



**ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY**  
**Kahilipara, Guwahati -19, Assam**

**DETAILED SYLLABUS**

**3rd Semester, B Tech**

**CIVIL ENGINEERING**

# CIVIL ENGINEERING

## Semester III B Tech (CIVIL ENGINEERING)

### Course Structure

| Sl. No.                  | Course No. | Subject                          | Hours |   |   | Credit |
|--------------------------|------------|----------------------------------|-------|---|---|--------|
| Theory                   |            |                                  | L     | T | P | C      |
| 1                        | MA131301   | Mathematics III                  | 3     | 2 | 0 | 4      |
| 2                        | CE131302   | Solid Mechanics                  | 3     | 2 | 0 | 4      |
| 3                        | CE131303   | Building Construction            | 3     | 0 | 0 | 3      |
| 4                        | CE131304   | Engineering Surveying I          | 3     | 2 | 0 | 4      |
| 5                        | CE131305   | Basic Fluid Mechanics            | 3     | 2 | 0 | 4      |
| 6                        | HS131306   | Sociology                        | 2     | 0 | 0 | 2      |
| <b>Practical</b>         |            |                                  |       |   |   |        |
| 7                        | CE131312   | Solid Mechanics Lab              | 0     | 0 | 2 | 1      |
| 8                        | CE131314   | Engineering Surveying I (Lab)    | 0     | 0 | 2 | 1      |
| 9                        | CE131315   | Fluid Mechanics Lab              | 0     | 0 | 2 | 1      |
| 10                       | CE131317   | Building Drawing and Autocad Lab | 0     | 0 | 2 | 1      |
| Total                    |            |                                  | 17    | 8 | 8 | 25     |
| Total Working Hours = 33 |            |                                  |       |   |   |        |
| Total Credits = 25       |            |                                  |       |   |   |        |

**Course Title:** MATHEMATICS III

**Course Code:** MA131301

**L-T-::** 3-2-

**Credit= 4**

**Abstract:**

This course of Mathematics is important for almost all the engineering disciplines. It deals with the partial differential equations of first order and 2<sup>nd</sup> order.

**Prerequisites:** Concept of solution of ODE, Elementary complex numbers and properties, Elementary probability and statistics – measures of central tendency, dispersions. Basic differentiation and integration [ HS / diploma level]

**Course Outcomes:**

The students will

- ❖ Be able to apply the fundamental concepts of Partial differential Equations.
- ❖ Get familiarised with the applications of Ordinary Differential Equations and Partial Differential Equations.
- ❖ Be able to apply different techniques of integration, including partial fractions, integration by parts and recurrence formulae, to solve problems.

| Module | Topic                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | No of hours | Marks |
|--------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|-------|
| 1      | <b>First order Partial differential equation:</b> Partial differential equation of first order, Linear partial differential equation, Non-linear partial differential equation, Homogenous and non-homogeneous partial differential equation with constant co- efficient, Cauchy type, Monge's method.<br><b>Second order Partial differential equation:</b> Second order partial differential equation The vibrating string, the wave equation and its solution, the heat equation and its solution, Two dimensional wave equation and its solution, Laplace equation in polar, cylindrical and spherical coordinates, potential. | 15          | 30    |
| 2      | <b>Complex Analysis:</b> Analytic function, Cauchy-Riemann equations, Laplace equation, Conformal mapping, Complex integration: Line integral in the complex plane, Cauchy's integral theorem, Cauchy's integral formula, Derivatives of analytic functions.<br><b>Mathematical Series:</b> Power Series, Taylor's series, Laurent's series, Singularities and zeros, Residue integration method.                                                                                                                                                                                                                                  | 15          | 30    |

|   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |    |    |
|---|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----|----|
| 3 | <b>Probability and statistics:</b><br>(i) Definition of probability, Laws of probability, Bays theorem, random variables, probability distributions and characteristics, binomial distribution, poisson's distributions and Normal distribution.<br>(ii) elementary sampling theory, tests of hypothesis (statistical inference), Standard error, Fiducial (Confidence) limits, Tests of significance- Students' T-tests, Chi square tests and Z –tests.                             | 10 | 25 |
| 4 | <b>Laplace Transform</b><br>Definition of Laplace transform, Laplace transform of elementary functions, inverse of Laplace transforms. Properties of Laplace Transform- Linearity, multiplication by $t^n$ and division by $t$ . Laplace Transform of derivatives and integrals. Shifting theorems, Laplace transform of (i) periodic function (ii) unit step function, (iii) Dirac-delta function. Convolution theorem, Application of Laplace transform to initial value problems. | 8  | 15 |

