

**Scheme & Syllabus for B.Tech (Civil  
Engineering) (II<sup>nd</sup> Year) according to Choice  
Based Credit System (CBCS)**

**(Semester III<sup>rd</sup> and Semester IV<sup>th</sup>)**

**For Session 2019-20 onwards  
(Batch 2018-2019 onwards)**

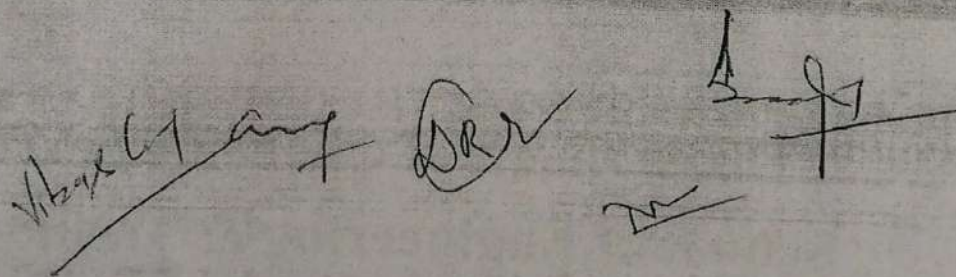


**Department of Civil Engineering  
School of Engineering & Technology**

**CENTRAL UNIVERSITY OF HARYANA  
MAHENDERGARH-123031  
HARYANA**

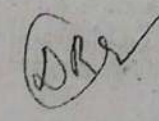
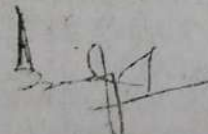
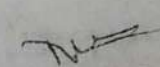
CENTRAL UNIVERSITY OF HARYANA  
SCHEME OF STUDIES & EXAMINATIONS  
B.Tech. 2<sup>nd</sup> YEAR (SEMESTER – III: CIVIL ENGINEERING)  
Choice Based Credit Scheme w.e.f. 2019-20

| S. No.       | Course No.  | Course Title                                   | Teaching Schedule |          |          | Marks of Class work | Examination Marks |            | Total       | Credit    | Duration of Exam |
|--------------|-------------|--|-------------------|----------|----------|---------------------|-------------------|------------|-------------|-----------|------------------|
|              |             |  | L                 | T        | P/D      |                     | Theor y           | Pract ical |             |           |                  |
| 1            | BT MAT 215A | MATHS III (TRANSFORM AND DISCRETE MATHEMATICS) | 3                 |          | -        | 30                  | 70                | -          | 100         | 3         | 3                |
| 2            | BT CE 201A  | STRENGTH OF MATERIALS                          | 3                 | 1        | -        | 30                  | 70                | -          | 100         | 4         | 3                |
| 3            | BT CE 203A  | SURVEYING                                      | 3                 | 1        | -        | 30                  | 70                | -          | 100         | 4         | 3                |
| 4            | BT CE 205A  | FLUID MECHANICS-I                              | 3                 | 1        | -        | 30                  | 70                | -          | 100         | 4         | 3                |
| 5            | BT CE 207A  | BUILDING CONSTRUCTION AND MATERIALS            | 3                 | -        | -        | 30                  | 70                | -          | 100         | 3         | 3                |
| 6            |             | GEC-I  | 3                 | 1        | 0        | 30                  | 70                |            | 100         | 4         | 3                |
| 7            | BT CE 209A  | STRENGTH OF MATERIALS LAB                      | -                 | -        | 2        | 30                  |                   | 70         | 100         | 1         | 3                |
| 8            | BT CE 211A  | SURVEYING LAB                                  | -                 | -        | 2        | 30                  |                   | 70         | 100         | 1         | 3                |
| 9            | BT CE 213A  | FLUID MECHANICS LAB                            | -                 | -        | 2        | 30                  |                   | 70         | 100         | 1         | 3                |
| 10           | BT AUD 201  | ENVIRONMENTAL SCIENCES                         | 2                 | -        | -        | 30                  | 70                | -          | 100         | 0         | 3                |
| <b>Total</b> |             |  | <b>20</b>         | <b>4</b> | <b>6</b> | <b>300</b>          | <b>490</b>        | <b>210</b> | <b>1000</b> | <b>25</b> |                  |



CENTRAL UNIVERSITY OF HARYANA  
SCHEME OF STUDIES & EXAMINATIONS  
B.Tech. 2<sup>nd</sup> YEAR (SEMESTER – IV: CIVIL ENGINEERING)  
Choice Based Credit Scheme w.e.f. 2019-20

