SCHEME OF EXAMINATION

And

SYLLABI

For

BACHELOR OF VOCATION

In

(CONSTRUCTION TECHNOLOGY)

3rd SEMESTER & 4th SEMESTER

Offered by

University School of Engineering and Technology

Guru Gobind Singh Indraprastha University
Dwarka, Delhi – 110078 [INDIA]
www.ipu.ac.in

Scheme and Syllabi for B.Voc. (Construction Technology)(2nd year) w. e. f. batch 2016-17, approved in the BOS of USET/USICT held on 19th July, 2016 & AC Sub Committee Meeting of USET/USICT held on 27th July, 2016.

NOMENCLATURE OF CODES GIVEN IN THE SCHEME OF B.VOC

1. **ET** stands for Engineering and Technology.
2. **V** stands for Vocation.
3. **MC** stands for Mobile Communication.
4. **SD** stands for Software Development.
5. **AE** stands for Automobile.
6. **CE** stands for Consumer Electronics.
7. **PT** stands for Printing Technology.
8. **CT** stands for Construction Technology.
9. **RA** stands for Refrigeration & Air-Conditioning.
10. **PD** stands for Power Distribution Management.
11. **ID** stands for Interior Design.
12. **AA** stands for Applied Arts.
13. **CS** stands for Computer Science.
14. **MS** stands for Management Studies.
15. **EN** stands for Environmental Engineering
16. **AS** stands for Applied Science.
17. **HS** stands for Humanities and Social Sciences.
18. **SS** stands for Social Services.
19. **L/T** stands for Lecture and Tutorial
20. **P** stands for Practicals.
21. **S/D** stands for Drawing/Studio
22. **P/D** stands for Practical/Drawing

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BACHELOR OF VOCATION
(CONSTRUCTION TECHNOLOGY)
THIRD SEMESTER EXAMINATION
(LEVEL-VI)

Paper Code	Paper ID	Paper	L	T/P	Credits
THEORY PAPERS					
ETVCT-601		Concrete Technology	3	0	3
ETVCT-603		Reinforced Cement Concrete Design-I	3	0	3
ETVCT-605		Surveying-II	3	0	3
ETVCT-607		Strength of Materials	3	0	3
OPEN ELECTIVE-III (Select any one)					
ETVCT-609		Fluid Mechanics	3	0	3
ETVMS-613		Organizational Behaviour	3	0	3
ETVMS-615		Operations Research	3	0	3
ETVMS-617		Industrial Management	3	0	3
PRACTICAL/VIVA VOCE					
ETVCT-651		Concrete Technology Lab	0	2	2
ETVCT-653		CAD based CED Lab	0	4	4
ETVCT-655		Surveying-II Lab	0	4	4
ETVCT-657		Strength of Materials Lab	0	2	2
ETVCT-659		Hydraulics Lab	0	2	2
ETVCT-661		Industrial Training-II	0	2	4
TOTAL			**15**	**16**	**33**

NOTE:
There are five industrial trainings to be carried out by the student(s) in B.Voc course. Industrial Trainings I, III and V will be with weightage of two credits each. These trainings are to be carried out during winter vacations for the duration of two weeks. Industrial Trainings II and IV will be with weightage of four credits each. These trainings are to be carried out during summer vacations for the duration of four to six weeks. These training may be done from industry/Skill Knowledge Providers (SKPs) /Sector Skill Councils (SSCs) / Training Centers/Institutes. Student should submit training report during evaluation. Industrial Training done at the end of the semester will be evaluated in the subsequent semesters.

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BACHELOR OF VOCATION
(CONSTRUCTION TECHNOLOGY)
FOURTH SEMESTER EXAMINATION
(LEVEL-VI)

Paper Code	Paper ID	Paper	L	T/P	Credits
THEORY PAPERS					
ETVCT-602		Reinforced Cement Concrete Design-II	3	0	3
ETVCT-604		Soil Mechanics	3	0	3
ETVCT-606		Highway Engineering	3	0	3
CORE ELECTIVE-I (Select any one)					
ETVCT-608		Structural Analysis	3	0	3
ETVCT-610		Water Engineering	3	0	3
OPEN ELECTIVE-IV (Select any one)					
ETVCT-614		Global Warming & Climate Change	3	0	3
ETVMS-616		Entrepreneurship Development and Planning	3	0	3
PRACTICAL/VIVA VOCE					
ETVCT-652		Reinforced Cement Concrete Design Lab	0	3	3
ETVCT-654		Soil Mechanics Lab	0	3	3
ETVCT-656		Highway Engineering Lab	0	2	2
ETVCT-658		Concrete Mix Design Lab	0	2	2
ETVCT-660		Industrial Training-III	0	0	2
ETVCT-662		Project-II	0	6	3
TOTAL			**15**	**16**	**30**

NOTE:

There are five industrial trainings to be carried out by the student(s) in B.Voc course. Industrial Trainings I, III and V will be with weightage of two credits each. These trainings are to be carried out during winter vacations for the duration of two weeks. Industrial Trainings II and IV will be with weightage of four credits each. These trainings are to be carried out during summer vacations for the duration of four to six weeks. These training may be done from industry/Skill Knowledge Providers (SKPs) /Sector Skill Councils (SSCs) / Training Centers/Institutes. Student should submit training report during evaluation. Industrial Training done at the end of the semester will be evaluated in the subsequent semesters.

NOTE FOR PROJECT:

The student will submit a synopsis at the beginning of the semester for approval from the departmental committee in a specified format, thereafter he/she will have to present the progress of the work through seminars and progress reports.

CONCRETE TECHNOLOGY

Paper Code: ETVCT-601   **L**   **T/P**   **C**
Paper: Concrete Technology   **3**   **0**   **3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objectives and Pre-requisites: To understand the basics of construction technology; to study the significance of quality and safety; to study the nuances of concrete and concrete technology. To understand different stages of preparation of concrete & significant types of concretes; Prerequisite knowledge on building components and construction is necessary.

Learning outcomes: After completing this course, student will be able to visualize the concept and applicability of concrete as a construction material. Enhanced confidence and understanding of various aspects of concrete technology, enables him in making better engineer. Knowledge of concrete, concreting and their types is immensely useful in construction sites. This subject helps in understanding the various subjects of this course in later stages.

UNIT-I
Introduction- Definition of concrete, uses of concrete in comparison to other building materials. Ingredients of Concrete- Cement: physical properties of cement, different types of cement as per IS Codes; Aggregates: Classification, characteristics, grading of aggregates, fineness modulus; interpretation of grading charts. Water: Quality requirements as per IS: 456-2000; Admixtures. Water Cement Ratio: Hydration of cement, principle of water-cement ratio, Duff Abram's Water-cement ratio law: Limitations of water-cement ratio law and its effects on strength of concrete.
                                                                          [T1, T2][No. of Hrs: 11]

UNIT-II
Concreting Operations- (to be studied in detail) Storing of Cement, Storing of Aggregate, Batching (to be shown during site visit), Mixing, Transportation of concrete, Placement of concrete, Compaction, Finishing concrete slabs, curing and form work.
                                                                          [T1, T2][No. of Hrs: 11]

UNIT-III
Properties of Concrete- in plastic state: (concept & tests are to be studied) Workability, Segregation, Bleeding and Harshness; in hardened state: Effects of water cement ratio, compaction, age, curing on strength of concrete. Compressive strength, grades of concrete, bond strength, shrinkage and creep, durability, chemical attack, sulphate attack, resistance to abrasion, resistance to fire, Impermeability, Dimensional changes.
                                                                          [T1, T2][No. of Hrs: 11]