**Reference books:**

1. E. Kreyszig, "Advanced Engineering Mathematics", Eighth Edition, Wiley India.
2. B.V. Ramana, "Higher Engineering Mathematics", McGraw Hil Education.
3. N.P. Bali and Manish Goel, "A text book of Engineering mathematics", Laxmi Publication.
4. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publication, Delhi.
5. Babu Ram, "Engineering Mathematics", Pearson.

**SOLID MECHANICS**

(CE131302)

L:T:C 3: 2:= 4

**Credit=4**

| Module | Topics                                                                                                                                                                                                                                             | Hours |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1      | <b><u>Simple Stresses and Strains-</u></b><br>Tension, compression and shear stresses - Hooke's law – Poisson's Ratio- Principle of Superposition- Stresses due to impact- composite bars -Volumetric Strain- elastic constants- thermal stresses. | 5     |
| 2      | <b><u>Compound Stresses-</u></b><br>Principal stress and principal strain- Mohr's circle- Thin and Thick Cylinder                                                                                                                                  | 3     |
| 3      | <b><u>Bending Moment and Shear Force-</u></b>                                                                                                                                                                                                      | 8     |

|                    |                                                                                                                                                                                           |           |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
|                    | Beams and support conditions -Types of supports and loads - shear force and bending moment - their diagrams for simply supported beams, cantilevers and overhanging beams.                |           |
| 4                  | <b><u>Bending Stress and Shear Stress-</u></b><br>Theory of simple bending – Stress distribution at a cross section due to Bending Moment and Shear Force                                 | 4         |
| 5                  | <b><u>Deflection of Beams-</u></b><br>Slope and Deflection for determinate structures using Moment Area and Conjugate Beam Method                                                         | 6         |
| 6                  | <b><u>Torsion of Circular Shafts:</u></b><br>Equation of Torsion-Strength and Stiffness-Torsional Rigidity-Polar Modulus-Power Transmitted by shaft of solid and hollow circular sections | 6         |
| 7                  | <b><u>Elastic Stability of Columns:</u></b><br>Short and Long Column, Euler's Theory of Columns, Derivation of Buckling Load for different end conditions, Rankine's Formula              | 6         |
| 8                  | <b>Introduction to Unsymmetrical Bending and Shear Centre.</b>                                                                                                                            | 2         |
| <b>Total Hours</b> |                                                                                                                                                                                           | <b>40</b> |

## **SOLID MECHANICS LAB (CE131312)**

**L:T:P: 0:0:2**

**Credit=1**

Introduction to testing equipments

- Uniaxial tension test ( Mild Steel, Timber)
- 1. Uniaxial compression test ( Timber along and across, concrete, bricks etc.)
- 2. Torsion test (Mild Steel, aluminum)
- 3. Analysis of truss model with spring members.
- 4. Compression test on brick masonry specimen
- 5. Hardness test
- 6. Creep test
- 7. Impact test
- 8. Strength of Etched and Un-etched glasses
- 9. Spring test
- 10. To study the microstructure of various metals.

### **Recommended Books:**

|                                                                                                         |
|---------------------------------------------------------------------------------------------------------|
| • Elements of Strength Timosenko, S.P. Affiliated East-West of Materials and Young, D.H. Press Pvt. Ltd |
| • Strength of Materials Srinath, L.S, Tata McGraw-Hill. Desai. P.                                       |
| • Engineering Mechanics Popov, E.P. PHI of Solids                                                       |
| • Solid Mechanics Kazimi Tata McGraw-Hill                                                               |
| • Introduction to Solid Shames, H PHI Mechanics                                                         |
| • Strength of Materials Timoshenko, S McGraw Hill Vol. I                                                |
| • Advanced Mechanics Of Solids Srinath, L.S. Tata McGraw-Hill                                           |
| • Strength of Materials Theory and problems Subramanian,R Oxford University Press                       |

