



**ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY  
GUWAHATI**

**Course Structure and Syllabus  
(From Academic Session 2018-19 onwards)**

**B.TECH  
CIVIL ENGINEERING  
6<sup>TH</sup> SEMESTER**



## ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY

### Course Structure

(From Academic Session 2018-19 onwards)

#### B.Tech 6<sup>th</sup> Semester: Civil Engineering

#### Semester VI / B.TECH/CE

Sl. No.	Sub-Code	Subject	Hours per Week			Credit	Marks	
			L	T	P	C	CE	ESE
<b>Theory</b>								
1	CE181601	Transportation Engineering-II	3	1	0	4	30	70
2	CE181602	Engineering Hydrology	3	1	0	4	30	70
3	CE181603	Structural Design-II	3	1	0	4	30	70
4	CE181604	Environmental Engineering-II	3	0	0	3	30	70
5	CE181605	Geotechnical Engineering-II	3	1	0	4	30	70
6	HS181606	Accountancy	2	0	0	2	30	70
<b>TOTAL</b>			17	4	0	<b>21</b>	<b>180</b>	<b>420</b>
Total Contact Hours per week : 21								
<b>Total Credits: 21</b>								

**N.B. 4-6 weeks Mandatory Industry Internship need to be done in the 6<sup>th</sup> semester break and the report is to be submitted and evaluated in 7<sup>th</sup> semester**

## Detailed Syllabus:

Course Code	Course Title	Hours per week L-T-P	Credit C
CE181601	Transportation Engineering-II	3-1-0	4

### Railway Engineering

#### MODULE 1: (8 hours)

**Permanent Way:** Rail, sleeper, ballast – their ideal requirements, dimensions, classification and behaviours, wearing of rails, coning of wheels, creep – causes, effects & remedies, Railway surveys – traffic, reconnaissance, preliminary and final location surveys.

**Geometric Design:** Gauges, alignment, horizontal curves, super elevation, Gradients and grade compensation, Length of transition curve, cross – sections of permanent way, Geometric requirements for high speeds.

#### MODULE 2: (8 hours)

**Construction of Railway Track:** Stages in construction, methods of plate laying, various fittings and fixtures, points and crossings, turn – outs and track junctions.

**Signaling and Interlocking:** Control of train movements types of signals in stations and yards, principles of interlocking.

**Resistances to Traction:** Various resistances, Hauling capacity and Tractive effort, various stresses in Railway Track.

### Airport Engineering

#### MODULE 3: (8 hours)

**Aircraft Characteristics:** Aeroplane component parts.

**Airport Planning:** Regional planning, Airport selection, Zoning laws, Imaginary surfaces.

**Airport Layout:** Geometric components of an airport and their functions, Typical Airport layouts.

**Runway Design:** Runway orientation, Basic Runway Length, corrections for Elevation, Temperature and Gradient, Runway Geometrics.

#### MODULE 4: (7 hours)

**Taxiway Design:** Geometric Design Standards, Turning radius, Exit Taxiways.

**Structural Design of Airport Pavements:** Design factors, Design methods for Flexible and Rigid Pavement, Design of an overlay, special characteristics and Requirements of Airport Drainage.

### Tunnel Engineering

#### MODULE 5: (9 hours)

##### Tunnels:

Introduction about tunnels, advantages and disadvantages of tunnels compared to open cuts, Criteria for selection of size and shape of tunnels, construction of shaft. Factors affecting methods of tunnelling.

**Driving Tunnels in Soft Ground:** General characteristics of soft ground, Different method of driving tunnels in soft ground.

**Driving Tunnels in Hard Ground:** Meaning of the term ‘Faces of Attack’, Mucking, methods of removal of muck. Methods of Ventilation, Lighting and aspects of drainage.

**Textbooks/Reference Books:**

1. Railway Engineering by Satish Chandra and M.M Agarwal
2. A textbook of railway engineering by S.C. Saxena and S.P. Arora
3. Airport Planning and Design by S. K. Khanna, M.G Arora and S.S. Jain
4. Airport Engineering by Rangwala
5. Harbour, Dock and Tunnel Engineering by R. Srinivasan
6. Roads Railways Bridges and Tunnels Engineering by Ahuja & Birdi

Course Code	Course Title	Hours per week L-T-P	Credit C
CE181602	Engineering Hydrology	3-1-0	4

**Course Objectives:**

1. To provide knowledge in the hydrological cycle, precipitation, evapotranspiration, infiltration and its measurements.
2. To estimate the runoff.
3. To understand hydrographs and IUH.
4. To know the types of aquifers
5. To understand the surface and subsurface in detail.
6. To understand the various methods of flood estimation and hence flood routing.