| S. No.       | Course No.  | Course Title                         | Teaching Schedule |          |          | Marks of Class work | Examination Marks |            | Total       | Credit    | Duration of Exam |
|--------------|-------------|--------------------------------------|-------------------|----------|----------|---------------------|-------------------|------------|-------------|-----------|------------------|
|              |             |                                      | L                 | T        | P        |                     | Theor y           | Practic al |             |           |                  |
| 1            | BT CE 202A  | STRUCTURAL ANALYSIS - I              | 3                 | 1        | -        | 30                  | 70                | -          | 100         | 4         | 3                |
| 2            | BT CE 204A  | FLUID MECHANICS-II                   | 3                 | 1        | -        | 30                  | 70                | -          | 100         | 4         | 3                |
| 3            | BT CE206A   | GEOMATIC ENGG                        | 3                 | -        | -        | 30                  | 70                | -          | 100         | 3         | 3                |
| 4            | BT CE208A   | TRANSPORTATION ENGINEERING - I       | 3                 | 0        | -        | 30                  | 70                | -          | 100         | 3         | 3                |
| 5            | BT CE 218 A | MECHANICAL ENGINEERING               | 3                 | 0        | -        | 30                  | 70                | -          | 100         | 3         | 3                |
| 6            |             | GEC-II                               | 3                 | 1        | -        | 30                  | 70                | -          | 100         | 4         | 3                |
| 7            | BT CE 210A  | STRUCTURAL ANALYSIS - I LAB          | -                 | -        | 2        | 30                  |                   | 70         | 100         | 1         | 3                |
| 8            | BT CE 212A  | FLUID MECHANICS-II LAB               | -                 | -        | 2        | 30                  |                   | 70         | 100         | 1         | 3                |
| 9            | BT CE 214A  | GEOMATIC ENGINEERING LAB             | -                 | -        | 2        | 30                  |                   | 70         | 100         | 1         | 3                |
| 10           | BT CE216A   | TRANSPORTATION ENGINEERING - I LAB   | -                 | -        | 2        | 30                  |                   | 70         | 100         | 1         | 3                |
| 11           | BT GF 202A  | GENERAL FITNESS IN CIVIL ENGINEERING | -                 | -        | -        | -                   |                   | 70         | 70          | -         | 3                |
| <b>Total</b> |             |                                      | <b>18</b>         | <b>3</b> | <b>8</b> | <b>300</b>          | <b>420</b>        | <b>350</b> | <b>1070</b> | <b>25</b> |                  |

*Checked by*   

Course Code: BT MAT 215A

| L | T | P | Credits |
|---|---|---|---------|
| 3 | 0 | 0 | 3       |

Mathematics-III  
B. Tech. 2nd Year (Semester -III)

class Work - 30 Marks  
Examination - 70 Marks  
Total - 100 Marks  
Duration of Examination - 3 Hrs

### UNIT - I

Laplace Transform Definition and existence of Laplace transform, Properties of Laplace Transform and formulae, Unit Step function, Dirac Delta function, Heaviside function, Laplace transform of periodic functions. Finding inverse Laplace transform by different methods, convolution theorem. Evaluation of integrals by Laplace transform, solving ODEs by Laplace transforms method.

### UNIT - II

Fourier Transform. Fourier Complex, Sine and Cosine transform, properties and formulae, inverse Fourier transforms, Convolution theorem. Fourier transform applications to solve ordinary and partial differential equations.

### UNIT - III

**Set Theory:** Algebra of sets, Classes of sets, Power Sets, Multi sets, Cartesian Product, Representation of relations, Types of relation, Equivalence relations and partitions, Partial ordering relations.

**Techniques of Counting:** Permutations with and without repetition, Combination, Pigeonhole principle.

### UNIT - IV

**Algebraic Structures:** Definition and examples of a monoid, Semigroup, Groups and rings, Homomorphism, Isomorphism and Automorphism, Subgroups and Normal subgroups, Cyclic groups, Integral domain and fields, Cosets, Lagrange's theorem.

#### Text Books:

- [1] E. Kreyszig, *Advanced Engineering Mathematics*, 10 edition. Hoboken, NJ: Wiley, 2011.
- [2] J.-P. Tremblay and R. Manohar, *Discrete Mathematical Structures with Applications to Computer Science*, 1 edition. New Delhi, India: McGraw Hill Education, 2017.
- [3] B. Kolman, R. Busby, and S. C. Ross, *Discrete Mathematical Structures*, 6 edition. Upper Saddle River, NJ: Pearson, 2015.
- [4] B. S. Grewal, *Higher Engineering Mathematics 44th Edition*. Khanna Publishers, 2017.

#### Reference Books:

- [1] S. Lipschutz, M. L. Lipson, and V. H. Patil, *Discrete Mathematics*, Revised Third edition. McGraw Hill Education, 2017.
- [2] C. L. Liu. and Mohapatra, *Elements of Discrete Mathematics: A Computer Oriented Approach*, 4th edition. New York: Mc Graw Hill India, 2011.
- [3] J. Bird, *Higher Engineering Mathematics, 7th ed*, 7 edition. Abingdon, Oxon ; New York, NY: Routledge, 2014.
- [4] R. K. Jain and S. R. K. Iyengar, *Advanced Engineering Mathematics 4e*, Fourth edition edition. Oxford: Narosa Publishing House Pvt. Ltd. - New Delhi, 2012.

# BT CE 201A: STRENGTH OF MATERIALS

B. Tech. 2<sup>nd</sup> Year (Semester - III)

| L | T | P  | Credits |
|---|---|----|---------|
| 3 | 1 | -- | 4       |

|                         |             |
|-------------------------|-------------|
| Class Work              | : 30 Marks  |
| Examination             | : 70 Marks  |
| Total                   | : 100 Marks |
| Duration of Examination | : 3 Hours   |

## UNIT - I

**Introduction:** Concept of stress and strain, generalized Hooke's law, Stress-strain diagram of ductile and brittle material, thermal stresses, volumetric stresses and strains. Analysis of Principal stresses and Strains, Mohr's stress circle, Relationship among elastic constants.

**Shear force and Bending moment diagrams:** Types of load on beam and frames, classification of beams, statically determinate problems, shear force and bending moment diagrams: simply supported, overhang and cantilever beams subjected to any combination of point loads, uniformly distributed and varying load and moment, relationship between load, shear force and bending moment.

