



**ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Guwahati**

Course Structure and Syllabus

(From Academic Session 2018-19 onwards)

B.TECH

CIVIL ENGINEERING

4th SEMESTER



ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

Course Structure

(From Academic Session 2018-19 onwards)

B. Tech 4th Semester: Civil Engineering

Semester IV/ B. TECH/CE

Sl. No.	Sub-Code	Subject	Hours per Week			Credit C	Marks	
			L	T	P		CE	ESE
Theory								
1	CE181401	Hydraulics and Hydraulics Machines	3	1	0	4	30	70
2	CE181402	Structural Analysis-II	3	1	0	4	30	70
3	CE181403	Engineering Survey-II	3	0	0	3	30	70
4	CE181404	Engineering Geology	3	0	0	3	30	70
5	CE181405	Construction Materials and Concrete Technology	3	0	0	3	30	70
6	MC181406	Environmental Science	2	0	0	0 (PP/NP)	-	100
Practical								
1	CE181411	Hydraulics and Hydraulic Machines Lab	0	0	2	1	15	35
2	CE181413	Engineering Survey Lab	0	0	4	2	15	35
3	CE181414	Engineering Geology Lab	0	0	2	1	15	35
4	CE181415	Construction Materials and Concrete Technology Lab	0	0	2	1	15	35
TOTAL			17	2	10	22	210	590
Total Contact Hours per week : 29								
Total Credits: 22								

N.B. 1. MC181406 is a Mandatory Audit Course (No Credit). It will be evaluated as PP (Pass) or NP (Not Pass)

2. 2-3 weeks Mandatory Academia Internship need to be done in the 4th semester break and the report is to be submitted and evaluated in 5th semester

Detail Syllabus:

Course Code	Course Title	Hours per week L-T-P	Credit C
CE181401	Hydraulics and Hydraulics Machines	3-1-0	4

MODULE 1: Viscous flow:

Viscosity- dynamic and kinematic; equation of motion- Navier- Stokes equation; laminar flow in circular pipes- Hagen Poiseuille equation; laminar flow between parallel plates- Couette flow.

MODULE 2: Turbulent flow:

Smooth and rough pipes or surfaces, Pandtler mixing length theory, velocity distribution for turbulent flow over smooth and rough surfaces, friction factor for smooth and rough pipes, Moody's diagram.

MODULE 3: Boundary Layer Theory:

Laminar and turbulent boundary layer along a flat plate; laminar sub-layer; boundary layer thickness- displacement, momentum and energy thickness; momentum integral equation; computation of boundary layer thickness, shear stress and drag force for laminar and turbulent boundary layer.

MODULE 4: Flow around Submerged Bodies:

Drag and lift; drag and lift coefficients; pressure and friction drag on sphere, cylinder and disc; separation of flow- Karman vortex street; circulation; lift on a cylinder-Magnus effect.

MODULE 5: Advanced pipe flow:

Pipe network analysis- Hardy Cross method; water hammer in pipes- rigid and elastic water column theories, gradually and instantaneous closure of valves; surge tank.

MODULE 6: Impact of Jet:

Force of jet on stationary and moving flat plates, force of jet on hinged plate, force of jet on stationary and moving curved vanes (symmetrical and unsymmetrical), force of jet on a series of plates (flat and curved) mounted on a wheel.

MODULE 7: Turbines:

Classification- impulse and reaction turbines; Work done, power, heads and efficiencies of turbines; Pelton wheel; Francis turbine; Kaplan and Propeller turbine; draft tube; unit quantities, specific speed.

MODULE 8: Pumps:

Centrifugal pump- classification, work done, heads and efficiencies of centrifugal pump, minimum starting speed, multi stage pump; Reciprocating pump- classification, discharge, work done and power, indicator diagram, effect of acceleration and friction on indicator diagram, air vessels.

