractured rock, UBC with Hoek-Brown criterion, foundation on slope), stress distribution in rocks, factor of safety, strengthening measures (concrete shear keys, bored concrete piles, tensioned cable anchors, concrete block at toe), settlement in rocks (from joint factor, for horizontal joints, from field tests)	10
6.	**Stability of rock slopes:** Modes of failure, rotational failure, plane failure, wedge method of analysis, buckling failure, toppling failure, improvement of slope stability and protection	05
7.	**Rock bolting and grouting:** Opening in Rocks, Rock Bolting and Grouting Introduction to theory of elasticity, lines and unlined tunnels, pressure tunnels and tunnels for other purposes. Grouting in rocks, objectives, contact grouting, consolidation grouting, process of grouting, grout requirement, types of grout, stage grouting, grout curtain. Rock bolts, rock bolt types and applications, theory of rock bolting, rock anchors, modes of failure, uplift capacity	05
	Total	**45**

Text Book:

1. J. C. Jaeger and N. G. W. Cook (2007), "Fundamentals of Rock Mechanics", *Oxford Press.*
2. T. Ramamurthy (Editor) (2007), "Engineering in Rocks", Prentice Hall.

Reference Books:

1. K. G. Stagg and O. C. Zienkiewicz (1968), "Rock Mechanics in Engineering Practice", *John Willey & Sons* (Classic Book)
2. Alfred Jumikis (1979), "Rock Mechanics-Vol. I & II', *Trans Tech Publication* (Classic Book)

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

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Program: B. Tech. Integrated (Civil Engineering)				Semester : X	
Course : Elective – III (Design of Hydraulic Structures)				Code : BTICI10007	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Analyse different forces and vibrations acting on different dam structures.
- Design different dam structures, different spillways and energy dissipaters
- Analyse small bridges, surplus weirs causeways and culverts

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Introduction:** Introduction, classification, comparative study of different types of dams, selection of type of dam, selection of site of dam, preliminary and final investigations of dam sites, fixation of storage capacity, reservoir losses, sedimentation in reservoirs, density currents.	04
2.	**Gravity dams:** Criteria for selection of dam site, construction material, forces acting on gravity dam, modes of failure, stability analysis, safety criteria, methods of design , stress analysis and stress contours, galleries, instrumentation, joints, keys, water seals, temperature control in concrete dams, foundation treatment.	10
3.	**Arch and buttress dams:** Types of arch dams, forces on an arch dam, design. Types of buttress dams.	04
4.	**Earth and rockfill dams:** Advantages and limitations, foundation of earth dams, causes and failures of earth dams, design criteria, design considerations in earthquake regions, seepage line for different conditions, filters, upstream blankets, stability analysis, Swedish circle method with pore pressure, details of construction and maintenance, types of rockfill dams, stability analysis, advantages.	10

5.	**Spillways and flood control works:** Factors affecting design of spillway, types of spillways, design principles of ogee spillway, chute spillway, siphon spillway and shaft spillway. Design of bucket type energy dissipater and stilling basin, flood mitigation reservoirs. Crest gates, types, advantages, choice, design of radial gate. Outlet works through dams, intake structures.	10
6.	**Miscellaneous topics:** Design of small bridges and culverts, data collection, high flood discharge, linear waterway calculation, scour depth, causeways and culverts, principles of hydraulic design. Design details of surplus weir, flush escape, direct sluice, canal drop, canal regulator, cross drainage works. Vibration and cavitation in hydraulic structures. Design of air vent.	07
	Total	**45**

Text Book:

1. Modi P.N. (2011), "Irrigation water resources and water power engineering", *Standard Book House*

Reference Books:

1. Garg S.K. (2010), "Irrigation Engineering and Hydraulic Structures", *Khanna Publishers*
2. Punmia B.C. (2011), "Hydraulics and Fluid Mechanics", *Laxmi Publications*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

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Signature
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Program:	B. Tech. Integrated (Civil Engineering)	Semester : X
Course :	Elective – III (Numerical Modelling of Groundwater Flow and Transport)	Code : BTICI10008

Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- understand the occurrence, distribution and characteristics of sub-surface water
- analyse Groundwater flow-transport phenomenon for Groundwater modelling
- suggest remedial measures to groundwater contamination