**BUILDING CONSTRUCTION**

(CE13103)

L:T=3:0

Credit= 3

| MODULE                                 | TOPIC                                                                                                                                                       | HOUR |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
| <b>Introduction</b>                    | Components of buildings                                                                                                                                     | 01   |
|                                        | Basic requirements of a building.                                                                                                                           | 01   |
| <b>Planning</b>                        | Types of drawings – plan, elevation, sectional elevation                                                                                                    | 01   |
|                                        | Principle of Planning                                                                                                                                       | 01   |
|                                        | Orientation of buildings                                                                                                                                    | 01   |
|                                        | Building bye-laws and its objectives.                                                                                                                       | 01   |
| <b>Foundation</b>                      | Functions of foundation,                                                                                                                                    | 01   |
|                                        | Classification: Isolated, combined footing, grillage foundation, raft foundation, pile foundation- types and application, pier foundation, well foundation. | 03   |
| <b>Masonry</b>                         | Stone masonry- types                                                                                                                                        | 01   |
|                                        | Classes and types of bricks                                                                                                                                 | 01   |
|                                        | Types of bonds                                                                                                                                              | 02   |
|                                        | Comparison of stone masonry and brick masonry                                                                                                               | 01   |
| <b>Shoring, Scaffolding Shuttering</b> | Shoring and its types                                                                                                                                       | 01   |
|                                        | Scaffolding and its types                                                                                                                                   | 01   |
|                                        | Shuttering for column, beam, slab                                                                                                                           | 01   |
| <b>Stairs</b>                          | Technical terms                                                                                                                                             | 01   |
|                                        | Requirements of a good stair, Dimensions of a step                                                                                                          | 01   |
|                                        | Classification of stairs                                                                                                                                    | 01   |
|                                        | Simple geometric calculations of stairs                                                                                                                     | 02   |
|                                        | Introduction to ramps, elevators, escalators, lift                                                                                                          | 01   |
| <b>Floors</b>                          | Requirements of a good floor                                                                                                                                | 01   |
|                                        | Types of flooring and method of their laying                                                                                                                | 02   |
|                                        | Upper floors                                                                                                                                                | 02   |
| <b>Roofs</b>                           | Requirements of a good roof, selection of roofs                                                                                                             | 01   |
|                                        | Types of roof                                                                                                                                               | 02   |
|                                        | Roof trusses                                                                                                                                                | 02   |
| <b>Doors, windows,</b>                 | Technical terms                                                                                                                                             | 01   |
|                                        | Location of doors and windows, size of doors                                                                                                                | 01   |

|                    |                            |           |
|--------------------|----------------------------|-----------|
| <b>ventilators</b> | Types of doors and windows | 03        |
|                    | Ventilators                | 01        |
| <b>TOTAL HOURS</b> |                            | <b>40</b> |

**BUILDING DRAWING AND AUTOCAD Lab (CE131317):**

**L:T:P= 0: 0: 2, Credit -1**

1. **Introduction:** - Conventional Symbols for building drawing.
2. **Building Drawing:** - Plan, Elevation and Section of- Single Storeyed, Multi Storeyed (flat roof & sloped roof) buildings.
3. **Introduction to use Softwares:** -Use of AutoCAD in Building Drawing.

**Reference Books:**

Building Construction: B C Punmia

Building Construction: Sushil Arora

**ENGINEERING SURVEYING-I**

(CE13104)

(CE13104)