Text / Reference Books:

1. Hydraulics and Fluid Mechanics (Including Hydraulic Machines)- by P. N. Modi and S. M. Seth
2. Hydraulics Fluid Mechanics and Fluid Machines- by S. Ramamrutham
3. A Textbook of Fluid Mechanics and Hydraulic Machines- by R. K. Bansal
4. Fluid Mechanics and Machinery- by C. S. P. Ojha, R. Berndtsson and P. N. Chandramouli
5. Fluid Mechanics- by Frank M. White
6. Fluid Mechanics and Turbomachines- by Madan Mohan Das
7. Fluid Mechanics- by A. K. Jain
8. Fluid Mechanics through Problems- by R. J. Garde
9. Theory and Application of Fluid Mechanics- by K. Subramanya

Course Code	Course Title	Hours per week L-T-P	Credit C
CE181402	Structural Analysis-II	3-1-0	4

MODULE 1: Fixed beams and Continuous Beam

Analysis of fixed and continuous beams

MODULE 2: Slope Deflection and Moment Distribution Method

Principle and numerical Example, Analysis of Continuous beam for Sinking support. Moment Distribution Method – Analysis of beam, portal frames

MODULE 3: Approximate analysis of indeterminate structures for Lateral loads

Portal and cantilever method of analysis of building frames for lateral loads.

MODULE 4: Plastic Analysis

Introduction, plastic moment of inertia, plastic section modulus, characteristic of plastic hinge, concept of Moment Redistribution, Shape factors for various sections. Static and Kinematic method, Beam, Sway and Combined mechanism for plastic collapse loads of beams, single bay single storey, two storey and two bay two storey portal frames, Gable Mechanism for simple pitch roof frame, deflection at point of collapse.

MODULE 5: Moving Loads and Influence lines

Application to determinate Structures-Beam, Truss, 3-hinged arch, Suspension Bridges. Muller-Breslau's Principles: Influence lines for support reactions, bending moment, shear force in propped cantilever, two span continuous beams and for two hinged arch.

Text / Reference Books:

1. Structural Analysis: T S Thandavamoorthy, Oxford University Press.
2. Basic Structural Analysis- C S Reddy, McGraw Hill Education (India) Private Limited, New Delhi.
3. Theory of Structure- S Ramamrutham, Dhanpat Rai Publishing Company, New Delhi.
4. Theory of Structure- B C Punmia, Laxmi Publications (P) Ltd.
5. Intermediate Structural Analysis – Wang C.K., Tata McGraw Hill Publishers, 2010.
6. Fundamentals of Limit Analysis of Structures (A Course in Plastic Analysis of Structures), V.K. Manicka Selvam, Dhanpat Rai Publication.

Course Code	Course Title	Hours per week L-T-P	Credit C
CE181403	Engineering Survey-II	3-0-0	3

MODULE 1: Curve surveying

Characteristics of different types of curves- Simple circular curve- Elements, Compound curve, Reverse curve, Transition curve- length, Ideal transition curve, Characteristics of transition curve, Computation and setting out of simple circular and transition curve;

Vertical curves – Types, length, computation and setting out of vertical curves, sight distance.

MODULE 2: Triangulation

Geodetic surveying- Principle, Classification of triangulation system, Triangulation figures, Strength of figures, Reconnaissance-selection of stations, Indivisibility and height, Signal and towers, Phase of signal, Base line measurements, Satellite station, measurement of horizontal angles.

Trilateration-Use, advantages, Triangulation vs Trilateration, Triangulate ration

MODULE 3: Theory of errors and adjustments

Errors and precision, definitions, Laws of accidental errors, Principle of least square, Laws of weights, Determination of probable error, Determination of most probable values- normal equations, method of correlates, Triangulation adjustment- station and figure adjustment, Adjustment of geodetic triangle- Spherical triangle, Spherical excess, Numerical problems.

MODULE 4: Modern Survey Equipment

Electromagnetic Waves-important characteristics, distance measurement, modulation, Types of EDM, Target-component and characteristics. Total Station-Procedures for topographic survey.