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Introduction:** General water balance, regional groundwater balance, distribution of sub-surface water, different types of aquifers, occurrence of groundwater in hydrogeologic formations, structures and types of wells, components of groundwater studies	05
2.	**Aquifer characteristics:** Darcy's law, determination of *in situ* hydraulic conductivity, flow through fractured medium. Governing equations of groundwater flow in aquifers, consideration of various recharge and discharge terms, Dupuit's theory of free surface flow	12
3.	**Groundwater flow modelling :** Introduction, major applications of groundwater models, numerical modelling of groundwater systems, time variant groundwater flow modelling, Galerkin's FEM formulation, , GW flow and solute transport modelling by Finite Difference Method (FDM), Finite Element Method (FEM) and Mesh free (MFree) methods	12
4.	**Contamination of groundwater:** Introduction, hydrodynamic dispersion of pollutants in Groundwater environment, Advection-Dispersion equation for modelling contaminant transport in porous media	12
5.	**Remediation of groundwater:** Methods of remediation- Pump and treat, pump and use, *In-situ* bioremediation	04
	Total	**45**

Text Book:

1. Rastogi A.K. (2011), "Numerical Groundwater Hydrology", *Penram International Publishing (India) Pvt. Ltd.*
2. Franklin W. Schwartz and Hubao Zhang(2012)," Fundamentals of Groundwater" *Wiley India Pvt. Ltd.*

Reference Books:

1. Bear J. (1979), "Hydraulics of Ground Water", *McGraw Hill Publishing, New York.* (Classic book)
2. Freeze R. A., Cherry J. A. (1979), "Ground Water", *Prentice Hall Inc. NJ.* (Classic book)

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

Signature
(Prepared by Concerned Faculty/HOD)

MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT
SVKM'S NMIMS MUMBAI

Signature
(Approved by Dean)

Program:	B. Tech. Integrated (Civil Engineering)			Semester : X	
Course :	Elective – III (Traffic Analysis and Design)			Code : BTICI10009	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- prepare the traffic flow modelling
- define the concept of vehicle arrival pattern
- describe the different methods of signal control strategy

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Introduction:** Introduction to Transportation System Engineering, activity - transport flow system, equilibrium between demand and supply	05
2.	**Microscopic and mesoscopic traffic flow modelling:** a) Car-following models: Concept of stimulus-response, general motors' models b) Lane changing models: Conceptual framework, lane selection model c) Vehicle arrival models: Poisson distribution, headway modelling, vehicle generation	10
3.	**Signalized intersection control:** a) Design and evaluation of traffic signal: Review of basics, delay model. b) Capacity and LOS analysis of a signalized I/S: HCM 2000 method of analysis c) Coordinated traffic signal: Concepts of offset, common cycle length bandwidth d) Vehicle actuated signals and Area traffic control: Basic principles, architecture	08
4.	**Macroscopic traffic flow modelling** : Traffic progression models, Robertson progression model, platoon movement, traffic flow modeling analogies, fluid flow analogy, Lighthill-Withams theory, Cell transmission models: Flow conservation, flow transmission	08

5.	**Capacity analysis of traffic facilitates :** a) Urban Street: HCM Classification, operational performance measures, Multilane highways: Characteristics, capacity and level of service HCM b) Freeway operations: Operational considerations, basic segment, weaving operation, Ramp metering: Merging and diverging areas; fixed, reactive, and predictive systems	07
6.	**Traffic impact studies**: Accident Studies, Accident data collection, statistics, safety audit, safety measures. fuel consumption and emission studies, pollutants, models, mitigation measures. congestion studies, performance measures, intensity, duration, extent, remedial measures Toll operation, queuing models, operations	07
	Total	**45**

Text Books:

1. Kadiyali, L. R. (2008), "Traffic Engineering and Transportation Planning", *Khanna Publications, India*

Reference Books:

1. Highway Capacity Manual (2010), "Transportation Research Board", *USA*
2. Khanna, S. K. & Justo, C. E. G. (2011), "Highway Engineering", *New Chand & Bros., Roorkee*

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT
SVKM'S NMIMS MUMBAI

Signature
(Approved by Dean)