**L:T: C= 3:2:=4**

| <b>MODULE</b> | <b>TOPIC</b>                                                                                                                                                                                                                                                                                                                                                                          | <b>HOURL</b> |
|---------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|
| 1.            | <b>LEVELLING</b><br>Object and Use of Levelling, Important terms in Levelling, Temporary and Permanent Adjustment of Level<br>Types of Levelling Operation, Curvature Correction, Refraction Correction and Combined Correction, Problems on Corrections<br>Reciprocal Levelling, Problems on Reciprocal Levelling, Difficulties Faced in Levelling, Problems on Reduction of Levels. | <b>12</b>    |

|                    |                                                                                                                                                                                                                                                                                                                                                                                                                                                              |           |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 2.                 | <b>THEODOLITE TRAVERSING:</b><br>Important terms in Theodolite Traversing, Temporary Adjustment of Theodolite, Measurement of Horizontal and Vertical Angles, Measurement of Deflection Angles, Methods of Traversing, Closing Error and its Limitations, Computations of Latitude and Departure,<br>Balancing of Traverse by Bowditch's rule and Transit rule.<br>Problems on Balancing of Traverse<br>Trigonometrical Levelling to find Height of Objects. | <b>10</b> |
| 3.                 | <b>PLANE TABLE SURVEYING:</b><br>Principle of Plane Table Surveying, Accessories of Plane Table, Orientation, Methods of Plane Tabling, Advantages and Disadvantages of Plane Tabling.                                                                                                                                                                                                                                                                       | <b>4</b>  |
| 4.                 | <b>CONTOURING:</b><br>Contours, Contour Interval, Horizontal Equivalent, Uses of Contour Map, Characteristics of Contours, Methods of Contouring, Capacity of the Reservoir.                                                                                                                                                                                                                                                                                 | <b>4</b>  |
| 5.                 | <b>TACHEOMETRIC SURVEYING:</b><br>Theory of Stadia Tacheometry, Determination of Stadia Constant, Anallactic Lens, Fixed Hair Method, Problems on Fixed Hair Method, The Tangential Method of Tacheometry.                                                                                                                                                                                                                                                   | <b>8</b>  |
| 6.                 | <b>COMPUTATION OF AREA AND VOLUME:</b><br>Calculation of area: The Mid Ordinate Rule, The Average Ordinate Rule, The Trapezoidal Rule, The Simpson's Rule.<br>Calculation of Volume: Trapezoidal Rule and Prismoidal Rule.                                                                                                                                                                                                                                   | <b>5</b>  |
| <b>Total Hours</b> |                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>43</b> |

#### **ENGINEERING SURVEYING I LAB (CE131314) : L:T:P=C: 0:0:2=1**

- To range a line more than one chain length and recording the details in a field book.
- Closed compass traversing to plot the existing layout of a building/ built-up area.
- Profile and Cross-sectional leveling with Dumpy Level.
- Plane table traversing.
- Indirect contouring by the method of grids.
- To measure horizontal angles by repetition and reiteration method.
- Open traverse by using theodolite.

**TEXT BOOKS:**

- Surveying and Levelling. N.N.Basak, Tata McGraw Hill.
- Surveying Vol I. B.C. Punmia, Ashok K. Jain, Arun K. Jain, Laxmi Publication.
- Surveying and Levelling, R Subramaniam, Oxford.
- A textbook of Surveying, C.L. Kochher, Dhanpat Rai Publication.
- Surveying and Levelling, Rangwala, Charotar Publishing House.

**BASIC FLUID MECHANICS**

(CE131305)