MODULE 5: Photogrammetry

Introduction, Types of aerial photograph, Definitions, Scale of a vertical photograph, computation of length and height from vertical photograph, Relief displacement, Scale of tilted photograph, Flight planning, Stereoscopic vision, Parallax in aerial photograph, measurement of parallax.

MODULE 6: Remote sensing

Electromagnetic energy, electromagnetic spectrum, Interaction of electromagnetic energy with matter, Atmospheric window, Active and passive remote sensing, Remote sensing platforms, Ideal and real remote sensing system, Types of data products, Data acquisition and interpretation, Application of remote sensing, Remote sensing in India

GPS- Introduction, principle of GPS.

Text / Reference Books:

1. Surveying Vol. I, II: Punmia, Jain & Jain, Laxmi publications, 2016
2. Surveying Vol. I, II: S.K. Duggal, McGraw-Hill Education Pvt. Ltd, 2013
3. Surveying and Leveling – R. Subramanian, Oxford University Press, 2015
4. Surveying & Leveling – N N Basak, Mc Graw-Hill Education Pvt. Ltd., 2014
5. Remote Sensing & Geographic Information System – A. M. Chandra, S. K. Ghosh, Alpha Science International Ltd; 2nd Revised edition (28 July 2015)

Course Code	Course Title	Hours per week L-T-P	Credit C
CE181404	Engineering Geology	3-0-0	3

Course objectives: To introduce basic geology and the importance of geological information in site investigation to civil engineering students.

MODULE 1: The Earth

Origin, Age and Internal structure of the Earth; Materials of Earth; Earth as a closed system. Geomorphology - Weathering of rocks and its engineering considerations; Geological work of wind and running water.

MODULE 2: Study of Minerals

Study of rock forming minerals, their physical properties & uses. Feldspar Group, Quartz group, Pyroxene group, Mica group and Clay minerals.

MODULE 3: Study of Rocks

Igneous, Sedimentary and Metamorphic rocks their formation, textures, structures and composition; Engineering properties of rocks.

MODULE 4: Structural Features of Rocks

Stratification, lamination, bedding, outcrop; dip and strike and their simple calculation; Folds, Faults, Joints, Unconformity.

MODULE 5: Stones and Aggregates

Building stones:

Requirement of good building stones, Physical Properties of Building stones- porosity, water absorption, crushing strength, fire resistance, abrasion resistance, frost resistance, density; Geological characteristics- mineralogical composition, texture and structure, resistance to weathering; Important building stones

Aggregates:

Aggregates- coarse and fine aggregates; Rock Aggregates for road and concrete mixes, suitable rock types and desired properties, Engineering properties of rock aggregates.

MODULE 6: Geological Hazards

Earthquakes- causes and effect of earthquake; Intensity and magnitude of earthquake waves; seismic zoning map of India and seismic micro zonation; Landslides – Terminology and classification; causes of landslides and its control.

MODULE 7: Geological Investigations

Objectives of geological investigations; General principle of geological and geophysical exploration; Electrical Resistivity Method and Seismic Refraction Method. Geological investigations required for selection of sites for buildings, bridges, highways, dams, reservoirs, tunnels

MODULE 8: Rock Mechanics

Engineering classification of Rocks-Intact and In-situ; Rock quarrying-rock drilling, rock boring, core recovery, modified core recovery, Rock Quality Designation (RQD).

Text / Reference Books:

1. Engineering Geology- SK Duggal, HK Pandey & N Rawal; Mc Graw Hill Education
2. Engineering and General Geology -Parbin Singh, 8th Ed. S.K, Kataria and Sons, New Delhi
3. Engineering Geology-Subinoy Gangopadhay; Oxford University Press, New Delhi
4. Rock Mechanics for Engineers-VP Verma; Khanna Publishers, New Delhi

Course Code	Course Title	Hours per week L-T-P	Credit C
CE181405	Construction Materials and Concrete Technology	3-0-0	3

1st part: CONSTRUCTION MATERIALS

MODULE 1: Introduction to Engineering Material

Evolutionary Trends in Construction Materials, Traditional and Innovative Materials, Properties of Materials, Functional Requirements of Materials, BIS codes and specifications for various building materials.