Program: B. Tech. Integrated (Civil Engineering)				Semester : X	
Course : Elective – IV (Pavement Design and Construction)				Code : BTICI10010	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Describe the different pavement structures and their functions
- Calculate the stresses in flexible and rigid pavements
- Determine the methodology for evaluation and strengthening of pavements
- Define the low cost roads, concrete roads

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Pavement structure and functional attributes:** factor affecting pavement design, types of wheel loads for highways and airports, development of design method for highway and airport pavements.	04
2.	**Stresses in flexible pavements:** 1-layer, 2-layer, 3-layers theories, EWLF, ESWL Stresses in Rigid pavement: load and temperature stresses, combined stresses.	04
3.	**Flexible Pavement Design** Airport pavement: Corps of Engineer's method, FAA method CDOT method, Asphalt institute method. Highway Pavement: Empirical methods using no soil strength criteria, empirical method based on soil strength criteria: CBR method as specified by IRC, Road note 29 methods, AASHTO method, Asphalt institute method. Fatigue and rutting as a failure criterion.	08
4.	**Rigid Pavement Design:** Airport pavements: PCA methods, corps of Engineer's method, FAA method. Joints and reinforcement requirement. Highway pavement: Current British procedure, IRC method.	06
5.	**Evaluation and strengthening:** flexible and rigid pavement distresses, condition and evaluation surveys, present serviceability index, roughness measurement, Benkaleman beam deflections, design of overlays, skid resistance and measurement.	06

6.	**Concrete road construction:** Mix design, concrete strength, size of aggregates, gradation, and workability, preparation of base form work, placing of reinforcement, compaction, and finishing, curing, joints.	04
7.	**Low Cost Raods (Rural Areas)** Classification of low cost roads, construction of low cost roads, stabilization of subgrade, base and its adventages, construction of granular base courses, macadam surface, macadam bases, low cost materials and methods used for highway construction, suitability of different types of roads under different situation. Soils.	05
8.	**Road making machinery** Role of labour versus machinery, in road construction, earth work machinery, rock excavation machinery, aggregate transportation and watering equipment, wet mix WMM Plant, Asphalt plant, (computerized), drum mix, Continuous batch mix, compaction equipment, bituminous equipment, storage, heating and spraying equipment, hot mix plants, cold mix plants, paver, finisher, concrete road making machinery, equipment usage rates, factors affecting usage rate.	08
	Total	**45**

Text Book:

1. L. R. Kadiyali and Dr. N. B. Lal (2011), "Principles and Practices of Highway Engineering", *Khanna Publication, New Delhi*

Reference Books:

1. Khanna & Justo, (2011), "Highway Engineering", *New Chand & Brothers, Roorkee.*
2. Yoder, E. J., (1975), "Principles of Pavement Design, Second edition", *John Wiley & Sons, Inc., New York (Classic Book)*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

Signature
(Prepared by Concerned Faculty/HOD)

Signature
(Approved by Dean)

Program: B. Tech. Integrated (Civil Engineering)				Semester : X	
Course : Elective – IV (GIS and Remote Sensing)				Code : BTICI10011	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- describe importance and significance of GIS and RS
- discuss sensor satellite system parameters
- discuss application of GIS and RS in Civil Engineering

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Introduction to remote sensing:** Electromagnetic spectrum, physics of remote sensing , effects of atmosphere , atmospheric windows, interaction of earth surface features with EMR, spectral characteristics of vegetation, water, soil, etc. various types of platforms, airborne and space based platforms, different types of aircraft, manned and unmanned spacecraft used for data acquisition, characteristics of different types of platforms, characteristics of Remote Sensors, multi spectral sensors, multi spectral scanners, microwave remote sensing, factors affecting microwave measurement-Radar wave bands, SLAR and SAR.	10
2.	**Sensors- Satellite system parameters:** Sensor parameters-spatial, spectral and radiometric resolution, False colour composite (FCC), multi spectral (thermal and microwave) imaging system, earth resources satellite and meteorological satellites different types of data products and their characteristics, image interpretation, basic principles of visual interpretation, elements of image interpretation, equipment for visual interpretation, activities of image interpretation, ground truth, basic principles of digital image processing, filtering	10
3.	**Geographic Information system:** History and development of GIS, GIS definitions and Terminology, architecture, system concepts, coordinate systems, standard GIS packages, type of data, spatial and non, spatial data, data structure, points, lines, polygon, vector and raster, files and data formats, spatial data modelling, Raster GIS model and Vector GIS models, GIS data file management and database models	08