UNIT-IV
Special concrete and concreting methods, concreting under special conditions, difficulties and precautions before, during and after concreting- Cold weather concreting, Under water concreting & Hot weather concreting.
                                                                          [T1, T2][No. of Hrs: 12]

Text Book(s):
[T1]   Shetty M. S, "Concrete Technology- Theory and Practice, S. Chand & Company Limited, New Delhi
[T2]   Gambhir, M. L. "Concrete Technology" Tata Mc-Graw Hill Publishing Company Limited, New Delhi

Reference Book(s):
[R1]   Neville, AM; "Properties of Concrete", Pitman (ELBS Edition available), London
[R2]   Varshney, R.S "Concrete Technology" Oxford and IBH Publishing, New Delhi
[R3]   Vazirani, V. N. & Chandola, S. P. "Concrete Technology" Khanna Publishers, Delhi
[R4]   Kulkarni, P. D, Ghosh, R. K & Phull, YR; "Text Book of Concrete Technology" Oxford and IBH Publishing Co. New Delhi

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REINFORCED CEMENT CONCRETE DESIGN-I

		L	**T/P**	**C**
Paper Code: ETVCT-603		3	0	3
Paper: Reinforced Cement Concrete Design-I				

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objectives and Pre-requisites: *To provide basic understanding of concepts of reinforced concrete design. The course also aims at designing of elements of structure. Knowledge of structural mechanics, building construction and construction materials is pre required.*

Learning outcomes: *After completing this course, student will be able to learn the intricacies of reinforced cement concrete design. Able to understand the concepts of limit state and working stress methods. Ability to design beam. This subject helps in understanding the various subjects of this course in later stages.*

UNIT-I

Reinforced concrete design philosophies, Concept of Reinforced Cement Concrete (RCC), Reinforcement Materials: Suitability of steel as reinforcing material, Properties of mild steel and HYSD steel, Loading on structures as per IS: 875. Introduction to- Working stress method & Limit state method, Shear and Development Length; Shear as per IS:456-2000 by working stress method- Shear strength of concrete without shear reinforcement, Maximum shear stress and Shear reinforcement.

[T1, T2][No. of Hrs: 11]

UNIT-II

Singly Reinforced Beam (Working stress method)-Basic assumptions, stress strain curve, neutral axis, balanced, under-reinforcement and over reinforced Beams, Moment of resistance for singly reinforced Beam. Design of singly reinforced Beam including sketches showing reinforcement details.

[T1, T2][No. of Hrs: 11]

UNIT-III

Concept of Limit State Method- Definitions, assumptions made in limit state of collapse (flexure), Partial factor of safety for materials, Partial factor of safety for Loads, Design Loads and Stress block, parameters. Singly Reinforced Beam-Theory & design of singly reinforced Beam

[T1, T2][No. of Hrs: 11]

UNIT-IV

Doubly Reinforced Beams- Theory & design of simply Supported doubly reinforced rectangular Beam by Limit State Method; Behaviour of T Beam, inverted T Beam, isolated T Beam & L Beams

[T1, T2][No. of Hrs: 12]

Text Book(s):
[T1]   Punmia, BC; "Reinforced Concrete Structure Vol I", Standard Publishers, Delhi
[T2]   Ramamurtham, S; "Design and Testing of Reinforced Structures", Dhanpat Rai and Sons, Delhi

Reference Book(s):
[R1]   Jain A.K., "Limit State Design of Renforced Concrete Structures"., Nem Chand Publishers, Roorkee.
[R2]   Shetty M.S., "Concrete Technology, Theory and Practice", S.Chand and Co., New Delhi.
[R3]   Raju K., "Reinforced Concrete", New Age International (P) Ltd., New Delhi.
[R4]   Varghese P.C., "Limit State Design of Reinforced Concrete", PHI (P) Ltd., New Delhi
[R5]   SanthaKumar A.R., "Concrete Technology", Oxford Publications, New Delhi
[R6]   UnikrishnaPillai S., "Reinforced Concrete Design", Tata McGraw Hill Publishing Company Ltd., ND.
[R7]   Sinha S.N., "Handbook of Reinforced Concrete Design", McGraw Hill Publishing Company., ND.
[R8]   Gambhir M.L., "Fundamentals of Reinforced Concrete Design"., PHI Learning (P) Ltd., New Delhi.

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SURVEYING-II

	L	T/P	C
Paper Code: ETVCT-605			
Paper: Surveying-II	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: MAXIMUM MARKS: 75

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objectives & prerequisites: *To study the concept of contouring, methods of contouring and their interpolation & applications. To study theodolite and its field applications. To study curve setting and different methods. To study tachometry and modern survey equipment. Having better understanding of surveying I is a prerequisite.*

Learning outcomes*: Ability to understand contour maps. Intricacies of surveying fieldwork. Use of equipment in the field with ease. Able to work with theodolite for various applications. Able to set the curves in the field able to use tachometric principles as required. Exposure to advancement equipment.*

UNIT-I
Contouring: Concept of contours, purpose of contouring, contour interval and horizontal equivalent, factors effecting contour interval, characteristics of contours, methods of contouring- Direct and indirect, interpolation of contours- methods; Applications of contour map, marking alignment of a road/ railway/ canal on a contour map, computation of reservoir capacity from a contour map.
[T1, T2, T3][No. of Hrs: 11]

UNIT-II
Theodolite Surveying: Construction and working of a transit vernier theodolite, axes of a theodolite and their relation; meaning of temporary and permanent adjustments of a transit theodolite; concept of transiting, swinging, face left, face right and changing face; measurement of horizontal angle- general, repetition and reiteration methods, and vertical angles. Prolonging a line (forward and backward), measurement of bearing of a line; traversing- included angles, Deflection angle and stadia measurement, plotting a traverse; concept of coordinates and solution of omitted measurements **(only one side affected)**, errors in theodolite survey and precautions taken to minimize them; limits of precision in theodolite traversing.
[T1, T2, T3][No. of Hrs: 11]

UNIT-III
Curves: Need and definition curves; Designation curve- Degree of the curve/ radius of the curve; Elements of simple circular curve, transition curve and vertical curve. Methods of Setting out of simple circular curves. Transition Curve- Need (centrifugal force and super elevation) and definition of transition curve; requirements of transition curve, length of transition curve for roads and shift of a curve. Vertical curves- Types of curves, Setting out of a vertical curve (simple numerical problems)
[T1, T2, T3][No. of Hrs: 11]

UNIT-IV
Tacheo-metric surveying- Tacheometry-principle of tacheometry, additive and multiplying constants, Instruments to be used in tachometry, methods of tachometry, stadia system of tachometry. General requirement and specifications for Engineering project surveys. Introduction to the use of Modern Surveying equipment.
[T1, T2, T3][No. of Hrs: 12]

Text Book(s):
[T1]   Basak, N.N "Surveying and Leveling" Tata McGraw-Hill, Delhi
[T2]   Punmia, BC; "Surveying and Leveling", Delhi Standard Publishers Distributors.
[T3]   Subramanian, R., "Fundamentals of surveying and levelling", oxford university press

Reference Book(s) Book(s):
[R1]   K.R. Arora, Surveying Vol. I and II Standard Book House, New Delhi
[R2]   Surveying, Arthur Bannister, Pearson Education
[R3]   Surveying, Mimi Das Saikia, Madan Mohan Das, PHI Publications
[R4]   Fundamentals of Surveying, S.K. Roy, PHI Publications
[R5]   Surveying and Leveling, T. P. Kanetkar and Kulkerni, Standard Publishers
[R6]   C. Venkatramaiah, "Textbook of Surveying", 2nd Edition, University Press.