## UNIT - II

**Theory of pure bending:** Flexural Stresses-Theory of simple bending - Assumptions - Derivation of bending equation:  $M/I = f/y = E/R$  - Neutral axis - Determination of bending stresses - Section modulus of rectangular and circular sections (Solid and Hollow), I, T and Channel sections.

**Shear Stresses in Beams:** Shear stress formula for beams, shear stress distribution in beams like rectangular, circular, triangular, I, T sections. Numericals.

## UNIT - III

**Torsion of Circular shafts:** Basic assumptions, torsion formula, power transmitted by shafts, design of solid and Hollow shafts based on strength and stiffness.

**Columns & Struts:** Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Euler's formulae for the elastic buckling load, Rankine Gordon Formula, Secant Formula, eccentric compression of a short strut of rectangular & circular sections, Numericals.

## UNIT - IV

**Slope & Deflection:** Relationship between bending moment, slope & deflection, Mohr's theorem, moment area method, conjugate beam method, method of integration, Macaulay's method, calculations for slope and deflection of (i) cantilevers and (ii) simply supported beams with or without overhang under concentrated load, Uniformly distributed loads or combination of concentrated and uniformly distributed loads, Numericals.

**Strain energy:** strain energy under axial, bending, shear, torsion, gradual, sudden and impact loading.

### Text Books

1. Strength of Materials by G H Ryder, ELBS publishers
2. Elements of Strength of Materials by Timoshenko & Young, East-West Press, New Delhi
3. Mechanics of Materials by Beer and Johnston, Tata McGraw Hill.
4. Elementary Structural Analysis, Norris & Wilbur, McGraw Hill Publisher
5. Strength of Materials, R K Bansal, Luxmi Publications-
6. Strength of Materials, U C Jindal, Pearson Publications

### Reference Books

1. Strength of Materials by Sadhu Singh, Khanna Publishers
2. Basic Structural Analysis, C.S. Reddy, Tata McGraw Hill Publication.
3. Fundamentals of Solid Mechanics by M L Gambhir, Prentice Hall of India
4. Strength of Materials Ramamurtham and Narayanan, S. Chand & Co.
5. Fundamentals of Structural Analysis B D Nantyal, New Age Publishers

BT CE - 203A: SURVEYING  
B. Tech. 2nd Year (Semester - III)

| L | T | P  | Credit |
|---|---|----|--------|
| 3 | 1 | -- | 4      |

|                         |             |
|-------------------------|-------------|
| Class Work              | : 30 Marks  |
| Examination             | : 70 Marks  |
| Total                   | : 100 Marks |
| Duration of Examination | : 3 Hours   |

UNIT - I

**Introduction to Surveying:** Definition, importance, Objectives, Maps, History of surveying and mapping, Importance, Maps and maps, Scale, Principles of survey, Classification of surveys, different techniques of surveying, Chain Surveying: Ranging, Chaining, Offsets, Errors in Chaining, Corrections to length measured with a tape

**Compass surveying & Plane Table Surveying:** Purpose of compass surveying, Comparison of compass surveying and chain surveying, Dip, Magnetic Declination, W.C.B., Q.B., and R.B Introduction to plane table surveying, principle, instruments, working operations, setting up the plane table, centering, leveling, Orientation, methods of plane table survey, danger circle, Lehmann's Rules, errors in plane tabling.

UNIT - II

**Leveling:** definitions of terms used in leveling, different types of levels, parallax, staves, adjustments, bench marks, classification of leveling, booking and reducing the levels, rise and fall method, line of collimation method, errors in leveling, permanent adjustments, Two peg test, reciprocal leveling, Corrections to curvature and refraction, cross sections and longitudinal leveling.

**Trigonometric Leveling:** Definitions & terms, curvature & refraction Methods: direct & reciprocal, eye and object correction, coefficient of refraction. **Contours:** Definition, representation of reliefs, horizontal equivalent, contour interval, characteristics of contours, methods of contouring, contour gradient, uses of contour maps.

UNIT - III

**Tachometry:** Definitions and terms used in tachometry, angular tachometry with staff vertical and staff inclined, Analytic lens theory, Tachometric field work, tangential method of tachometry, direct reading tachometer.

**Theodolite Traversing:** types of theodolites, measurement of angles, temporary and permanent adjustments, closed & open traverse, consecutive and independent co-ordinates, advantages & disadvantages of traversing closing error, Bowditch, Transit rules.

UNIT - IV

**Triangulation:** Triangulation systems, classification, strength of figure, selection of triangulation stations, grade of triangulation, field work of triangulation, triangulation computations, Introduction to EDM, Total Station and its working, survey adjustment and treatment of observation, adjustment of triangulation figures by method of least squares.

**Curves:** Definition, elements of a simple curve, different methods of setting out a simple circular curve, elements of a compound curve, reverse curves, introduction of transition curves, vertical curves and sight distances.

**B. Tech. III Semester (Civil)**  
**BT CE-205 A: FLUID MECHANICS-I**

|   |   |     |       |
|---|---|-----|-------|
| L | T | P/D | Total |
| 3 | 1 | -   | 4     |

Max. Marks: 100  
Theory: 70 marks  
Sessional: 30 marks  
Duration: 3 hrs

**UNIT-I**

**Introduction:**

Fluid properties, mass density, specific weight, specific volume and specific gravity, surface tension, capillarity, pressure inside a droplet and bubble due to surface tension, compressibility viscosity, Newtonian and Non-newtonian fluids, real and ideal fluids.