4.	**Data input and data editing**: Input methods, GPS as data capture, data editing. spatial analysis, data retrieval, query, simple analysis, record, buffering and overlay, vector data analysis, raster data analysis, modelling in GIS, digital elevation model, DTM, modelling networks integration of RS and GIS, need and facilities for integration, application of these to Civil Engineering, Cadestral records and LIS	08
5.	**Application of GIS and RS in Civil Engineering**: Various projects in Civil Engineering and preparation of GIS Projects with database management	09
	Total	**45**

Text Book:

1. Anji Reddy, M. (2012), "Remote Sensing and Geographical Information System", *BSP Publications*

Reference Books:

1. Abhishek Tiwary and Jeremy Colls (2010), " Air Pollution: Measurement, Modelling and Mitigation", *Routledge*
2. Clarke, K.C. Parks B.O., and Crane M.P. (2010), "Geographic Information systems and environmental modelling", *PHI of India , New Delhi*
3. Chang, K (2013), "Introduction to Geographic Information Systems", *Tata Mc Graw Hills Edition, NewDelhi*

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

Signature
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(Approved by Dean)

SVKM's Narsee Monjee Institute of Management Studies

Mukesh Patel School of Technology Management & Engineering

Program: B. Tech. Integrated (Civil Engineering)				**Semester :** X	
Course : Elective – IV (Industrial Waste Treatment)				**Code :** BTICI10012	
Teaching Scheme				**Evaluation Scheme**	
Lecture Hours Per week	**Practical Hours Per week**	**Tutorial Hours Per week**	**Credit**	**Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)**	**Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)**
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Explain components of water supply schemes
- Estimate various water demands and its calculation
- Describe water treatment process and Design of various treatment units
- Analyze water sample and explain its distribution

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	Standards for disposal of treated industrial wastewaters into water bodies, municipal sewer and land, Standards for Disposal of industrial solid wastes and gaseous emission from various industries and treatment systems such as Incinerator etc.	09
2.	Industrial waste generation (solid & liquid waste and gaseous emission) and their characteristics, variation in its Quality and quantity, Estimation of capacity of equalisation tank. Industry specific physico-chemical and biological treatment requirements, alternatives and their evaluation in respect of treatment.	09
3.	Waste streams (solid, liquid and gaseous), their characteristics and manufacturing processes of integrated steel plant, sponge iron unit, alumina/aluminum manufacturing unit, copper smelter, fertilizer plant, thermal power plant, distillery/brewery, paper/pulp industry, tannery, textile unit and oil refinery	09
4.	Methods of waste reduction such as process modification, volume and strength reduction, segregation, reuse, recycle, material conservation, good housekeeping. Neutralization, equalization, Engineering precipitation and solidification. Economic feasibility of joint treatment of raw industrial effluent with municipal sewage. Need assessment and design of common effluent treatment plant for industrial estates. Planning and management of industrial wastes (solid, liquid and gaseous) from small scale industries.	09

5.	Selection of unit operations and their design for treatment and management of wastes (solid, liquid and gaseous) from integrated steel plant, sponge iron unit, alumina/aluminum manufacturing unit, copper smelter, fertilizer plant, thermal power plant, distillery/brewery, paper/pulp industry, tannery, textile unit and oil refinery.	09
	Total	**45**

Text Books:

1. Patwardhan A. D.(2008), "Industrial Waste Water Treatment", *Prentice Hall of India*

Reference Books:

1. Soli J. Arceivala, Shyam R. Asolekar (2007), "Waste Water Treatment for Pollution Control and Reuse" *Tata McGraw Hill Professional*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

Signature
(Approved by Dean)

Program:	B. Tech. Integrated (Civil Engineering)			Semester : X	
Course :	Elective – IV (Environmental Impact Assessment and Audit)			Code : BTICI10013	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- Describe Environmental Impact Assessment and process
- Prepare the Rapid and Comprehensive EIA Report