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STRENGTH OF MATERIALS

Paper Code: ETVCT-607	**L**	**T/P**	**C**
Paper: Strength of Materials	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objectives & prerequisites: *To impart basic knowledge and skill regarding properties of materials, concept of stresses and strains, bending moment and shear force diagrams, second moment of area, bending and shear stresses. To develop knowledge of mechanics and to have in-depth understanding of material responses to Load. Thorough understanding of applied mechanics subject is prerequisite for studying this subject.*

Learning outcomes: *Ability to understand the concepts- stress- strain, BMD-SFD. Helpful in better understanding of structural subjects in lateral stage.*

UNIT I
Properties of Materials- Classification of materials, elastic materials, plastic materials, ductile materials and brittle materials; Introduction to tensile test, compressive test, impact test, fatigue test, torsion test on metals.
Simple stresses and strains : Definition, types of stresses and strains; Hooke's law, Modulus of elasticity, various elastic constants and their relationship, stress strain curve for ductile materials, deformation of bars under axial Loads, temperature stresses, bars of varying cross sections and composite sections, Poisson's ratio, volumetric strain.

[T1, T2][No. of Hrs. 11]

UNIT II
Shear force and bending moment: Different types of beams and loads; shear force and bending moment diagrams for cantilever and simply supported beams with and without overhangs subjected to different kinds of Loads, relation between Loading, shear force and bending moments.
Moment of Inertia: Concept of moment of inertia and second moment of area and radius of gyration, theorems of parallel and perpendicular axis, second moment of area of common geometrical Sections: rectangle, triangle, circle. Second moment of area for L, T and I Sections, Section modulus.

[T1, T2][No. of Hrs. 11]

UNIT III
Bending and shear stresses in Beams: Theory of simple bending, moment of resistance, modulus of Section, calculation of bending stresses in Beams for different Loads and different types of structural Sections. Shear stress and its distribution on different types of cross Sections of Beams. (No derivation)

[T1, T2][No. of Hrs. 11]

UNIT IV
Combined direct and bending stresses: Middle third rule, core of a Section, stresses due to wind, water and earth pressure in structures like retaining walls, dams, chimneys, walls etc.
Columns & struts- columns and struts of uniform Section, crippling/buckling Load, Euler theory and concept of equivalent length, Rankine's formula, Eulers and Rankine Formula (No derivation).

[T1, T2][No. of Hrs. 12]

Text Book(s):
[T1]   Ramamrutham, S., "Strength of Materials", Dhanpat Rai and Sons., New Delhi
[T2]   Punmia, BC., "Strength of Materials", Standard Publishers, Delhi

Reference Book(s):
[R1]   Mechanics of Materials, Popov E.P., Prentice Hall of India
[R2]   Structures, Schodek, Pearson Education
[R3]   Strength of Materials, Nash, W.A., Tata Mc Graw Hill Publications
[R4]   Basic Structural Analysis, Reddy, Mc Graw Hill Publications
[R5]   B.S. Basavarajaiah, P. Mahadevappa, "Strength of Materials", 3rd Edition, University Press.
[R6]   James M Gere," Strength of Materials", Cengage Publication
[R7]   Timoshenko, Stephen, Elements of Strength of Materials Part-2, CBS publication

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FLUID MECHANICS
(Open Elective-III)

	L	**T/P**	**C**
Paper code: ETVCT-609	3	0	3
Paper: Fluid Mechanics			

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objectives & prerequisites: To understand the concept of fluid mechanics, different types of fluids, fluid properties. To study the behaviour of the fluid at rest and at motion. To study pressure measurements, flow measurements, types of flow, systems of pressure. To study pipe flow and open channel flow. Basic knowledge of mathematics and applied mechanics enable better understanding of this subject.

Learning outcomes: Ability to visualize and analyse concept of fluid mechanics. Better understanding of this subject is helpful in later stages.

UNIT I
Introduction: Concept of fluid and its behaviour, types of fluids- liquid, gas & vapour; ideal & real; Newtonian & non-Newtonian properties, Properties of fluids- Mass density, specific weight/ volume, specific gravity, Concept of viscosity- dynamic & kinematic, cohesion & adhesion; surface tension, capillarity, vapour pressure, compressibility, capillary inversion and cavitation. Types of fluid flow: steady & unsteady, uniform and non-uniform, laminar & turbulent, compressible & incompressible, rotational and Irrotational, one, two & three dimensional (concept only. No mathematical equations)
[T1, T2][No. of Hrs. 11]

UNIT II
Hydrostatic Pressure- Concept of pressure, Force, Pascal law and its applications, hydrostatic law of pressure variation, Hydrostatic forces on surfaces-Total pressure & Centre of pressure, vertical, plane & inclined plane surfaces (Rectangular, triangular, trapezoidal, circular shapes).
Pressure measurements- systems- absolute & gauge, measurement: manometers- simple & differential; Mechanical gauges.
[T1, T2][No. of Hrs. 11]

UNIT III
Meaning of system, control volume, continuum, Basic principles- principle of conservation of mass, energy and momentum. Discharge and continuity equation. Types of hydraulic energy: Potential energy, kinetic energy, pressure energy. Bernoulli's theorem: statement and description (without proof of theorem), assumptions and limitations.
Discharge measurement- Orifice (hydraulic coefficients)**,** Venturi meter, Notches and weirs, Pitot tube, and Current Meter (simple Numerical Problems) .
[T1, T2][No. of Hrs. 11]

UNIT IV
Flow through Pipes: Reynold's experiment- laminar, transition & turbulent flow; meaning of Reynold's number (upper and lower critical), velocity (upper and lower critical) and velocity distribution. Head loss in pipelines- Major & minor (due to friction, sudden expansion and sudden contraction, entrance, exit, obstruction and change of direction- No derivation of formula). Hydraulic Gradient Line and Total Energy Line. Flow from single reservoir, between two reservoirs. Water hammer phenomenon and its effects elementary treatment. Pipes in series and parallel.
Difference between pipe flow and open channel flow. Classification of open channel flow. Discharge through channel by Chezy's and Manning's formulae. Concept of prismatic channel & most economic section. General lay out of hydroelectric power plant.
[T1, T2][No. of Hrs. 12]

Text Book(s):
[T1]   R. K. Bansal, "Fluid Mechanics", Laxmi Publications, Delhi
[T2]   A.K. Jain, "Fluid Mechanics and Fluid Machines", Khanna Publishers, New Delhi

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Reference Book(s):
[R1]   Vijay Gupta, Santosh K Gupta, "Fluid Mechanics and its Application", New Age Publications.
[R2]   R.J.Garde, "Fluid Mechanics through Problems", New Age Publications.
[R3]   Victor Streeter, "Fluid Mechanics", International Edition, Tata McGraw Hill Publications
[R4]   Hughes and Brighton, "Fluid Mechanics", , Tata McGraw Hill

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ORGANIZATIONAL BEHAVIOR
(Open Elective-III)

		L	T/P	C
Paper Code: ETVMS-613		3	0	3
Paper: Organizational Behavior				

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The aim of this paper is to provide managerial skills in the students.

UNIT-I

Introduction: Concept and nature of Organizational Behaviour; Contributing disciplines to the field of O.B.; O.B. Models; Need to understand human behaviour; Challenges and Opportunities, Management functions, Tasks and responsibilities of a professional manager; Managerial skills.

[T1, T2][No. of Hrs. 11]

UNIT-II

Individual & Interpersonal Behaviour: Biographical Characteristics; Ability; Values; Attitudes-Formation, Theories, Organization related attitude, Relationship between attitude and behaviour; Personality – determinants and traits; Emotions; Learning-Theories and reinforcement schedules, Perception –Process and errors.