**Kinematics of Fluid Flow:**

Steady & unsteady, uniform and non-uniform, laminar & turbulent flows, one, two & three dimensional flows, stream lines, streak lines and path lines, continuity equation in differential form, rotation and circulation, elementary explanation of stream function and velocity potential, rotational and irrotational flows, graphical and experimental methods of drawing flownets.

**UNIT-II**

**Fluid Statics:**

Pressure-density-height relationship, gauge and absolute pressure, simple differential and sensitive manometers, two liquid manometers, pressure on plane and curved surfaces, center of pressure, Buoyancy, stability of immersed and floating bodies, determination of metacentric height, fluid masses subjected to uniform acceleration, free and forced vortex.

**UNIT-III**

**Dynamic of Fluid Flow:**

Euler's equation of motion along a streamline and its integration, limitation of Bernoulli's equation, Pitot tubes, venturimeter, orificemeter, flow through orifices & mouth pieces, sharp crested weirs and notches, aeration of nappe.

**Dimensional Analysis and Hydraulic Similude:**

Dimensional analysis, Buckingham theorem, important dimensionless numbers and their significance, geometric, kinematic and dynamic similarity, model studies, physical modeling, similar and distorted models.

**UNIT-IV**

**Boundary layer analysis:**

Boundary layer thickness, boundary layer over a flat plate, laminar boundary layer, turbulent boundary layer, laminar sub-layer, smooth and rough boundaries, local and average friction coefficient, separation and its control.

**Drag and Lift:**

Types of drag, drag on a sphere, flat plate, cylinder and airfoil, development of lift on immersed bodies like circular cylinder and airfoil, flow around a sphere-Stokes' law

**Books:**

- 1 Hydraulic and Fluid Mechanic by P N Modi & S M Seth
- 2 Introduction to Fluid Mechanics by Robert W. Fox & Alan T. McDonald
- 3 Fluid Mechanics Through Problems by R.J. Garde
- 4 Engineering Fluid Mechanics by R.J. Garde & A.G. Mirgaoker

BT CE 207A: BUILDING CONSTRUCTION AND MATERIALS  
B. Tech. 2<sup>nd</sup> Year (Semester - III)

| L | T  | P | Credits |
|---|----|---|---------|
| 3 | -- | - | 3       |

|                         |             |
|-------------------------|-------------|
| Class Work              | : 30 Marks  |
| Examination             | : 70 Marks  |
| Total                   | : 100 Marks |
| Duration of Examination | : 3 Hours   |

UNIT - I

**Bricks:** Composition of good brick earth, harmful ingredient, manufacture of bricks, characteristics of good bricks, testing of bricks, classification of bricks as per IS 1077-1985.

**Rocks and Stones:** Classification of rocks, test for stones, characteristics of a good building stone, deterioration of stones, common building stones of India, comparison of the brick work and stone work.

**Timber:** Classification of timbers, structure of timber, seasoning of timber, defects in timber, fire proofing of timber

UNIT - II

**Cement:** Types, Manufacture, basic properties of cement compounds, grades, packing, storage, quality control and curing, additives, special cements, all testing as per IS.

**Steel:** Manufacture of steel, market forms of steel e.g. mild steel and HYSD steel bars, rolled steel sections, stainless steel mortars

**Aggregates:** Classification of Aggregates, Characteristics of Aggregate, Deleterious Materials and Organic Impurities, Soundness, Alkali-Aggregate Reaction, Thermal Properties of Aggregate, Fine Aggregate, Coarse Aggregate, Broken Brick Coarse Aggregate, Testing of Aggregates

UNIT - III

**Masonry, stone masonry,** basic terms, materials for stone masonry, classification, dressing of stones, joints in stone masonry, Brick Masonry, laying tools, basic terms, bonding of bricks, tools, inspection of brickwork, strength of brick work, Cavity walls, features, wall ties, construction of cavity wall, Lintels.

**Construction equipment's:** Modern equipment's used in the construction of multi storey buildings and bridges

UNIT - IV

**Damp proof course:** requirement in buildings, D.P.C. at Plinth level, in basement and roof tops etc., Basement & Retaining walls. Drawings.

**Foundation types and suitability,** spread, arch, combined, cantilevered, Raft, Grillage, Piles & wells, Footings in block cotton soil, IS Specifications and drawings.

**Stairs & Stair cases:** Suitability of location, stairs in multi-storeyed buildings, Residential and public buildings, dimensions, Requirements, classification, types of stairs, Lift & escalators, drawings.

Text Books

1. Building Materials by P C Varghese, PHI.
2. Engineering Materials, by S.C. Rangawala, Charotar Publishing House, Anand.
3. Building Construction by Sushil Kumar, Standard Publisher and Distributors.
4. Building Construction by B. C. Punima, Laxmi Publisher House

Reference Books

1. Engineering Materials, by Sushil Kumar, Metropolitan Press
2. Engineering Materials by N.C. Choudhary, Technical Publishers.
3. Materials Science, J.C. Anderson & KDB Lever, ELBS fifth Edn., 2004.
4. Indian Practical Civil Engg. Handbook, P N Khanna, Engineers Publishers, 2000.
5. National Building Code, B. I. S.