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Environmental Impact Assessment (EIA):** Introduction, definitions and concepts, rationale and historical development of EIA, Significance of EIA, Role of EIA in planning & decision making process, objectives of EIA.EIA for civil engineers.	08
2.	**Environmental Assessment Process:** Assessment methodology, Socioeconomic impact assessment, Air quality impact analysis, Noise impact analysis, Energy impact analysis, Water quality impact analysis, Vegetation & wild life impact analysis, Cumulative impact assessment, Ecological impact assessment, Risk assessment.	08
3.	**Environmental Impact Assessment** Basic concept behind EIS, Stages in EIS production: Screening, scoping, prediction, evaluation, reducing impact, monitoring, conclusions, typical EIS outline.	08
4.	Preparation of Rapid and Comprehensive EIA report for any five projects of different sectors of construction industry	08
5.	Environmental Auditing Definition, aims & objectives, audit principles, incentives to undertake audit, partial environmental audits, stages of implementing environmental audits, scope of audit, Provisions of various environmental acts of India	08

6.	Case Studies	05
	Total	**45**

Text Book:

1. A.K. Shrivastava (2003), "Environmental Impact Assessment", *APH Publishing Corporation*

Reference Books:

1. A. Kumar, B.B. Hosetti (1998), "Environmental Impact Assessment and Management", *Daya Publishing House (Classic Book)*
2. R.R. Barthwal (2002), "Environmental Impact Assessment", *New Age International Publisher*

Term Work:

Term work should consists of the following

1. Minimum seven assignments covering the prescribed syllabus

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

Signature
(Approved by Dean)

Program:	B. Tech. Integrated (Civil Engineering)	Semester : X
Course :	Elective IV- (Construction Quality Control and Assurance)	Code : BTICI10014

Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- describe the quality control aspects in planning, systems, management, assurance
- evaluate quality assurance and improvement techniques

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Quality management:** Introduction, definitions and objectives, factors influencing construction quality, responsibilities and authority, quality plan, quality management guidelines, quality circles	08
2.	**Quality systems:** Introduction, quality system standard, ISO 9000 family of standards, requirements, preparing quality system documents, quality related training, implementing a quality system, Third party certification	09
3.	**Quality planning :** Quality policy, objectives and methods in construction industry, consumers satisfaction, Ergonomics, time of completion, statistical tolerance, Taguchi's concept of quality, codes and standards, documents, contract and construction programming, inspection procedures, processes and products, total QA / QC programme and cost implication, Ishikawa fishbone diagram, source event diagram.	09
4.	**Quality control and assurance:** Objectives, regularity agent, owner, design, contract and construction oriented objectives, methods, techniques and needs of QA/QC, different aspects of quality, appraisals, factors influencing construction quality, critical, major failure aspects and failure mode analysis, stability methods and tools, optimum design, reliability testing, reliability coefficient and reliability prediction, cost of quality	10

5.	**Quality improvement techniques:** Selection of new materials, influence of drawings, detailing, specification, standardization, bid preparation, construction activity, safety, social and environmental factors, natural causes and speed of construction on quality of delivery. Life cycle costing.	09
	Total	**45**

Text Book:

1. James, J.O' Brian (2012), "Construction Inspection Handbook – Total Quality Management", *Van Nostrand*

Reference Books:

1. Juran Frank, J.M. and Gryna, F.M.(2001), "Quality Planning and Analysis", *McGraw Hill*
2. John L. Ashford (2003), "The Management of Quality in Construction", *E & F.N.Spon*

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT * SVKM'S NMIMS MUMBAI

Program: B. Tech. Integrated (Civil Engineering)				Semester : X	
Course : Elective – IV (Construction Contracts and Administration)				Code : BTICI10015	
Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes:

After completion of this course, students would be able to:

- describe different types of contracts in construction
- describe arbitration and legal aspect and its provisions