[T1, T2][No. of Hrs. 11]

UNIT-III

Organization Structure and Process: Organizational climate and culture, Organizational Structure and Design, Managerial Communication, Motivation, Stress and its management, Decision Making: Organizational Context of Decisions, Decision Making Models; Problem Solving.

[T1, T2][No. of Hrs. 11]

UNIT-IV

Interactive Aspects of Organizational Behaviour: Interpersonal Behaviour: Johari Window; Transactional Analysis – ego states, types of transactions, life positions, applications of T.A, Group Dynamics; Management of Organizational Conflicts; Leadership Styles.

[T1, T2][No. of Hrs. 12]

Text Book(s):
[T1]   Luthans Fred., "Organizational Behaviour", McGraw Hill, 2010, 12th ed.
[T2]   Robbins & Judge (15th ed.), "Essentials of Organizational Behaviour", Pearson 2012.

References Book(s):
[R1]   Stoner, R. James A.F., Edward Freeman Daniel R Gilbert Jr., Management 6TH Ed, PHI
[R2]   George, J. M. & Jones, G.R. (2009). Understanding and Managing Organizational Behaviour, 5th Edition, Pearson Education.
[R3]   Green Berg, J. and Baron, R.A. (2008), Behaviour in Organization. Prentice Hall of India.
[R4]   Mcshane, S.L., Von Glinow, M.A., Sharma, R.R. (2006) Organizational Behaviour. Tata McGrawHill

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OPERATIONS RESEARCH
(Open Elective-III)

		L	T/P	C
Paper Code: ETVMS-615		3	0	3
Paper: Operations Research				

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The objective of the paper is to acquaint the student with mathematical techniques being adopted in industry which help managers in decision taking.

UNIT-I
Linear Programming: Formulation of LP Problem. Graphical method, Simplex method for maximization and minimization LP Problems. Duality in Simplex Problems,
Queuing Theory: Introduction to probability concept for queuing problems. Basic structure, Terminology, Classification, Birth and Death Process. Queuing Models.
[T1][No. of Hrs. 11]

UNIT-II
Transportation Models: MODI method for optimality check, North West Corner Method, Least-cost Method and Vogel's Approximation Method (VAM) for solving balanced and unbalanced transportation problems. Problems of degeneracy and maximization.
Assignment Models: Assignment model for maximization & minimization problems. Travelling Salesman Problems, Industrial Problems.
[T2][No. of Hrs. 11]

UNIT-III
Sequencing Theory: Processing of n-jobs through m-machines with each job having same processing order. Processing of two jobs through m-machines with each job having different processing order.
Decision Theory: Decision making under uncertainty and under risk, Multistage decision making, Multi criteria decision making.
[T1][No. of Hrs. 11]

UNIT-IV
Network Models: Introduction to PERT and CPM. Fundamental concept of Network models and construction of network diagrams. Activity time estimates. Critical path and project time duration. Probability of completing the project on or before specified time. Concept of Float and slack.
Game Theory: Two person zero-sum games. Minimax and Maximin principle. Arithmetic, Algebraic, Matrix Algebra method. Solution by Dominance, Subgame, Graphical method, Linear programming method.
[T2][No. of Hrs. 12]

Text Book(s):
[T1] Hira and Gupta, "Operation Research" S. Chand Publications
[T2] H.A. Taha, "Operations Research", Prentice-Hall India, 6th Edition, 2004.

Reference Book(s):
[R1] S.Kalavathy, "Operations Research", Vikas Publication, 4th Edition, 2013.
[R2] N.D. Vohra, "Operations Research", Tata McGraw Hill, 2004.
[R3] Richard Bronson, Govindasami Naadimuthu, "Operations Research", Tata McGraw Hill, 2004
[R4] A.P. Verma, "Operations Research", S.K. Kataria & Sons, 2004.
[R5] J.K. Sharma, "Operation Research", Macmillan India Ltd. 2005.

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INDUSTRIAL MANAGEMENT
(Open Elective-III)

		L	T/P	C
Paper Code: ETVMS-617		3	0	3
Paper: Industrial Management				

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objective: The course provides a broad introduction to some aspects of business management and running of business organization.

UNIT-I
Industrial relations- Definition and main aspects. Industrial disputes and strikes. Collective bargaining.
Labour Legislation- Labour management cooperation/worker's participation in management. Factory legislation. International Labour Organization.

[T1, T2][No. of Hrs. 11]

UNIT-II
Trade Unionism- Definition, Origin, Objectives of Trade Unions. Methods of Trade unions. Size and finance of Indian Trade unions-size, frequency distribution, factors responsible for the small size. Finance-sources of income, ways of improving finance.

[T1, T2][No. of Hrs. 11]

UNIT-III
Work Study-Method study and time study. Foundations of work study. Main components of method study. Time study standards. Involvement of worker's unions. Work Sampling. Application of work study to office work.

[T1, T2][No. of Hrs. 11]

UNIT-IV
Quality Management- What is Quality? Control Charts. Quality is everybody's job. Taguchi Philosophy. Service Quality. What is Total Quality Management (TQM)? Roadmap for TQM. Criticism of TQM. Six Sigma.

[T1, T2][No. of Hrs. 12]

Text Book(s):
[T1]   Sinha, P.R.N., Sinha I.B. and Shekhar S.M.(2013), Industrial Relations, Trade Unions and Labour Legislation. Pearson Education
[T2]   Chary, S.N. (2012), Production and Operations Management. Tata McGraw Hill Education.

Reference Books:
[R1]   Srivastava, S.C. (2012), Industrial Relations and Labour Laws, Vikas Publishing
[R2]   Shankar R (2012), Industrial Engineering and Management. Galgotia Publications
[R3]   Telsang, M. (2006), Industrial Engineering and Production Management. S.Chand
[R4]   Thukaram, Rao (2004), M.E. Industrial Management. Himalaya Publishing House.

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CONCRETE TECHNOLOGY LAB

Paper Code: ETVCT-651   **L   T/P   C**
Paper: Concrete Technology Lab   **0   2   2**

Note:- *The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.*

<u>**List of Experiments:**</u>

1. To determine flakiness and elongation index of coarse aggregates
2. To determine silt in fine aggregate
3. Determination of specific gravity and water absorption of aggregates
4. Determination of bulk density and voids of aggregates
5. To determine surface moisture in fine aggregate by displacement method
6. To determine fineness modulus of fine and coarse aggregate
7. Determination of particle size distribution of fine, coarse and all in aggregate by sieve analysis (grading of aggregate)
8. To determine necessary adjustment for bulking of fine aggregate
9. To determine the fineness, specific gravity and unit weight of cement
10. To determine workability by slump test
11. Compaction factor test for workability
12. Effect of water cement ratio on strength of concrete
13. Non-destructive tests-
14. Tests for compressive strength of concrete cubes for different grades of concrete.
15. Field visit to Ready Mix Concrete plant.

INSTRUCTIONAL STRATEGY

This subject is of practical nature. While imparting instructions, teachers are expected to organize demonstrations and field visits to show various stages of concreting operations. While working in the laboratory, efforts should be made to provide extensive practical training to students so as to make them confident in the preparation and testing of concrete. Teachers should also organize viva examination so as to develop understanding about concepts and principles involved. The experiments may be demonstrated to students through video programmes developed in the field of 'concrete technology' by NITTTR, Chandigarh.