Bamboo, Timber and timber based products, Bricks -Classification
Paints, Sealants and Adhesives; Glass.

MODULE 2: Cement, Aggregates, Steel

Cement- Different types and Grades of Cement, Hydration of cement, Physical and chemical properties, Gel Structure, Testing of Cement for Physical and chemical properties as per BIS specifications.

Aggregates-Testing of Aggregates for physical and mechanical properties Water.
Steel-Reinforced Steel Bars, Structural Steel
Roofing Sheets, Corrugated galvanized Iron sheet, Galvalume sheets for roofing

MODULE 3: Modern Materials

Damp Proofing, Water Proofing, Thermal Insulation, Sound Insulation and Fire Protection materials, Solid and Hollow Concrete Block, Autoclaved Aerated concrete (AAC) Blocks, Fly-ash Bricks, Interlocking Paver Blocks, Aluminium Composite Panels, Galvalume Sheets.

2nd part: CONCRETE TECHNOLOGY

MODULE 1: Fresh and hardened Concrete

Proportioning of concrete, Operations involved in concrete production, Workability-Measurement of workability. Problem of segregation and bleeding and laitance.

Strength of Concrete: Compressive strength and factors affecting it, Testing of hardened concrete-cube and cylindrical sample, Platen effect, flexure test, Stress-strain relation and modulus of elasticity, Shrinkage, Creep of concrete and its effect.

Durability of Concrete: Corrosion of reinforcing bars, sulphate attack, frost action, deterioration by fire, concrete in seawater, acid attack, and carbonation.

MODULE 2: Concrete Mix Design

Principle and methods, Statistical Quality control. Concrete Rheology, Maturity concept, IS method for concrete Mix Design.

MODULE 3: Special concretes and modern materials

Admixtures- Action of admixtures, Types, Advantages
Special concrete as Lightweight concrete. High Density Concrete, Sulphur impregnated concrete, Polymer concrete, Lime concrete, High strength concrete, Fibre Reinforced Concrete.

MODULE 4: Non-destructive testing

Destructive vs. Non-Destructive testing, Methods & Principles of NDT. Rebound hammer, UPV, core-cutting

Text / Reference Books:

1. “Engineering Materials”, Rangawalla. S.C Chartar Publishing House
2. “Building Materials”, Varghese, PHI Learning Pvt. Ltd.
3. “Alternative Building Materials and Technologies” by Jagadish, Reddy and Rao, New Age International (P) ltd.
4. Rai Mohan and Jai Singh M.P. “Advances in Building Materials and Construction-CBRI Roorkee”.
5. “Civil Engineering Materials” “Technical Teachers” Training Institute Chandigarh, Tata McGraw Hill Publishing Company Ltd., New Delhi.
6. Spence RJS and Cook DJ- ‘Building Materials in Developing Countries’ John Wiley and Sons.
7. Shetty M.S. “Concrete Technology, Theory and Practices”. S. Chand & Company Ltd., New Delhi.
8. Neville A.M., Properties of Concrete, Pitman Publishing Company.
9. Gambhir M.L. “Concrete Technology”- Tata McGraw Hill Publishing Company Ltd., New Delhi.
10. Gambhir M.L. “Concrete Manual”- Dhanpal Rai & Sons, Delhi.