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Construction contracts:** Indian Contracts Act, elements of contracts, types of contracts, features, suitability, design of contract documents, international contract document, standard contract document, Torts	08
2.	**Tenders:** Prequalification, bidding, accepting, evaluation of tender from technical, contractual and commercial perspective, contract formation and interpretation, potential contractual problems, World Bank procedures and guidelines	08
3.	**Arbitration:** Comparison of actions and laws, agreements, subject matter, violations, appointment of arbitrators, conditions of arbitration, powers and duties of arbitrator, rules of evidence, enforcement of award, costs, Arbitration and Conciliation Act 1996	08
4.	**Legal requirements:** Insurance and bonding, laws governing sale, purchase and use of urban and rural land, and revenue codes, tax laws, income tax, sales tax, excise and custom duties and their influence on construction costs, legal requirements for planning, Property Law, Agency Law, Local Government Laws for approval, statutory regulations	08
5.	**Labour regulations:** Social security, welfare legislation, Laws relating to wages, bonus and industrial disputes, Labour Administration, insurance and safety regulations, workmen's Compensation Act, Indian Factory Act, Child Labour Act, other Labour Laws	08

6.	**Claims and Claims Management:** Claims, common claims in construction, claims from contractor and from employer, Dispute resolution board, claims management.	05
	Total	**45**

Text Book:

1. Jimmie Hinze (2010), "Construction Contracts", *McGraw Hill*

Reference Books:

1. Patil. B.S. (2006), "Civil Engineering Contracts and Estimates", *Universities Press (India) Private Limited.*
2. Joseph T. Bockrath (2010), "Contracts and the Legal Environment for Engineers and Architects", *McGraw Hill*

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

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MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT ★ SVKM'S NMIMS MUMBAI

Program:	B. Tech. Integrated (Civil Engineering)	Semester : X
Course :	Elective - IV (Smart Cities: Planning and Technology)	Code : BTICI10016

Teaching Scheme				Evaluation Scheme	
Lecture Hours Per week	Practical Hours Per week	Tutorial Hours Per week	Credit	Internal Continuous Assessment (ICA) as per Institute Norms (50 Marks)	Term End Examinations (TEE) Theory (3 Hrs, 70 Marks)
3	0	2	4	Scaled to 30 marks	Scaled to 70 marks

Outcomes

After completion of this course, students would be able to:

- understand the basic concept of smart city
- identify requirements of a smart city
- understand the use of technological innovations for smart city enablement

Detailed Syllabus: (Per session plan)

Unit	Description	Duration
1.	**Definition, components & characteristics of a smart city:** Context & definition, need, components & characteristics, basic principles involved in planning, benefits of smart cities. Barriers to development of smart cities, five ICT essentials, 3 layer concept of modern cities (Urban infrastructure, facility & service layers), Understanding the need to reduce carbon emissions and developing sustainable smart solutions. Four facets of smart solutions - Physical, Institutional, Social & Economic Infrastructure; Framework of public information system in smart cities.	08
2.	**Smart security infrastructure:** City surveillance systems, Intelligent Traffic Management Systems, Emergency Response systems & smart solutions to handle crisis management. Public safety, smart payments and finance	06
3.	**Smart telecommunications infrastructure:** Wired & wireless network systems, Role of satellite communication, Wi-Fi and RF systems in smart communication, Optical Fibre Cable and DWDM (Dense Wave Division Multiplexing), IPMPCS (Multi-Protocol Cable Switching) solutions	08
4.	**Smart transport facilities:** Smart transportation, Logistics, Real time Information systems, traffic information management, smart solutions for water supply and waste water engineering; Remote sensing & GIS technology.	10

5.	**Smart environmental facilities:** Water and wastewater, waste management, health and human services.	04
6.	**Energy solutions:** Smart solutions that can be integrated with renewable energy. Smart grid systems, Reducing carbon emissions without compromising on convenience of users. Community Energy Management systems, Energy on wheels, H2H & V2H (Home to Home & Vehicle to Home) Energy solutions, smart meters.	09
	Total	**45**

Text Book:

1. Chou T.(2015), "Remote Sensing and smart city", *WIT Press, UK*

References:

1. Reference Guide, Version 2, (August 2015), Smart Cities Council of India
2. Buscher V., Doody L, Hill D., (2010), "Smart Cities: Transforming the 21st century city via the creative use of technology", *Arup*
3. Renata Paola Dameri, Camille Rosenthal-Sabroux and Cham, (2014), "Smart City: How to Create Public and Economic Value with High Technology in Urban Space (Progress in IS)", *Springer*
4. Anthony M Townsend (2013), "Smart Cities: Big Data, Civic Hackers, and the Quest for New Utopia " *WW Nortan and Company*