CAD BASED CED LAB

Paper Code: ETVCT-653		**L**	**T/P**	**C**
Paper: CAD Based CED Lab		**0**	**4**	**4**

Note:- *The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.*

List of Experiments:

Teachers are expected to develop skills in preparation of proper drawings with emphasis onto prepare drawings on AutoCAD as per IS code of practice. Students are expected to draw following drawing (already learned/ practiced in CED subject) in AUTOCAD

1. AutoCAD- An over view- Practice of various commands used in AUTOCAD and draw different Geometric Constructions, conventional signs, as per I. S. standards and , different symbols used in civil engineering drawing & dimensioning and lettering

2. Elevation, Sectional plan and Sectional side elevation of flush door & glazed door
3. Elevation, Section plan and Sectional side elevation of paneled window and glazed window
4. Details of spread footing foundations, Load bearing and non-Load bearing wall for given thickness of walls with the help of given data or rule of the thumb, showing offsets, position of DPC. The details of the concrete and brick plinth protection have to be shown in the drawing.
5. Plans of 'T' and Corner junction of walls of 1 Brick, 1-1/2 Brick and 2 brick thick in English bond
6. Wooden roof truss showing details of joints, fixation of roof coverings, eaves and gutters- King post truss
7. Wooden roof truss showing details of joints, fixation of roof coverings, eaves and gutters- queen post truss
8. Drawing plan and Section of a dog legged stair (excluding reinforcement details)
9. Drawing plan, elevation of a small building by measurement.
10. Drawing detailed plan, elevation and Section of a two room residential building from a given line plan, showing details of foundations, roof and parapet

SURVEYING-II LAB

Paper Code: ETVCT-655	**L**	**T/P**	**C**
Paper: Surveying-II LAB	**0**	**4**	**4**

Note:- *The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.*

List of Experiments:

1. Computation of horizontal angle between intersecting lines by general method
2. To determine horizontal angle between intersecting lines by repetition method
3. Find out horizontal angles formed at center by different stations by reiteration method
4. i) To find out height of an object/ tower
   ii) To determine elevation of Points by Trigonometrical Leveling
5. i) To compute magnetic bearings of different lines using theodolite
   ii) To prolong Centre line of a road/ railway line
6. i) To compute tachometric constants- multiplying constant (k) & additive constant (c)
   ii) To find out the gradient of between wo given stations/ Centre line of a road
7. To run a closed traverse with a theodolite/ tachometer (at least five sides) and its plotting by coordinate method
8. Preparing a contour plan by radial line method/ stadia method
9. Preparing a contour plan by method of squares
10. Setting out of a simple circular curve by linear method(s)
11. To set out a simple circular curve by angular method (s)
12. Study of Total Station
13. To verify/ compute area of regular & irregular figures by digital Planimeter
14. Demonstration of digital instruments through field visits and government agencies.

INSTRUCTIONAL STRATEGY

This is highly practice-oriented course. While imparting theoretical instructions, teachers are expected to demonstrate the use of various instruments in surveying; stress should be laid on correct use of various instruments so as to avoid/minimize errors during surveying. It is further recommended that more emphasis should be laid on hands on training during practical work by students. Students shall be in a position to identify intricacies of using manual and digital/ electronic equipment.

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STRENGTH OF MATERIALS LAB

Paper Code: ETVCT-657

	L	T/P	C
	0	2	2

Paper: Strength of Materials Lab

Note:- *The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.*

List of Experiments:

1. Introduction to testing equipment.
2. Determination of yields stress, ultimate stress, percentage elongation and plot the stress strain diagram and compute the value of young's modulus on mild steel.
3. Determination of Young's modulus of elasticity for steel wire with Searl's apparatus.
4. Determination of modulus of rupture of a timber Beam.
5. Uniaxial compression test:
   Timber-along and across/ concrete specimens/ brick masonry specimens
6. Torsion test:
   Mild Steel/Aluminum)
7. Hardness Test
8. Spring Test
9. Impact test

   • New experiments may also be designed

HYDRAULICS LAB

Paper Code: ETVCT-659   L   T/P   C
Paper: Hydraulics Lab   0   2   2

Note:- *The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.*

List of Experiments:

1. Determination of Pressure using different pressure measuring devices such as Piezometers, U-tube manometer and Bourdon's pressure gauge
2. To verify Bernoulli's Theorem.
3. To calibrate a Venturi-meter & orifice-meter
4. To determine the coefficient of discharge of an orifice (or a mouth piece) of a given shape. Also to determine the coefficient of velocity and the coefficient of contraction of the orifice (or the mouth piece).
5. To determine coefficient of discharge of a rectangular notch/triangular notch.
6. To perform Reynold's experiment- To study the transition from laminar to turbulent flow and to determine the lower critical Reynolds number.
7. To determine Darcy's coefficient of friction for flow through pipes.
8. To determine minor losses due to Sudden enlargement, Sudden Contraction and bEnds
9. To determine velocity of flow of an open channel by using a current meter.
10. Study and working of Reciprocating pump/ Centrifugal pump/ Impulse turbine/ Reaction turbine.
11. Study of water meter/mechanical flow meter/Pitot tube

NOTE:

Site visit to hydro-electric power plant shall be organized to study salient features. Also visit to government-organizations / research- institutes shall be conducted to study open channel flow setups. Hydraulics being a fundamental subject, teachers expected to lay considerable stress on understanding the basic concepts, principles and their applications through practical work in the laboratory.

REINFORCED CEMENT CONCRETE DESIGN-II

Paper Code: ETVCT-602   **L**   **T/P**   **C**
Paper: Reinforced Cement Concrete Design-II   **3**   **0**   **3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objectives & prerequisites: *To provide better understanding of RCC design. To study design of one way slab and two way slabs, axially loaded columns, stair cases and footings. To study basics of pre stressed concrete and mix design. Basic understanding and knowledge of RCC 1 and Concrete technology are prerequisites.*

Learning outcomes*: Able to understand the design of reinforced cement concrete structural elements such as one way and two way slabs, columns, footings and stair cases. Enhanced employability. Better understanding of mix design.*

UNIT-I
One Way Slab- Theory and design of simply Supported one way slab including sketches showing reinforcement details (plan and Section) by Limit State Method. Two Way Slab- Theory and design of two-way simply Supported slab by Limit State Method including sketches showing reinforcement details
[T1, T2][No. of Hrs. 11]

UNIT-II
Axially Loaded Column- Definition and classification of columns, Effective length of column, Specifications for longitudinal and lateral reinforcement, Design of axially loaded square, rectangular and circular short columns by Limit State Method including sketching of reinforcement.
[T1, T2][No. of Hrs. 11]

UNIT-III
Staircases by L.S.M.- Structural behaviour of stairs, effective span of stairs, estimation and distribution of Loads, effective breadth of flights, design of cantilever steps, design of doglegged and open well stairs spanning parallel to the flight.
Design of Column Footings by L.S.M.- Types of RCC footings, Footings with uniform thickness and Sloped footings – minimum thickness – critical Sections – minimum reinforcement , distribution of reinforcement, development length, cover, minimum edge thickness requirements as per IS 456 – 2000. (**Only design of isolated footing (square and rectangular) with uniform thickness is to be asked**)
[T1, T2][No. of Hrs. 13]

UNIT-IV
Pre-stressed Concrete- Concept, methods: pre-tensioning and post tensioning, advantages & disadvantages and losses (No numericals. Concept only). Introduction to concrete mix design.
[T1, T2][No. of Hrs. 10]

Important Note: Use of BIS: 456-2000 is permitted in the examination.