L:T=C: 3:2=4

| MODULE | TOPIC                                                                                                                                                                                                                                                                                                                                                          | HOURL |
|--------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1.     | <b>Introduction:</b><br>Fluids and continuum, properties of fluids, Ideal and real fluids, Newtonian and non-Newtonian fluids, measurement of surface tension                                                                                                                                                                                                  | 4     |
| 2.     | <b>Fluid Statics:</b><br>Hydrostatic law, pressure, density, height relationship, manometer, pressure on plane, curved and submerged surfaces, Centre of pressure, Buoyancy, Equilibrium of floating bodies, metacentre.                                                                                                                                       | 8     |
| 3.     | <b>Fluid Kinematics:</b><br>Types and states of motion- steady and unsteady, uniform and nonuniform, laminar and turbulent flow, compressible and incompressible flows, one, two & three dimensional flows, streamlines, streak lines and path lines, stream tube, stream function and velocity potential, flow net and its drawing, Free and forced vortexes. | 8     |
| 4.     | <b>Fluid Dynamics:</b><br>Continuity equation, Euler's equation, Bernoulli's equation-application. Total energy. Momentum equation, Energy equation.                                                                                                                                                                                                           | 8     |
| 5.     | <b>Flow Through Openings:</b><br>Orifices, Mouthpieces, Co-efficient of contraction, velocity and discharge, flow through sluice gates under free and submerged flow conditions.                                                                                                                                                                               | 8     |
| 6.     | <b>Notches and Weirs:</b><br>Rectangular, triangular and trapezoidal notches and weirs, Francis's formula with end contraction, suppressed weir, Cippoletti weir, submerged weir, broad crested weir.                                                                                                                                                          | 8     |
| 7.     | <b>Flow Through Pipes:</b><br>Loss of head due to friction, bend and elbows, sudden enlargement, sudden contraction, obstruction and at entrance. Darcy Weisbach formula, coefficient of friction, flow through compound pipes. Siphon                                                                                                                         | 4     |
| 8      | <b>Flow Measurement:</b><br>Venturi meter, orifice meter, Nozzle meter, pitot tube, current meter.                                                                                                                                                                                                                                                             | 2     |
| 9      | <b>Dimensional and Model Analysis:</b><br>Rayleigh's method, Buckingham's pi-theorem, important dimensionless parameter and their significance. Application of                                                                                                                                                                                                 | 4     |

|  |                                                                                                                                                                                     |  |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  | dimensional analysis to fluid flow problems. Geometric, Kinematics and dynamic similarities, scale ratio, velocity, force, discharge speed and power of prototype, Distorted model. |  |
|--|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|

### LAB: BASIC FLUID MECHANICS(CE131315)

1. Determination of coefficient of triangular notch.
2. Verification of Bernoulli's theorem.
3. Determination of coefficient of Orifice.
4. Reynold's experiment for laminar and turbulent flow.

### TEXTBOOKS:

- A textbook of Fluid Mechanics and Hydraulic Machines-. Dr. R. K. Bansal, Laxmi Publication.
- A textbook of Fluid Mechanics and Hydraulic Machines- Sukumar Pati, Tata MacGraw Hill.
- A textbook of Fluid Mechanics – R K Rajput, S Chand & Company Pvt.
- Fluid Mechanics through Problems – R. J. Garde- New Age Publications
- Fluid Mechanics & Machinery, Ojha,CSP Oxford University Press.

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                 |                         |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
| <b>HS131306</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <b>SOCIOLOGY</b>                                                                                                                                                                                                                                                                                                | L = 2<br>T = 0<br>C = 2 |
| Module-I                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Sociology in the Industrial Perspective: Concept of sociology/ Sociology as a science?/ Sociology of work and industry/ Perspectives for sociological analysis of work/ Class conflict in industry/ Social impact of industrialization                                                                          | 12 Hours                |
| Module-II                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Work and Social Change: Nature of modern societies/ Emergence of industrial capitalism/ Technology and social change/ The information society after the industrial society/ Postmodernity/ Globalization and convergence/ Significance of the service sector today/ Work restructuring and corporate management | 12 Hours                |
| Module-III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Work Experiences in Industry: The concept of alienation/ Work satisfaction/ Technology and work experience/ Social background of workers/ Work orientations/ Stress and anxiety of the worker/ Work and leisure/ Unemployment/ Conflicts in the workplace                                                       | 12 Hours                |
| Total                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |                                                                                                                                                                                                                                                                                                                 | 36 Hours                |
| Reference Books                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                 |                         |
| <ol style="list-style-type: none"> <li>1. Miller and Form, Industrial Sociology (London: Harper &amp; Row, 1968)</li> <li>2. N. R. Sheth, Social Framework of Indian Factory (Bombay: Oxford University Press, 1968)</li> <li>3. Gisbert, Fundamentals of Industrial Sociology (New Delhi: Oxford University Press, 1971)</li> <li>4. P. Gisbert, Fundamentals of Industrial Sociology (New Delhi: Oxford University Press, 1971)</li> <li>5. Tony J. Watson, Sociology, Work and Industry (New York: Routledge, 2004 reprint)</li> </ol> |                                                                                                                                                                                                                                                                                                                 |                         |

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