Term Work:

Term work should consists of the following

1. Minimum eight assignments covering the prescribed syllabus

MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT * SVKM'S NMIMS MUMBAI

Signature
(Prepared by Concerned Faculty/HOD)

Signature
(Approved by Dean)

Program: B. Tech. Integrated (Civil Engineering)				Semester : XI	
Course/ Module : In-plant Training Phase I				Module Code : BTICI11001	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Internal Continuous Assessment (ICA) (Marks - 300)	Term End Examinations (TEE) (Marks- ---)
0	40	0	15	Marks Scaled to 300	---

Pre-requisite: Domain Knowledge of relevant stream

Objectives:

1. To make the student conversant with industrial activities, organizational behavior and ethics.
2. To understand various industrial aspects construction processes, productivity improvement, value engineering, quality control etc.
3. To identify, analyze and solve engineering problems from relevant industry.

Outcomes:

After completion of the course, student would be able to:

1. Interpret and solve technical problems through the application of engineering principles.
2. Enhance communication skills and maintain discipline, safety norms and environmental awareness.
3. Practice leadership and managerial skills.

Guidelines:

In-plant Training, Trainee's Code of Conduct:

Trainee is required to:

- Join on the stated date and complete the training as specified by the Industry
- Fill the Joining Report, get it endorsed by the concerned Industry Official and email the scanned copy within One week of joining to the Placement Department and Faculty Mentor.
- Adhere to all the rules and regulations, safety norms of the Industry and thereby ensure professional conduct
- Take instructions from the Industry Mentor on a daily basis and complete the same with due diligence and quality
- Fill the Weekly log book, get it endorsed by the concerned Industry Official and then email the scanned copy within two weeks to the Faculty Mentor

Mentoring process:

- Every In plant trainee shall be allocated two Mentors: an Industry Mentor and a Faculty from the Department (appointed by Head of the Department).
- Faculty Mentor shall connect with the Industry Mentor and the Trainee on a periodic basis.

Training Report:

- Students should take guidance from faculty and industry mentor and prepare a report on their work done in In-plant training and one copy should be submitted to the Institute.
- The report should be prepared in a format prescribed by the University.

Report: Interim Report (IR)
(One copy to be submitted each to Internal mentor & Company Mentor)
This report must cover the following aspects:

Interim Presentation
It should give overview about the training to be done.

a. *Synopsis*: A statement of about 100-words describing what the training is about.
b. *Goals*: Stating what the training will accomplish
c. Schedule: A time frame indicating steps that will be required and the expected date when they will be completed.
d. *Reference*: Bibliography and internet materials referred.

Final Presentation
The Final Presentation will evaluate the students in terms of the following

a. Knowledge of basic concepts
b. Ability to identify and analyze the problem
c. Ability to apply the knowledge to solve the problem
d. Logical development of the subject
e. Effective oral communication

Training Report
(One copy to be submitted each to Institute & Company Mentor)
The Report (Interim Report and Final Report), which is the written component of evaluation, may be judged for the following points.

1. Comprehensive study of the problem & objective
2. Methodology and implementation
3. Ability to analyze the problem
4. Logical sequencing, organizing and data handling
5. Findings, observations, concluding remarks in terms of the objectives set earlier and the future scope of the problem.

In-plant Training Evaluation Scheme

Evaluation Phases	Evaluation	Marks	Duration	Remarks
Weekly Log book	Weekly progress report **	100	15 Weeks	Evaluated by Industry Mentor
Interim	Weekly log book (30 Marks Internal Mentor), Interim Presentation and Report (70 Marks)	100	Between 8th to 10th week	Panel of at least two faculty mentors
Final	Final Presentation and Report	100	End of the term	Panel: Industry and Internal
Total Marks		300		

Any other information: NIL

Details of Internal Continuous Assessment (ICA)
Test Marks: --
Term Work Marks: 300

** Weekly program report to be evaluated every week for 10 marks. Total 150 marks to be scaled down to 100 marks. 10 marks for every week to be evaluated for punctuality delivery of the assigned work, behaviour etc.