Text Book(s):
[T1] Punmia, BC; "Reinforced Concrete Structure Vol I", Standard Publishers, Delhi
[T2] Ramamurtham, S; "Design and Testing of Reinforced Structures", Dhanpat Rai and Sons, Delhi

Reference Book(s):
[R1] Jain A.K., "Limit State Design of Reniforced Concrete Structures"., Nem Chand Publishers, Roorkee.
[R2] Shetty M.S., "Concrete Technology, Theory and Practice", S.Chand and Co., New Delhi.
[R3] Raju K., "Reinforced Concrete", New Age International (P) Ltd., New Delhi.
[R4] Varghese P.C., "Limit State Design of Reinforced Concrete", PHI (P) Ltd., New Delhi
[R5] SanthaKumar A.R., "Concrete Technology", Oxford Publications. New Delhi
[R6] UnikrishnaPillai S., "Reinforced Concrete Design".,Tata McGraw Hill Publishing Company Ltd., ND
[R7] Sinha S.N., "Handbook of Reinforced Concrete Design", McGraw Hill Publishing Company., ND
[R8] Gambhir M.L., "Fundamentals of Reinforced Concrete Design"., PHI Learning (P) Ltd., New Delhi.

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SOIL MECHANICS

		L	T/P	C
Paper Code: ETVCT-604		3	0	3
Paper: Soil Mechanics				

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objectives & prerequisites: *To study concept of soil formation and physical properties. To understand laboratory tests and field tests on soils. To study the concept of permeability and seepage, deformation of soils, shear strength of soils and compaction of soils. Basic knowledge of fluid mechanics and construction materials is further helpful in better understanding of this subject.*

Learning outcomes*: Better understanding of concept of soil mechanics helpful in the construction sites. Able to classify and identify different soils. Enhanced soil testing(both field and in-situ) abilities. Understanding of importance of compaction of soils. Helpful in better understanding of foundation engineering and soil exploration techniques in later stage.*

UNIT-I
Soil formation, properties: Origin of soils, soil formation, geographical distribution of major soils in India, composition of soil, particle size and shapes, inter-particle forces. Three phase diagram and relationships among void ratio, specific gravity, dry density, porosity, water content, unit weights and degree of saturation.
Classification of soils: Necessity, principles, Indian and unified classification, plasticity charts.
Laboratory and field identification of soil: Determination of water content, specific gravity and grain size distribution for coarse grained and fine grained soils, Atterberg limits and indices, visual identification by simple field test, field density by core cutter and sand, replacement methods.
                                                              [T1, T2][No. of Hrs: 11]

UNIT-II
Permeability and seepage: Concept of pore water pressure, Total, effective and neutral stresses. Darcy's law, laboratory and field permeability tests, factors affecting permeability, shrinkage and swelling of soil.
Deformation of soils: Concept of effective stress, definition and meaning of total stress, effective stress and neutral stress.
Definition: consolidation and compaction. Definition and practical significance of compression index, coefficient of consolidation, degree of consolidation. Meaning of total settlement, uniform settlement, differential settlement and rate of settlement and their importance; Settlement due to construction operations and lowering of water table, Tolerable settlement for different structures as per BIS.
                                                          [T1, T2, T3][No. of Hrs: 11]

UNIT-III
Shear strength of soil: stress strain curve, Concept of shear failure in soils along with examples. Factors contributing to shear strength of soils, Coulomb's law, Determination of shearing strength- direct shear test and unconfined compression test. Brief idea about tri-axial shear test, Drainage conditions of test and their significance. Peak strength and ultimate strength, their significance Comparisons between laboratory and field test.
                                                              [T1, T2][No. of Hrs: 11]

UNIT-IV
Soil Compaction: Definition of compaction and its necessity, Laboratory compaction test (as per BIS) definition and importance of optimum water content, maximum dry density; moisture dry density relations for typical soils. Field compaction: methods and equipment, choice of equipment; Compaction requirements; Compaction control; Density control, field density test, (sand replacement), moisture control, Proctor's needle and its use, thickness control.
                                                              [T1, T2][No. of Hrs: 12]

Text Book(s):
[T1]   Punmia, B. C. "Soil Mechnics and Foundations"; Delhi Standard Publishers Distributors.
[T2]   Bharat ingh and Shamsher Prakash; "Soil Mechanics and Foundations Engineering"; Roorkee, Nem Chand and Bros.

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Reference Book(s):
[R1]   Soil Mechanics and Foundation Engg., Purushothama Raj, Pearson Education
[R2]   Geotechnical Engg, Venkataramaiah, New Age International Publishers
[R3]   GeoTechnical Engineering [Principles and Practices],P.Donald,Coduto,PHI Publications
[R4]   Soil mechanics in engineering practice by Karl Terzaghi, Ralph Brazelton Peck, Gholamreza Mesri, Wiley.
[R5]   Geotechnical engineering: principles and practices of soil mechanics and foundation engineering, by V. N. S. Murthy, Marcel Dekker
[R6]   Soil mechanics by Lambe and Whitman Wiley edition
[R7]   Basic And Applied Soil Mechanics by Gopal Ranjan and A. S. R. Rao, New age international Ltd
[R8]   Soil Engineering, Alam singh,CBS Publication
[R9]   Geotechnical Engg, Gulati and Dutta, McGrawHill Education (I) Pvt. Ltd

HIGHWAY ENGINEERING

Paper Code: ETVCT-606   **L   T/P   C**
Paper: Highway Engineering   **3   0   3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**
1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objectives and Pre-requisites: To learn the fundamentals for alignment and geometric and pavement design of highway, various aspects of traffic engineering, highway construction materials, quality control and maintenance etc. Having knowledge of surveying and, construction materials is pre-requisite.

Learning outcomes: After completing this course, student will be able to learn the intricacies of highway engineering. Able to understand geometric design aspects of roads, details of highway materials and necessity of roadside development. This subject helps in understanding the various subjects of this course in later stages.

UNIT-I
Highway Development and Alignment: Scope of highway engineering, road development and planning in India, role of NHAI, IRC, CRRI, MORT&H, classification of roads, types of road pattern, Planning and Engineering surveys, Highway alignment- requirements, Highway project financing and economics of urban roads, expressways, national and state highways.
[T1, T2, T3][No. of Hrs: 11]

UNIT-II
Highway Geometric Design: Glossary of terms used in road geometrics and their importance, Cross Section, elements, width, camber, gradient, sight distance, requirements and design principles of horizontal and vertical alignment, Alignment and Geometrics of hill roads. Highway safety and safety audit.
[T1, T2][No. of Hrs: 11]

UNIT-III
Highway materials: Properties of sub-grade and pavement component materials, Tests on sub grade soil, aggregates and bituminous materials, Bituminous paving mixes, Marshall Mix design criteria. Use of fly ash, concrete and polymers in highway construction.
[T1, T2, T3][No. of Hrs: 11]

UNIT-IV
Road Pavements- Types of pavements, their merits and demerits, typical cross-Sections, functions of various components, Pavement Construction Techniques and Quality Control, road construction equipment. **Highway Drainage:** Surface drainage and subsoil drainage, Pavement failures, Maintenance and Strengthening. Introduction to software pertaining to maintenance of records w.r.t. Highway Engineering.
[T1, T2, T3][No. of Hrs: 12]

Text Book(s):
[T1]   Khanna and Justo, "Highway Engineering", Nem Chand and Bros. Publishers
[T2]   Saxena, "Textbook of Highway and Traffic Engineering", CBS Publishers
[T2]   Kadiyali, L. R., "Highway Engineering", Khanna Publishers, Delhi, 1996.

Reference Book(s):
[R1]   I.S. specifications on concrete, aggregates and bituminous materials
[R2]   David Croney, "Design and performance of road pavements", McGraw Hill
[R3]   Wright Dixon, "Highway Engineering", Wiley India.
[R4]   Dr. L. R. Kadiyali, "Traffic Engineering and Transport Planning", KP.
[R5]   James H. Banks "Introduction to Transportation Engineering", McGraw Hill
[R6]   R. Srinivasa Kumar, "Textbook of Highway Engineering", University Press.