BT CE 209A: STRENGTH OF MATERIALS LAB  
B. Tech. 2<sup>nd</sup> Year (Semester - III)

| L  | T  | P | Credits |
|----|----|---|---------|
| -- | -- | 2 | 1       |

|                         |             |
|-------------------------|-------------|
| Class Work              | : 30 Marks  |
| Examination             | : 70 Marks  |
| Total                   | : 100 Marks |
| Duration of Examination | : 3 Hours   |

List of Experiments:

1. To determine Rockwell hardness number of the specimen of steel/soft metal.
2. To determine Brinnel hardness number of the specimen of steel/soft metal.
3. To study the behavior of ductile material under tension on Universal Testing Machine
4. To study the behavior of brittle material under tension on Universal Testing machine.
5. To study the behavior of brittle material under compression on Universal Testing machine.
6. To determine the Torsional rigidity of shaft on torsion testing machine.
7. To determine the impact strength of M.S./C.I. specimen on Izod impact testing machine.
8. To determine the impact strength of M.S./C.I. specimen on Charpy impact testing machine.
9. To determine flexural rigidity of a beam simply supported at the ends and carrying a concentrated load at the center.

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BT CE - 211A: SURVEYING LAB  
B. Tech. 2nd Year (Semester - III)

| L  | T  | P | Credits |
|----|----|---|---------|
| -- | -- | 2 | 1       |

|                         |             |
|-------------------------|-------------|
| Class Work              | : 30 Marks  |
| Examination             | : 70 Marks  |
| Total                   | : 100 Marks |
| Duration of Examination | : 3 Hours   |

List of Experiments

1. Chain Survey of an area
2. Compass Surveying
3. Plane table survey of an area.
4. Leveling Exercises.
5. Measurement of vertical and horizontal angles with Theodolite.
6. Tachometric Constants.
7. Tachometric Survey
8. Two point / three point problem.
9. Setting out a simple circular curve by different methods.
10. Measurements with Total Station.

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July 27

**BT CE - 213A: FLUID MECHANICS LAB**  
**B. Tech. 2<sup>nd</sup> Year (Semester - III)**

| L  | T  | P | Credits |
|----|----|---|---------|
| -- | -- | 2 | 1       |

|                         |   |           |
|-------------------------|---|-----------|
| Class Work              | : | 30 Marks  |
| Examination             | : | 70 Marks  |
| Total                   | : | 100 Marks |
| Duration of Examination | : | 3 Hours   |

**List of Experiments**

1. Verification of Bernoulli's Theorem.
2. Calibration of Venturimeter.
3. Calibration of an orifice meter.
4. Determination of Hydraulic Coefficients of a orifice & mouth piece.
5. Determination of friction factor for pipes.
6. Visualization of laminar and turbulent flow and estimating critical Reynold's number.
7. Determination of metacentric height of a ship model.
8. To measure the velocity distribution over a flat surface in a wind tunnel and to determine the Reynold's no. and boundary layer thickness along the plate.
9. To measure the pressure distribution around a cylinder in a wind tunnel and to calculate the coefficient of drag at different Reynold's number.

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insects, birds. Study of simple ecosystems—pond, river, hill slopes, etc  
equal to 5 lecture hours)

(Field work

REFERENCE BOOKS:

1. A Textbook of Environmental Studies by Asthana D.K. and Asthana Meera
2. Fundamental Concepts in Environmental Studies by Mishra D.D.
3. Environmental Studies by S.C. Sharma M.P. Poonia
4. Textbook of Environmental Studies for Undergraduate by Erach Bharucha
5. Environmental Studies: Third Edition by R. Rajagopalan

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CE - 202 A: STRUCTURAL ANALYSIS I  
B. Tech. 2<sup>nd</sup> Year (Semester - IV)

| L | T | P  | Credits |
|---|---|----|---------|
| 3 | 1 | -- | 4       |

|                         |             |
|-------------------------|-------------|
| Class Work              | : 30 Marks  |
| Examination             | : 70 Marks  |
| Total                   | : 100 Marks |
| Duration of Examination | : 3 Hours   |

UNIT I

Analysis of Determinate Trusses Introduction, various types, stability, determination of forces in member of trusses by method of joints, method of sections, zero force members.  
Deflection of Beams Review of Double Integration Method and Macaulay's Method, moment area theorem, conjugate beam method, unit method and strain energy method. Maxwell's reciprocal theorem.

UNIT II

Fixed and Continuous Beams: Degree of static and kinematic indeterminacies, Analysis of fixed beams, continuous beams and propped cantilevers by moment-area theorem and strain energy method, fixed end moments due to different types of loadings, effects of sinking and rotation of supports, bending moment and shear force diagrams for fixed beams and propped cantilevers, slope and deflection of fixed beams, analysis of continuous beams by the three moment theorem (Clapeyron's theorem) due to different types of loadings.

UNIT III

Rolling Loads: Introduction to rolling loads and influence lines, Determination of shear force, bending moment at a section and absolute shear force and bending moment due to single point load, uniformly distributed load, several point loads etc.

Influence Lines: Construction of Influence lines for reaction, shear forces and bending moment for simply supported, overhanging and compound beams, influence lines for girders with floor beams, Influence lines for forces in members of frames.

UNIT IV

Analysis of Two hinged and Three Hinged Arches:  
Parabolic and circular Arches. Bending Moment Diagram for various loadings, Temperature effects, Rib shortening, Axial thrust and Radial Shear force diagrams.  
Cables and suspension Bridges: Introduction, shape of a loaded cable, cable carrying point loads and UDL, cables with ends at different level, cable subjected to temperature stresses, suspension bridge with two hinged and three hinged stiffening girder.