Signature
(Prepared by Concerned Faculty/HOD)

Signature
(Approved by Dean)

Program: B. Tech. Integrated (Civil Engineering)				Semester: XII	
Course/ Module : In-plant Training Phase II				Module Code: BTICI12001	
Teaching Scheme				Evaluation Scheme	
Lecture (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Internal Continuous Assessment (ICA) (Marks - 300)**	**Term End Examinations (TEE) (Marks- ---)**
0	40	0	15	Marks Scaled to 300	---

Pre-requisite: Domain Knowledge of relevant stream

Objectives:

1. To make the student conversant with industrial activities, organizational behavior and ethics.
2. To understand various industrial aspects construction processes, productivity improvement, value engineering, quality control etc.
3. To identify, analyze and solve engineering problems from relevant industry.

Outcomes:

After completion of the course, student would be able to:

1. Interpret and solve technical problems through the application of engineering principles.
2. Enhance communication skills and maintain discipline, safety norms and environmental awareness.
3. Practice leadership and managerial skills.

Guidelines:

In-plant Training, Trainee's Code of Conduct:

Trainee is required to:

- Join on the stated date and complete the training as specified by the Industry
- Fill the Joining Report, get it endorsed by the concerned Industry Official and email the scanned copy within One week of joining to the Placement Department and Faculty Mentor.
- Adhere to all the rules and regulations, safety norms of the Industry and thereby ensure professional conduct
- Take instructions from the Industry Mentor on a daily basis and complete the same with due diligence and quality
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Mentoring process:

- Every In plant trainee shall be allocated two Mentors: an Industry Mentor and a Faculty from the Department (appointed by Head of the Department).
- Faculty Mentor shall connect with the Industry Mentor and the Trainee on a periodic basis.

Training Report:

- Students should take guidance from faculty and industry mentor and prepare a report on their work done in In-plant training and one copy should be submitted to the Institute.
- The report should be prepared in a format prescribed by the University.

Report: Interim Report (IR)
(One copy to be submitted each to Internal mentor & Company Mentor)
This report must cover the following aspects:

Interim Presentation
It should give overview about the training to be done.

a. *Synopsis*: A statement of about 100-words describing what the training is about.
b. *Goals*: Stating what the training will accomplish
c. Schedule: A time frame indicating steps that will be required and the expected date when they will be completed.
d. *Reference*: Bibliography and internet materials referred.

Final Presentation
The Final Presentation will evaluate the students in terms of the following

a. Knowledge of basic concepts
b. Ability to identify and analyze the problem
c. Ability to apply the knowledge to solve the problem
d. Logical development of the subject
e. Effective oral communication

Training Report
(One copy to be submitted each to Institute & Company Mentor)
The Report (Interim Report and Final Report), which is the written component of evaluation, may be judged for the following points.

1. Comprehensive study of the problem & objective
2. Methodology and implementation
3. Ability to analyze the problem
4. Logical sequencing, organizing and data handling
5. Findings, observations, concluding remarks in terms of the objectives set earlier and the future scope of the problem.

In-plant Training Evaluation Scheme

Evaluation Phases	Evaluation	Marks	Duration	Remarks
Weekly Log book	Weekly progress report **	100	15 Weeks	Evaluated by Industry Mentor
Interim	Weekly log book (30 Marks Internal Mentor), Interim Presentation and Report (70 Marks)	100	Between 8th to 10th week	Panel of at least two faculty mentors
Final	Final Presentation and Report	100	End of the term	Panel: Industry and Internal
Total Marks		300		

Any other information: NIL

Details of Internal Continuous Assessment (ICA)
Test Marks: --
Term Work Marks: 300

** Weekly program report to be evaluated every week for 10 marks. Total 150 marks to be scaled down to 100 marks. 10 marks for every week to be evaluated for punctuality delivery of the assigned work, behaviour etc.

Signature
(Prepared by Concerned Faculty/HOD)

MUKESH PATEL SCHOOL OF TECHNOLOGY MANAGEMENT
SVKM'S NMIMS MUMBAI

Signature
(Approved by Dean)