**MODULE 1: Introduction**

**(2 hours)**

Hydrologic cycle – Schematic representation, System representation. Global Water Budget, History of Hydrology, Scope of Hydrology.

**MODULE 2: Weather and Precipitation**

**(7 hours)**

Characteristics of the atmosphere, Atmospheric Water Vapor and its Indices –Vaporization, Condensation, Vapor Pressure, Density of moist air, Dew point temperature, Humidity. Mechanism of formation of Precipitation – Mechanism of cooling, Mechanism of condensation, Mechanism of droplet growth, Mechanism of accumulation of moisture. Forms and Types of Precipitation. Measurement of rainfall – Non-Recording and Recording Rain gauges, AWS, Radar measurement of rainfall, Selection of Rain gauge site, Rain gauge net – work, Adequacy of Rain Gauge Stations. Methods of computing average rainfall – Arithmetic mean method, Thiessen Polygon method, Isohyetal method. Interpolation and Adjustment of Missing Data – Station Year Method, Double mass curve. Related Numerical Problems. Hyetograph and mass curve of rainfall, Depth Area Duration Curve. Calculation of Return period from rainfall frequency curve.

**MODULE 3: Infiltration**

**(3 hours)**

Introduction, Factors affecting infiltration, Infiltration capacity- Horton’s infiltration curve. Infiltration Indices, Numerical solutions, Measurement of infiltration – Flooding type Infiltrimeter

**MODULE 4: Evapotranspiration**

**(4 hours)**

Introduction, Factors affecting evaporation, Measurement of Evaporation – Empirical Formulae (Meyer’s equation), Water Budget Method, Energy Budget Method, Mass Transfer Method, Aerodynamic method, Reservoir evaporation and methods for its reduction. Evapotranspiration – Estimation–Empirical equations–(Blaney Criddle equation, Thornthwaite equation), Using Lysimeter.

**MODULE 5: Runoff**

**(8 hours)**

Introduction, Estimation of runoff – Empirical formulae, Infiltration method, Hydrograph analysis, Rational method.

**MODULE 6: Hydrograph**

**(8 hours)**

Introduction, Components of hydrograph, Base Flow Separation, Computation of direct Surface Runoff. Unit Hydrograph – Definition, Derivation of UH with assumptions, Limitations and uses, UH of different durations, Synthetic UH, Instantaneous UH, all related numerical problems.

**MODULE 7: Estimation of Flood****(8 hours)**

Introduction, Methods of Estimation – Rational method, envelop curves, Empirical formulae, PMP chart, UH method, Flood Frequency Analysis – Gumbel’s method, Log-Pearson Type – III Distribution, (All related numerical problems)

**MODULE 8: Flood Routing****(8 hours)**

Introduction – Reservoir routing and Channel routing, Hydrologic Routing – Basic Equations, Reservoir Routing by Modified Pul’s Method, Channel Routing – Muskingum Equation and Muskingum method, Hydraulic Routing – Introduction by S.V. Equation

**Textbooks/Reference Books:**

1. Applied Hydrology - V. T. Chow, McGraw-Hill Science/Engineering/Math; 1 edition (February 1, 1988)
2. Engineering Hydrology – K. Subramanya, Tata McGraw-Hill Education
3. Hydrology – M. M. Das, PHI (1 December 2009)
4. Hydrology – H. M. Roghunath, New Delhi: New Age International (P) Ltd., Publishers, 2006
5. Applied Hydrology – K. N. Mutreja, Tata McGraw-Hill
6. Irrigation Engineering and Hydraulic Structures --- S. K. Garg, Khanna publishers, 2006
7. Irrigation Water Power and Water Resource Engineering --- Arora, Standard Publishers Distributors, 2015

Course Code	Course Title	Hours per week L-T-P	Credit C
CE181603	Structural Design-II	3-1-0	4

### **MODULE 1: Introduction to Methods of Design**

Properties of Structural Steel, Corrosion, Fire Protection. Indian Standard Specifications and Sections. General Design Requirements & Design Process. Analysis Procedures & Design Philosophy. Introduction to Limit State Design. Partial safety Factor-Load-Load Combinations-Classification of Cross sections- Plastic, Compact, Slender Sections, Buckling Class of Sections. IS code provisions.

### **MODULE 2: Design of Connections and Fasteners**

Connections with Lap Joint and Butt Joint, Single Cover Butt Joint, Double Cover Butt Joint, Types of fasteners – Bolted connections, Riveted Connections, Welded Connections, Assumptions- Design examples – Design of Bolted Connections, Design strength of Bolt, Block Shear Failure, Design of Welded connections – Butt weld- Fillet weld – Design examples.