Text Books

1. Elementary Structural Analysis, Norris & Wilbur, McGraw Hill Publisher,
2. Basic Structural Analysis, C.S. Reddy, Tata McGraw Hill Publication
3. C K WANG, " Intermediate Structural Analysis" McGraw Hill Publisher

Reference Books

1. Structural Analysis (A unified approach), D.S. Parkash Rao, University Press.
2. Theory of structures, Punmia and Jain, Luxmi Publications.
3. Structural Analysis Thandvamoorthy TS Oxford University Press
4. Structural Analysis Deydas Menon Narosa Publishing House

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B. Tech. IV Semester (Civil)  
BT CE-204A: FLUID MECHANICS-II

204A

J. B. S. S.

| L | T | P/D | Total |
|---|---|-----|-------|
| 3 | 1 | -   | 4     |

Max. Marks: 100  
Theory: 70 marks  
Sessionals: 30 marks  
Duration: 3 hours

#### UNIT-I

**Flow in Open Channels:** Difference between pipe flow and channel flow, Types of channels, Classification of flows, Sub Critical and Supercritical Flows, Velocity distribution in channel, Design of Channels, Most efficient channel sections

**Flow Measurement:** Flow over notches and weirs, Pitot tube floats and current meters for velocity measurement, Flow over Spillways, Sluice gates, Free overfall flow.

#### UNIT-II

**Concepts of Specific energy and specific Force:** Specific energy and specific curve, Momentum Equation in open channels, Specific force & specific force curve Critical depth and its computation.

**Hydraulic jump:** Froude number and types of hydraulic jump, Applications Jumps in channels. Unsteady flow equation, Pre jump and post jump depths, length of Hydraulic Jump and energy dissipation, Surges.

#### Unit III

**Gradually Varied Flow:** Channel transitions, Non-uniform flow in open channels, Dynamic equation for GVF, Water surface profiles, GVF flow computations. Design of Channels, Most efficient channel sections.

#### UNIT-IV

##### Flow through pipes:

Types of flows-Reynold's experiment, laminar flow through pipes-Hagen Poiseuille law, shear stress on turbulent flow, boundary layer in pipes-Establishment of flow, velocity distribution for turbulent flow in smooth and rough pipes, resistance to flow of fluid in smooth and rough pipes, Stanton and Moody's diagram. Darcy's weisbach equation, other energy losses in pipes, loss due to sudden expansion, hydraulic gradient and total energy lines, pipes in series and in parallel, equivalent pipe, branched pipe, pipe networks, Hardy Cross method, water hammer.

##### Books:

- 1 Hydraulic and Fluid Mechanic by P.N.Modi & S.M.Seth
- 2 Introduction to Fluid Mechanics by Robert W.Fox & Alan T.McDonald
- 3 Fluid Mechanics Through Problems by R.J.Garde
- 4 Engineering Fluid Mechanics by R.J.Garde & A.G.Mirajgaoker

BT CE – 206A: GEOMATICS ENGINEERING

B. Tech. 2<sup>nd</sup> Year (Semester – IV)

|   |   |    |         |
|---|---|----|---------|
| L | T | P  | Credits |
| 3 | 0 | -- | 3       |

|                         |   |           |
|-------------------------|---|-----------|
| Class Work              | : | 30 Marks  |
| Examination             | : | 70 Marks  |
| Total                   | : | 100 Marks |
| Duration of Examination | : | 3 Hours   |

UNIT – I

**Introduction to Geomatic Engineering-** Introduction to map and Geographic coordinate system-Map projections, projected coordinate system, application of coordinate systems; Global positioning system (GPS)- Elements, satellite constellation and signals and GPS measurements.

UNIT – II

**Remote Sensing:** Definition and scope of Remote sensing, Nature and spectrum of Electromagnetic radiation, Reflectance, Transmission and Absorption, Thermal Emission – Plank's formula, Stefan – Boltzman Law, Wein's Displacement Law; Emissivity – Kirchoff's Law; Interaction of EMR with Atmosphere: Scattering, Refraction, Absorption, Transmission. Atmospheric Windows; Interaction of EMR with Earth Surface: Spectral Reflectance Curves, Interaction of earth surface with EM radiation in visible, Near Infrared, Thermal Infrared and Microwave regions. Idealised & Real sequence of remote sensing.

UNIT – III

**Remote sensing- Platforms and sensors:** Platforms, Orbital characteristics, sensor parameters- spatial resolution, spectral resolution, radiometric resolution, Storage and Retrieval of data. Indian Remote Sensing satellite systems- Introduction, Stages of development, Sensors, Types of scanning system.

**Data Processing:** Initial data statistics. Pre-processing – Atmospheric, Radiometric and Geometric corrections, Image Histogram, Classification of images and interpretation.

Application- Application of remote sensing to various engineering fields.