STRUCTURAL ANALYSIS
(Core Elective-I)

Paper Code: ETVCT-608	**L**	**T/P**	**C**
Paper: Structural Analysis	**3**	**0**	**3**

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objectives & prerequisites: *To study elements of structural analysis, moment are method & conjugate beam method, double integration method and singularity function method, deflection by energy methods. Having mathematical and analytical ability, proper understanding of applied mechanics & strength of materials is a prerequisite.*

Learning outcomes*: Enhanced knowledge in the field of structural analysis. Better understanding of elements of structural analysis, moment are method & conjugate beam method, double integration method and singularity function method, deflection by energy methods. Useful in later stages for studying advance structural analysis.*

UNIT-I
Elements of Analysis- Brief introduction to structures and loads, determinate and indeterminate structures, degree of freedom, degree of static indeterminacy, analysis of determinate truss.

[T1, T2, T3][No. of Hrs: 11]

UNIT-II
Moment Area Method & Conjugate beam method.

[T1, T2, T3][No. of Hrs: 11]

UNIT-III
Double integration method & Singularity function method.

[T1, T2, T3][No. of Hrs: 11]

UNIT-IV
Deflection by energy methods- virtual work method and Castigliano's theorem

[T1, T2, T3][No. of Hrs: 12]

Text Book(s):
[T1]   Negi L. S. and Jangid R. S. "Structural analysis"
[T2]   B.C. Punmia, Ashok Jain & Arun Jain "Theory of structures"
[T3]   Khurmi R. S., "Theory of structures" S. Chand publications, Delhi

Reference Book(s):
[R1]   Analysis of structures by V.N. Vazirani & M.M. Ratwani
[R2]   Strength of materials by F.V. Warnock
[R3]   G.S. Pandit, "Structural Analysis", CBS Publication.
[R4]   C.S. Reddy, "Basic Structural Analysis", Tata McGraw Hill

WATER ENGINEERING
(Core Elective-I)

		L	T/P	C
Paper Code: ETVCT-610		3	0	3
Paper: Water Engineering				

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.
2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objectives & prerequisites: *To familiarize the students with the basics of water quality and its treatment methods, importance of planning, analysis and design of modern water supply schemes. To study demand of water, sources of water, water quality, water purification and distribution. Basic knowledge of fluid mechanics and soil mechanics are helpful.*

Learning outcomes*: Able to compute demands of water. Better understanding of sources of water and purification processes. Better understanding of procedures of water purification and distribution. Useful in understanding waste water engineering in later stages.*

UNIT-I
Demand of water: Domestic, commercial and public requirements, Factors affecting demand fluctuations, Estimate of prospective population, fire demand requirements and other allowances.
Sources of water: Surface and underground sources, such as, impounded, perennial stream, shallow wells artesian wells, deep wells, infiltration galleries, intake works from different sources.
[T1, T2][No. of Hrs: 11]

UNIT-II
Water quality: Suspended solids, turbidity, colour, taste odour, temperature, Total dissolved solids, pH, acidity, alkalinity, hardness, nitrates, chlorides, fluorides, metals, organics, nutrients, and Pathogens.
In-stream standards: Potable water standards, waste water / effluent standards, standards for receiving wastes in natural streams / sewer / sea, Bio-monitoring of streams and lakes Groundwater quality, chemical/ biological remediation of ground water.
[T1, T2][No. of Hrs: 11]

UNIT-III
Water Purification- Water pollutants and their sources, Sedimentation - purpose, types of sedimentation tanks; Coagulation flocculation - usual coagulation and their feeding, Filtration - significance, types of filters, their suitability; Necessity of disinfection of water, forms of chlorination, break Point chlorine, residual chlorine, application of chlorine. Flow diagram of different treatment units, functions of (i) Aeration fountain (ii) mixer (iii) flocculator, (iv) classifier, (v) slow and rapid sand filters (vi) chlorination chamber. Removal of dissolved impurities.
[T1, T2][No. of Hrs: 11]

UNIT-IV
Water Distribution- Methods of distributing water, Different types of pipes - cast iron, PVC, steel, asbestos cement, concrete and lead pipes. Their suitability and uses, types of joints in different types of pipes. Appurtenances: Sluice, air, reflux valves, relief valves, scour valves, bib cocks, stop cocks, fire hydrants, water meters their working and uses; Distribution site: Requirement of distribution, minimum head and rate, methods of layout of distribution pipes; Systems of water supply - Intermittent and continuous service reservoirs - types, necessity and accessories; Wastage of water - preventive measures; Maintenance of distribution system & Leakage detection; Laying out pipes and building water supply. Plumbing and Sanitary installations.
[T1, T2][No. of Hrs: 12]

Text Book(s):
[T1]   Duggal, KN; "Elements of Public Health Engineering";, S. Chand and Co. New Delhi
[T2]   Rangwala, SC; "Water Supply and Sanitary Engineering"; Anand Charotar Book Stall

Reference Book(s):
[R1]   Steel, EW; "Water Supply and Sewerage"; McGraw Hill.
[R2]   Venugopala Rao, "Principles of Environmental Science and Engineering", Prentice Hall India

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[R4]   Kiely, Gerardd "Environmental Engineering" Tata McGraw Hill

[R5]   Hammer, Hammer "Water and Wastewater Technology" PHI Learning Pvt. Ltd

[R6]   Qasim, Motley, Zhu "Water works engineering" PHI Learning Pvt. Ltd.

[R7]   C.D.Gupta, V.K.Gupta "Water Supply Handbook" Jain Brothers

**   A field visit may be planned to explain and show the relevant things.

GLOBAL WARMING & CLIMATE CHANGE
(Open Elective-IV)

		L	**T/P**	**C**
Paper Code: ETVCT-614		3	0	3
Paper: Global Warming & Climate Change				

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 12.5 marks.

Objectives & Pre-requisites: *To study concepts of global warming & climatic change. To study factors responsible for global warming, impact of climatic change, national and international policies. To study and understand Kyoto mechanism. Basic knowledge of environmental studies subject is a pre requisite.*

Learning outcomes: Understanding of philosophy of global warming and climatic change. Able to realize the factors responsible for global warming and corresponding climatic change. Understanding the importance and nuances of Kyoto mechanism.

UNIT-I
The Climate system: Sun, Atmosphere, Ocean, Ice and energy balance of the earth, history of climate change, human-caused climate change, impacts of climate change on human well-being and the natural world.

[T1, T2,T3][No. of Hrs. 11]

UNIT-II
Key concepts of global warming, climate change, greenhouse gas effect, Interrelationship between these three phenomenon, Green-House Effect as a Natural Phenomenon and increase in Greenhouse gas effect because of anthropogenic activities, Green House Gases (GHGs) and their Emission Sources, Global Warming Potential (GWP) of GHGs, Past Present and Future trends of global warming.

[T1, T2, T3][No. of Hrs. 11]

UNIT-III
Impacts of climate change Extreme weather events, Temperature Rise, Sea Level rise, Coastal Erosion and landslides; future impacts of global warming, global warming and the hydrological cycle, climate change impact on ecosystems and agriculture.

[T1, T2, T3][No. of Hrs. 11]

UNIT-IV
Possible remedies of global warming- various mitigation and adaptation measures taken/ proposed to combat global warming; National and International policies to combat global warming and climate change-UNFCC-Kyoto Protocol, Paris agreement its role in Climate Change; IPCC- its role in global climate protection Role of countries and citizens in containing Global Warming.

[T1, T2, T3][No. of Hrs. 12]

Text Books
[T1]   Current trends in Global Environment by A.L. Bhatia (2005) Energy Sources
[T2]   Global Warming – A Very Short Introduction, Mark Maslin, oxford.
[T3]   UNFCC & IPCC reports (www.unfccc.int & http://www.ipcc.ch/)

Reference Books
[R1]   Global Warming The Complete Briefing - John T Houghton Cambridge press
[R2]   Climate Change: A Multidisciplinary Approach, by William James Burroughs, Cambridge press
[R3]   Contemporary climatology-Robinson, Taylor and Francis group

NOTE: Seminars/ discussions should be carried out on issues pertaining to global warming and climate change among the students.