### **MODULE 3: Design of Tension Members**

Introduction, Plates and Angles as Tension members, Plates with holes as Tension Members, Calculation of Net Area, Yield and Rupture of plates under tension. Angles with holes under Tension. Angles connected through one leg and both legs.

### **MODULE 4: Design of Compression Members**

Buckling Class of Compression Members. Design Compressive strength- Design Example of Struts in Trusses, Design of Angles connected through one-leg and both legs, Design of Axially Loaded Columns. Design of Built-up columns, Laced and Battened Columns, Design of Lacing systems and Batten Systems

### **MODULE 5: Design of Beams**

Classifications of Beam sections, Plastic, Compact, Slender section, Behaviour of Steel Beams, Analysis and design of Laterally restrained and Un-Restrained Beams, Design strength in bending, Plastic Section Modulus - Design Examples. Design check for Shear in Beams

### **MODULE 6: Design of Beam-Column**

Behaviour of members under combined loading, Shear and Bending – Modes of Failures – beam - Column Connection, Design Examples.

### **MODULE 7: Design of Column Splices and Column Base**

Design of Column Splice-Design Examples- Design of Column Base- Slab Base- Gusseted Base- Design Examples

### **Textbooks/Reference Books:**

1. IS-800-2007. General Construction in Steel, Code of Practice
2. Steel Structures: Design and Practice , N. Subramanian, Oxford University Press.
3. Design of Steel Structures, N. Subramanian, Oxford University Press.
4. Design of Steel Structures – S. Duggal, McGraw Hill Education (India) Private Limited.
5. Design of Steel structures – S. S. Bhavikatti, I.K. International Publishing House Pvt. Ltd.
6. Design of Steel Structures - Anand S. Arya , J.L. Ajmani

Course Code	Course Title	Hours per week L-T-P	Credit C
CE181604	Environmental Engineering-II	3-0-0	3

### **MODULE 1: Wastewater Treatment Processes: Theory and Application**

Screening, Comminuting, Grit Removal, Flow Measurement, Primary Sedimentation, Aeration, Solids Separation, Settling Operations, Coagulation, Filtration, Softening, Disinfection

### **MODULE 2: Secondary Treatment of Wastewater and Disposal**

Attached Growth Method, Suspended Growth method, Tertiary treatment of wastewater, Sludge Disposal standards and methods, Miscellaneous Treatment of Wastewater: Stabilization ponds, and Oxidation, ditches

### **MODULE 3: Air and Environment**

Types of Pollutants, their sources and impacts, Air pollution meteorology, Air control, air quality standards and limits.

### **MODULE 4: Solid Wastes**

Sources of Solid Wastes-Municipal. Hazardous, Characteristics, Generation, collection and transportation of solid wastes, Engineering systems for solid waste management (reuse/recycle, Energy recovery, treatment and disposal)

### **MODULE 5: Noise Pollution & Control**

Intensity, Duration – Types of Industrial Noise, Effects of Noise – Noise Measuring & Control – Permissible Noise Limits

#### **Textbooks:**

1. H. S Peavy, D. R Rowe and G. Tchobanoglous, *Environmental Engineering*, McGraw-Hill International Ed., 1985.
2. Metcalf & Eddy, *Wastewater Engineering- Treatment and Reuse* (Revised by G. Tchobanoglous, F. L. Burton and H. D. Stensel), Tata McGraw Hill, 4<sup>th</sup> Edn., 2004.
3. T. J McGhee, *Water Supply and Sewerage*, McGraw-Hill Inc., 1991.
4. Environmental Engineering Vol. I and II Santosh Kumar Garg.
5. Environmental Engineering K.N.Duggal.
6. Environmental Engineering Vol. I and II, B.C. Punmia.

#### **Reference Books:**

1. T. J McGhee, *Water Supply and Sewerage*, McGraw-Hill, Inc
2. J. M. Montgomery, *Water Treatment Principles and Design*, John Wiley & Sons
3. M. L Davis and D. A Cornwell, *Introduction to Environmental Engineering*, McGraw-Hill, Inc
4. S.J Arceivala and S. R. Asolekar, *Wastewater Treatment for Pollution Control and Reuse*, Tata McGraw Hill, 2006.
5. *Manual for Sewer and Sewerage*, Central Public Health & Environmental Engineering Organisation, Ministry of Housing and Urban Development, Govt. of India
6. *Manual for water supply and treatment*, Central Public Health & Environmental Engineering Organisation, Ministry of Housing and Urban Development, Govt. of India