UNIT – IV

**Geographical Information system (GIS):** Definition, and Components, Geographical data: types and characteristics; Spherical and plane coordinate systems in GIS; geo-referencing; Digital representation of geographic data: Data structure, spatial data model, raster and vector models; GIS data standards: concepts and components; Integration of Remote sensing and GIS; GIS project design and planning methodologies; GIS data base management systems; Application of GIS in civil engineering

Text Books

1. Geomatic Engineering. Manoj K Arora, RC Badjatiya, Nem Chand & Bros



2. Remote Sensing and Image Interpretation, by Lillisand, T.M. & Kiefer R.W., John Wiley and Sons.
3. Introduction to Remote Sensing, by Campbell, J.B. Taylor and Francis.
4. Principles of Geographic information systems, Burrough, P.A and MacDonnel, R.a , Oxford University press
5. Concepts and Techniques of GIS, C P.Lo, Albert K W Yeung, PHI

#### Reference Books

1. Digital Remote Sensing, by Nag. P. & Kudrat, M. Concept Publication Company.
2. Remote Sensing and Photogrammetry – Principles and Applications, by Jhanwar, M.L. and Chouhan, T.S. Vigyan Prakashan, Jodhpur.

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## BT CE- 208A: TRANSPORTATION ENGINEERING – I

B. Tech. 2<sup>nd</sup> Year (Semester – IV)

| L | T | P  | Credits |
|---|---|----|---------|
| 3 | 1 | -- | 4       |

|                         |             |
|-------------------------|-------------|
| Class Work              | : 30 Marks  |
| Examination             | : 70 Marks  |
| Total                   | : 100 Marks |
| Duration of Examination | : 3 Hours   |

### UNIT – I

**Highways development Planning:** Introduction, Different modes of transport, Development of Transport System, Phased development of Roads in India. Highway Surveys & Alignment, Design, Drawings, Estimates & Project Report.

**Highway materials and testing:** sub grade, sub base and base course materials, bituminous materials, testing of soil, aggregate and bitumen.

### UNIT – II

**Geometric Design of Highways:** Introduction, Highways Classification, Right of way, Land width, width of formation, width of pavement, Sight Distances, camber, horizontal and vertical Road Curves, Transition Curves.

**Design of Pavements:** Types of pavements, Factors affecting design of pavements, wheel load factor, Climatic Factors, Structure of Flexible pavement, Function of various components of Flexible pavement, design of flexible pavements by G.I. & CBR methods, stresses in rigid pavements, design of rigid pavements by IRC method.

### UNIT – III

**Traffic Studies:** Road user characteristics, Importance of traffic studies, spot speed, speed and delay and origin and destination studies. Vehicular flow models. Stream variables: Spacing and concentration, headway and flow, mean speed. Time distance diagram of flow. Traffic operations and control devices, intelligent transport systems.

**Road Safety Audits:** Road Safety Audits: Safety concerns in highway projects, Systems approach, various stages of Safety Audit, Preparation of Audit Reports.

### UNIT – IV

**Highway construction:** road types--earth roads, gravel roads, water bound macadam, bituminous pavement including surface treatment, premix carpet, mastic asphalt, bituminous macadam, bituminous concrete and cement concrete roads. Construction of earth, gravel and water bound macadam roads, Construction Equipments.

**Maintenance:** Introduction, Maintenance of Earth, gravel, WBM, GSB, WMM Roads, Bituminous Roads, Maintenance of berms, Side Slopes, Pavement edge and draining work. Failures of flexible and rigid pavements: Maintenance, evaluation and its strengthening.

#### Text Books

1. Highway Engineering by Khanna and Justo, Nem Chand & Brothers, Roorkee
2. Highway Engineering by L.R. Kadyali, Nem Chand & Brothers, Roorkee

#### Reference Books

1. Highway Engineering by Oglesby and Hews
2. Transportation Engineering by G.V. Rao, Tata McGraw Hill Publisher, New Delhi

BT CE - 210A: STRUCTURAL ANALYSIS-I LAB

B. Tech. 2<sup>nd</sup> Year (Semester - IV)

| L  | T  | P | Credits |
|----|----|---|---------|
| -- | -- | 2 | 1       |

|                         |             |
|-------------------------|-------------|
| Class Work              | : 30 Marks  |
| Examination             | : 70 Marks  |
| Total                   | : 100 Marks |
| Duration of Examination | : 3 Hours   |

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List of Experiments:

1. To verify Betti's Law
2. To determine the flexural rigidity ( $EI$ ) of a given beam.
3. To verify Moment-Area Theorems for slope and deflection of a beam.
4. To study the behavior of different types of struts.
5. To determine the elastic displacement of curved members.
6. To determine the horizontal displacement of the roller end in a curved beam.
7. To make computer programs for theoretical verification of the above experiments.

*Handwritten signatures and text:*  
A large signature, possibly "Vijay", is written across the page.  
Below it, the name "Vijay" is written and underlined.  
To the right, there is another signature and the number "22".

BT CE -212A: FLUID MECHANICS-II LAB  
B. Tech. 2<sup>nd</sup> Year (Semester - IV)

| L  | T  | P | Credits |
|----|----|---|---------|
| -- | -- | 2 | 1       |

|                         |   |           |
|-------------------------|---|-----------|
| Class Work              | : | 30 Marks  |
| Examination             | : | 70 Marks  |
| Total                   | : | 100 Marks |
| Duration of Examination | : | 3 Hours   |

List of Experiments:

1. To determine Manning's co-efficient of roughness for the rough bed of a given flume.
2. To measure the velocity distribution in a rectangular channel by Prandtl Pitot tube and to determine the energy correction factors
3. To study the flow through a horizontal contraction in a rectangular open channel.
4. To calibrate a current meter
5. To study the formation of hydraulic jump in a horizontal rectangular open channel (Measurement of Froude no. and energy loss)
6. To study the flow over a hump in a channel bed.
7. To study the pressure distribution along the spillway surface for different heads.
8. To calibrate a broad-crested weir and to study the pressure distribution along its surface.
9. To study the flow under a sluice gate and formation of hydraulic jump at different Froude no.