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ENTREPRENEURSHIP DEVELOPMENT AND PLANNING
(Open Elective-IV)

		L	T/P	C
Paper Code: ETVMS-616		3	0	3
Paper: Entrepreneurship Development and Planning				

INSTRUCTIONS TO PAPER SETTERS: **MAXIMUM MARKS: 75**

1. Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 25 marks.

2. Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be of 12.5 marks.

Objectives: *The Course Aims at Instituting Entrepreneurship Skills in the Students by giving an overview of the process of entrepreneurship. The Course aims at inculcating entrepreneurial spirit among the students.*

UNIT-I
Foundations of Entrepreneurship: What is an Entrepreneur? The benefits of Entrepreneurship. The power of small business. Class exercise- case discussion on entrepreneurs like - Dhirubhai Ambani, Karsenbhai Patel, Ramesh Babu, Kailash Katkar, Patricia Narayan etc.

[T1, T2][No. of Hrs.11]

UNIT-II
Launching Entrepreneurial Ventures: Creativity and innovation. Methods to initiate ventures. Legal challenges in Entrepreneurship ventures. The search for Entrepreneurial capital. Class exercise- Survey your locality and come up with at least one entrepreneurial venture. Discuss in class about ways to enhance the business in most innovative manner.

[T1, T2][No. of Hrs.11]

UNIT-III
Formulation of the Entrepreneurial Plan: The assessment functions with opportunities. The marketing Aspects of new ventures. Business plan preparation for new ventures. Class Exercise- Building your own Business Plan.

[T1, T2][No. of Hrs.11]

UNIT-IV
Institutions Supporting Small Business Enterprises: Central level institutions. State level institutions. Other agencies. Industry Associations. Class exercise- discussions on current government schemes supporting entrepreneurship and finding out which scheme will most suit the business plan devised by the student.

[T1, T2][No. of Hrs.12]

Text Books
[T1]   Kuratko, D.F. & Rao T.V. (2012). Entrepreneurship: A South Asian Perspective. Cengage
[T2]   Charantimath, P. (2009). Entrepreneurship Development: Small Business Enterprises. Pearson

References Books
[R1]   Naggendra S.and Manjunath V.S. (2009). Entrepreneurship and Management. Pearson

REINFORCED CEMENT CONCRETE DESIGN LAB

		L	T/P	C
Paper Code: ETVCT-652				
Paper: Reinforced Cement Concrete Design-II Lab		0	3	3

Note:- *The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.*

List of Experiments:

Drawing/ Design based on RCC Design I and RCC Design II have to be prepared

1. Singly reinforced beam (working stress method)
2. Singly reinforced beam (limit state method)
3. Doubly reinforced beam
4. T- beam
5. L- beam
6. One way slab
7. Two way slab
8. Column
9. Stair case
10. Footing

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SOIL MECHANICS LAB

Paper Code: ETVCT-654　　　　　　　　　　　　　　　　　　　　　　　**L**　　**T/P**　　**C**
Paper: Soil Mechanics Lab　　　　　　　　　　　　　　　　　　　　　　　**0**　　　**3**　　　**3**

Note:- *The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.*

List of Experiments:

1. To determine the moisture content of a given sample of soil
2. Determine the specific gravity of soil.
3. Determine the in situ density of natural or compacted soils by sand replacement method and core cutter method.
4. Extraction of Disturbed and Undisturbed Samples- Extracting a block sample, Extracting a tube sample, Extracting samples for mechanical analysis and Field identification of samples
5. Grain size analysis/ Mechanical analysis- plotting and interpretation of grain size distribution curve
6. Determination of consistency limits
7. Permeability test
8. Laboratory Compaction Tests (Standard Proctor Test)- Computation of results and plotting & Determination of optimum moisture content and maximum dry density
9. Demonstration of- Direct Shear and Vane Shear Test on sandy soil samples
10. Site visit to any in-situ testing/ testing Centers

INTRUCTIONAL STRATEGY

The teacher while imparting instructions are expected to lay greater emphasis on the practical aspects rather than theory and mathematical treatment. To bring clarity regarding concepts and principles involved, teachers should organize demonstrations in the laboratories and fields. It is necessary to create understanding that soils fail either under shear or settlement due to heavy Loads. This can be shown by making use of photographs of such failures. Efforts should be made in the practical classes that students perform practical exercises individually. Conduct of viva examination at the End of each practical work will develop clear understanding about type concepts and principles related to this subject.

CONCRETE MIX DESIGN LAB

Paper Code: ETVCT-658   **L   T/P   C**
Paper: Concrete Mix Design Lab   **0   2   2**

Note:-   *More experiments may be designed by the respective institutes as per their choice.*

List of Experiments:

A Report based on following aspects/ items has to be prepared for evaluation
- Field visit to RMC plant should be conducted and salient features have to be observed
- To study different methods of concrete mix designs
- Concrete mix design for RMC
- Concrete mix design as per IS Hand book.

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HIGHWAY ENGINEERING LAB

Paper Code: ETVCT-656	L	T/P	C
Paper: Highway Engineering Lab	**0**	**2**	**2**

Note:- *The required list of Experiments is provided as under. The example cited here are purely indicative and not exhaustive. Attempt shall be made to perform all experiments. However, at least 8 experiments should be done in the semester. More experiments may be designed by the respective institutes as per their choice.*

List of Experiments:

1. Determination of penetration value of bitumen
2. Determination of softening Point of bitumen
3. Determination of ductility of bitumen
4. Viscosity test
5. Flash and fire Point test
6. Determination of bitumen content by centrifuge extractor
7. Aggregate crushing strength test
8. Determination of impact value of the road aggregate
9. Determination of abrasion value (Los Angeles') of road aggregate
10. Determination of the California bearing ratio (CBR) for the sub-grade soil
11. Determination of marshal stability value.
12. Study of rebound Deflection of pavement by Benkelman Beam.
13. Field visit to Hot mix plant/ Field visit to highway construction site for demonstration of operation of: Tipper, tractors (wheel and crawler), scraper, bulldozer, dumpers, shovels, grader, roller, dragline, road pavers, JCB etc.

PROJECT-II

Paper Code: ETVCT-662   **L   T/P   C**
Paper: Project-II   **0   6   3**

Objectives: The practical training cum project work is intended to place students for project oriented practical training in actual work situations for the stipulated period with a view to:

   a) Develop understanding regarding the size and scale of operations and nature of field work in which students are going to play their role after completing the courses of study.
   b) Develop understanding of subject based knowledge given in the class room in the context of its application at work places
   c) Develop first-hand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems in the world of work.
   d) Develop special skills and abilities like interpersonal skills, communication skills, attitudes and values.

This practical training cum project work should not be considered as merely conventional industrial training in which students are sent at work places with minimal supervision. This experience is required to be planned and supervised on regular basis by the faculty. For the fulfilment of above objectives, Institute may establish close linkage with relevant organizations for providing such an experience. It is necessary that each organization is visited well in advance and activities to be performed by student are well defined. The chosen activities should be such which are of curricular interest to students and of professional value to industrial/field organizations. Project selected should not be too complex which is beyond the level of the students. The placement of the students for such a practical cum project work should match with the competency profile of students and the project work assigned to them. Project Lab has to be developed and nurtured. Various testing equipments such as non-destructive testing equipments, water analysis testing equipments etc., may be procured for enhancing project lab.

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