Course Code	Course Title	Hours per week L-T-P	Credit C
CE181605	Geotechnical Engineering-II	3-1-0	4

**MODULE 1: Earth Pressure Theories**

**(7 hours)**

Type of earth retaining structures. Lateral earth pressure. Active and passive earth pressure, earth pressure at rest. Theory application to all types of soils with different surcharge and saturation (Rankine's theory). Coulomb's wedge theory. Rebhann's graphical method and Culmann's graphical method for active earth pressure. Numerical problems

**MODULE 2: Stability of Slopes**

**(4 hours)**

Infinite and finite slopes. Stability analysis of infinite and finite slopes. The Swedish slip circle method. Friction circle method. Use of Taylor's stability chart. Numerical solutions

**MODULE 3: Ground Investigation and Geotechnical Characterization**

**(6 hours)**

Depth of exploration. Number and disposition of pits and boring. Ground water levels. Methods of sub-surface exploration. Soil samples and samplers. Standard penetration test and different corrections over it. Seismic refraction method and electrical resistivity method

**MODULE 4: Bearing Capacity**

**(10 hours)**

Bearing capacity criteria. Modes of Shear failure. Terzaghi's bearing capacity theory. Skempton's, Meyerhof's and Brinch Hansen's bearing capacity theory. B.I.S. Code provision. Settlement analysis in sands and clays. Permissible settlements for different structures. Allowable bearing pressure. Bearing capacity from field tests- based on Standard Penetration Test, based on Cone Penetration Test, Based on Plate Load Test. Numerical Problems

**MODULE 5: Deep Foundation**

**(6 hours)**

Types of piles. Method of installation. Point resistance and skin friction. Load carrying capacity of piles - dynamic formulae, static formulae, pile load test. Group action in piles – efficiency, Under-reamed pile. Negative skin friction. Pullout resistance of piles. Numerical problems

**MODULE 6: Well Foundation**

**(2 hours)**

Types of wells and Caissons. Necessity, different components. Depth and bearing capacity calculations. Forces acting. Well sinking. Control of shifts and tilts

**Textbooks/Reference Books:**

1. Soil Mechanics and Foundation Engineering- P. Purushothama Raj, Pearson Education in South Asia, Second Edition, (2018)
2. Geotechnical Engineering – Debasish Moitra, Universities Press; First Edition edition (2016)
3. Geotechnical Engineering – Shashi K Gulati & Manoj Dutta, McGraw Hill Education (16 May 2005)
4. Basic and Applied Soil Mechanics- Gopal Ranjan & A.S. Rao (1991), Wiley Eastern Ltd., New Delhi
5. Soil Mechanics and Foundation: Dr. B. C. Punmia, Laxmi Publications; Sixteenth edition (2017), Language: English, ISBN-10: 8170087910, ISBN-13: 978-8170087915
6. Soil Engineering in Theory and Practice (Part I & Part II): Dr. Alam Singh, CBS; 2 edition (1 December 2009)
7. Foundation Analysis and Design: Joseph E. Bowles, McGraw-Hill, 1977

Course Code	Course Title	Hours per week L-T-P	Credit C
HS181606	Accountancy	2-0-0	2

**MODULE 1:**

Concept and classification of Accounts, Transaction, Double Entry system of Book Keeping, Golden rules of Debit and Credit, Journal- Definition, advantages, Procedure of Journalising, Ledger, advantages, rules regarding Posting, Balancing of Ledger accounts, Trial Balance- Definition, objectives, procedure of preparation.

**MODULE 2:**

Name of Subsidiary Books, Cash Book-definition, advantages, objectives, types of Cash Book, preparation of different types of cash books, Bank Reconciliation Statement, Regions of disagreement between Cash Book with Pass Book balance, preparation of Bank Reconciliation Statement

**MODULE 3:**

Final Account: Preparation of Trading Account, Profit and Loss Account with adjustments.

**MODULE 4:**

Concept of Capital Expenditure and revenue Expenditure, Baddebts, Provision for Bad and Doubtful debts, Provision for discount on Debtors, Outstanding expenses, Prepaid expenses, Accrued Income

**MODULE5:**

Introduction to Depreciation Accounting- Meaning, causes, factors, methods of charging depreciation etc.

**Textbooks/Reference Books:**

1. Theory and Practice of accountance- KR Das, KM Sinha, KS Pal Choudhury, Dr. A Rahman, PK Pujary
2. Book- Keeping & Accountancy- C Mohan Juneja, J R C Chawla, KK Sakseena
3. Double Entry Book- Keeping & Accountancy- JR Batliboi

\*\*\*\*\*