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BT CE - 218A: MECHANICAL ENGINEERING  
B. Tech. 2<sup>nd</sup> Year (Semester - IV)

| L | T  | P  | Credits |
|---|----|----|---------|
| 3 | -- | -- | 3       |

|                         |             |
|-------------------------|-------------|
| Class Work              | : 30 Marks  |
| Examination             | : 70 Marks  |
| Total                   | : 100 Marks |
| Duration of Examination | : 3 Hours   |

UNIT-I

**THERMODYNAMICS** - Elementary definitions in thermodynamics, fundamentals of first and 2nd law of thermodynamic- concept of internal energy, enthalpy and entropy, heat pump and refrigerator, elementary numerical problems.

**PROPERTIES OF STEAM & BOILERS:** properties of steam, use of steam tables and mollier diagram, measurement of dryness fraction of steam, Carnot and Rankin cycle, elementary numerical problems. Classification of boilers, Comparison of water and fire tube boilers mounting and accessories with their functions, Constructional and operational details of Cochran and Babcock and Wilcox boilers, elementary numerical problems.

**STEAM TURBINES AND CONDENSERS:** Classification of turbines and their working principles, Types of condensers and their uses.

UNIT-II

**I.C. ENGINES AND GAS TURBINES:** Introduction, Classification, Constructional details and working of two-stroke and four-stroke diesel and petrol engines, Efficiency of Otto & Diesel cycles, Working principle of gas turbine, elementary numerical problems

**REFRIGERATION AND AIR CONDITIONING-** rating of refrigeration machine, coefficient of performance, simple vapor compression cycle, fundamentals of air conditioning, use of Psychrometric charts.

UNIT-III

**WATER TURBINES AND PUMPS :** Introduction, Classification, Construction details and working principle of Pelton, Francis and Kaplan turbines, Classification of water pumps.

**SIMPLE LIFTING MACHINES:** Definition of machine, Velocity ratio, Mechanical advantage, Efficiency, Laws of machines, Reversibility of machine, Wheel and axle, Differential pulley block. Single, double and triple start worm and worm wheel, Single and double purchase winch crabs, Simple and compound screw jacks, elementary numerical problems.

#### UNIT-IV

**INTRODUCTION TO POWER TRANSMISSION AND DEVICES:** Belt drive, Rope drive, Chain drive, Types of gear and Gear train, Types and function of clutches, Types and function of brakes.

**STRESSES AND STRAIN S:** Introduction, Concept & types of Stresses and strains, Poisson's ratio, stresses and strains in simple and compound bars under axial loading, Stress-strain diagrams, Hooke's law, Elastic constants & their relationships. Concept of shear force and bending moments in beams, elementary numerical problems.

#### TEXT BOOKS:

1. Hydraulic and Fluid Mechanics - Modi and Seth, Pub. - Standard Book House, New Delhi
2. Engineering Thermodynamics - C.P. Arora, Pub. - TMH, New Delhi
3. Thermal Engineering - A.S. Sarad, Pub. - Satya Prakashan, New Delhi.
4. Engineering Mechanics - K.L. Kumar, Pub. - TMH, New Delhi.
5. Theory of Machines - S.S. Rattan, Pub. - TMH, New Delhi.

*vibhakar Singh*

BT CE - 214A: GEOMATICS ENGINEERING LAB  
B. Tech. 2<sup>nd</sup> Year (Semester - IV)

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|----|----|---|---------|
| L  | T  | P | Credits |
| -- | -- | 2 | 1       |

|                         |             |
|-------------------------|-------------|
| Class Work              | : 30 Marks  |
| Examination             | : 70 Marks  |
| Total                   | : 100 Marks |
| Duration of Examination | : 3 Hours   |

List of Experiments

1. Study and image interpretation of remote sensing data.
2. Introduction to CAD/GIS/Image Processing software
3. Study of digital image characteristics such as:
  - DN value,
  - Histogram,
  - Color image generation,
  - Simple Image enhancement,
  - On-screen digitization from images,
  - Area computation,
  - Geo-registration of images etc.

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BT CE- 216A : TRANSPORTATION ENGINEERING-I LAB

B. Tech. 3<sup>rd</sup> Year (Semester – IV)

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|----|----|---|---------|
| L  | T  | P | Credits |
| -- | -- | 2 | 1       |

|             |      |           |
|-------------|------|-----------|
| Class Work  | :    | 30 Marks  |
| Examination | :    | 70 Marks  |
| Total       | :    | 100 Marks |
| Duration    | of : | 3 Hours   |
| Examination |      |           |

**List of Experiments:**

1. To test toughness of road Aggregates by Impact Test
2. To test hardness of aggregates by Los Angles Abrasion Test
3. To perform Crushing Strength Test on Aggregates
4. To identify grade of bitumen using Penetration Test.
5. To test the ductility of bitumen using Ductility test.
6. To test water absorption and specific gravity of road aggregates using density basket.
7. To find out Softening Point of Bitumen.
8. To find out Flash & fire point of bitumen.
9. To determine spot speed of traffic by radar speedometer and endoscope.
10. To conduct CBR test on samples of subgrade.
11. To perform classified traffic Volume count on a road section.

*Vibranth Singh*

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