Course Code	Course Title	Hours per week L-T-P	Credit C
MC181406	Environmental Science	2-0-0	0

MODULE 1: Environment and Ecology

- i. Introduction
- ii. Environment and Ecology
- iii. Objectives of ecological study
- iv. Aspects of Ecology
 - a) Autecology
 - b) Synecology
- v. Ecosystem
 - a) Structural and functional attributes of an ecosystem
 - b) Food chain and food web
 - c) Energy flow
 - d) Biogeochemical cycles

MODULE 2: Land: Use and Abuse

- i. Land use: Impact of land – use on environmental quality
- ii. Land degradation
- iii. Control of land degradation
- iv. Waste land
- v. Wet lands

MODULE 3: Water Pollution

- a) Introduction
- b) Water quality standards
- c) Water pollution
- d) Control of water pollution
- e) Water pollution legislations
- f) Water quality management in Rivers

MODULE 4: Air Pollution

- i. Introduction
 - a) Air pollution system
 - b) Air pollutants
- ii. Air pollution laws
- iii. Control of air pollution
 - a) Source correction method
 - b) Pollution control equipment
 - c)

MODULE 5: Noise Pollution

- i. Introduction
- ii. Sources of noise pollution
- iii. Effects of noise
 - a) Physical effects
 - b) Physiological effects

- c) Psychological effects
- iv. controls of Noise pollution

Text / Reference Books:

1. Environmental engineering and management by Dr Suresh Dhameja
2. Environmental studies by Dr B.S. Chauhan
3. Environmental science and engineering by Henry and Hence
4. Environmental studies for undergraduate course by Dr Susmitha Baskar
5. Chemistry for environmental engineering and science by Clair Sawyer

Course Code	Course Title	Hours per week L-T-P	Credit C
CE181411	Hydraulics and Hydraulics Machines Lab	0-0-2	1

LIST OF EXPERIMENTS

1. Verification of Bernoulli's theorem
2. Determination of metacentric height of a floating body
3. Determination of water surface profile for a free vortex flow
4. Determination of water surface profile for a forced vortex flow
5. Determination of Coefficient of discharge for a Venturimeter
6. Determination of coefficient of discharge for an orificemeter
7. Calibration of a rectangular notch
8. Determination of friction factor for a pipe flow.
9. Study of performance characteristics of a centrifugal pump.
10. Study of performance characteristics of a Pelton wheel turbine.

Course Code	Course Title	Hours per week L-T-P	Credit C
CE181413	Engineering Survey Lab	0-0-4	2

Practical 1: Horizontal and vertical angle measurement

To measure horizontal angle with the method of repetition and vertical angle with Theodolite and determine the height of an object with Trigonometric levelling.

Practical 2: Traversing and map preparation

To carry out closed traversing with Theodolite, prepare map of the area along with contour map using concepts of Gale's Traverse Table.

Practical 3: Curve setting: Simple circular curve

To set a simple circular curve between two given straight roads by Rankine's method.

Practical 4: Curve setting: Combined curve

To set a combined curve (Simple circular and Transition curve) between two given straight roads.

Practical 5: Open traversing with total station

To carry out open traversing with Total Station.

Practical 6: GPS survey

To carry out a GPS survey.

Course Code	Course Title	Hours per week L-T-P	Credit C
CE181414	Engineering Geology Lab	0-0-2	1

LIST OF EXPERIMENTS

1. Identification of hand specimen of rocks and minerals with the help of their physical properties
2. Problems of dip and strike
3. Geological maps and sections
4. Completion of outcrops
5. Borehole correlation problems

Course Code	Course Title	Hours per week L-T-P	Credit C
CE181415	Construction Materials and Concrete Technology Lab	0-0-2	1

Laboratory work:

1. Testing of cement.
Standard consistency, setting time (initial and final), fineness, soundness and compressive strength test (3 days, 7 days and 28 days).
2. Testing of Aggregates.
 - (a) Fine aggregate.
Sieve analysis for zoning and fineness modulus (FM), Bulking of sand, Absorption and moisture content, specific gravity.
 - (b) Coarse aggregate.
Sieve analysis for grading, absorption and moisture content, specific gravity flakiness index, Elongation index, Impact value, Crushing value and Abrasion value.
3. Compressive strength test of concrete, workability test of fresh concrete.
4. Concrete Mix design by IS method.
