ASSAM SCIENCE AND TECHNOLOGY UNIVERSITY
Kahilipara, Guwahati - 19

SYLLABUS

6th Semester, B Tech

Civil Engineering

6th Semester B.Tech (CIVIL ENGINEERING)

Sl. No.	Sub Code	Subject	L	T	P	Credit
		Theory				
1	CE131601	Structural Analysis- III	3	2	0	4
2	CE131602	Design of Structure- II	3	2	0	4
3	CE131603	Geotechnical Engineering-I	3	2	0	4
4	CE131604	Transportation Engineering – II	3	2	0	4
5	CE131605	Environmental Engineering I	3	2	0	4
		Practical				
7	CE131612	Design of Structure- II Lab	0	0	2	1
8	CE131613	Geotechnical Engineering-I Lab	0	0	4	2
9	CE131614	Transportation Engineering – II Lab	0	0	2	1
10	CE131615	Environmental Engineering I Lab	0	0	2	1
Total			15	10	10	25
Total Contact Hours = 35						
Total Credits = 25						

STRUCTURAL ANALYSIS- III (CE131601)

L-T-P= 3-2-0   **Credit=4**

Expected Weeks=12

Module	Topics	Hours
1	**Introduction to Flexibility Method of Matrix Analysis:** Introduction to flexibility method, Element flexibility matrix, Principle of contragradience, Force Transformation Matrix, Member Flexibility matrix, Construction of structure flexibility matrix. Matrix determination of the displacement vector, Determination of member forces.	6
2	**Analysis of Beams and Frames using Flexibility Method** Analysis of axially rigid continuous beams by flexibility method using Force Transformation Matrix, Analysis of rigid plane frames with axially rigid members by flexibility method using Force Transformation Matrix.	6
3	**Introduction to Stiffness Method of Matrix Analysis** Fundamentals of the stiffness method, equivalent joint loads, Displacement and Transformation matrix. Member stiffness matrix, Total or System stiffness matrix.	5
4	**Analysis of Beams and Frames using Stiffness Method** Continuous Beam and rigid frame analysis with axially rigid members by stiffness method using Displacement Transformation Matrix.	8
5	**Structural Dynamics** Elements of structural dynamics, free and forced vibration of single degree of freedom system, un-damped and damped system. Response of harmonic and periodic loading. Multi degree of freedom system-concept of shear building and modal analysis of structures. Ductility of structures, long & short period structures, concept of response spectrum.	10
6	**Introduction to Finite Element Method**.	5
	Total Hours	40

Recommended Books:

• Basic Structural Analysis Reddy, C. S. Tata McGraw Hill
• Structural Analysis, Thandavamoorthy.T.S. Oxford Higher Education
• Indeterminate Structural Analysis Kinney, J.S. McGraw Hill Book Company
• Matrix Analysis of framed Structures Weaver, W. CBS Publishers
• Finite Element Analysis Krishnamurthy, C. S. Tata Mc-Graw Hill
• Dynamics of Structurs A. K. Chopra

DESIGN OF STRUCTURE- II (CE131602)

L-T-P= 3-2-0   **Credit=4**

Expected Weeks=12

Module	Topics	Hours
1	**Introduction** Properties of structural steel, I.S. Rolled Sections, I.S. Specifications.	2
2	**Design Approach** Factor of safety, permissible and working stresses, elastic method, plastic method, introduction to limit states of design.	3
3	**Connections** Riveted, bolted and welded connections, strength & efficiency and design of joints, Introduction to high strength friction grip bolts.	4
4	**Tension Members** Design of tension members.	6
5	**Compression members** Strut and column, built-up column, column with lacings and batten. Column splices.	6
6	**Beams** Stability of flange and web, built-up sections, plate girders including stiffeners, connections and curtailment of flange plates. Design of web Splice.	6
7	**Beam-column connection.** Stability considerations, Interaction formulae	6
8	**Column bases** Slab base, Gusseted base and Grillage footing.	4
9	**Flexural members: Beams:** Role of plate buckling, Classification of section: plastic, compact, semi-compact, slender, Design strength of laterally supported beams, Shear buckling strength- Post-critical method, Shear-moment interaction, Design strength of laterally unsupported beams, Lateral torsional buckling, Effect of restraints and effective length.	6
10	**Design of Roof Trusses** Roof Truss Design (Forces in the members to be given)	5
	Total Hours	48

Design of Structure- II Lab (CE 131612)

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

Expected Weeks=12

• Compressive, Flexural and tensile strength of Mortar.
• Initial drying shrinkage, moisture movement, and coefficient of expansion of concrete.
• Stress strain curve of concrete.
• Behaviour of under reinforced and over reinforced R.C. beams in flexure.
• Behaviour of R.C. beams, with and without shear reinforcement in shear.
• Bond strength between steel bar and concrete (a) in a beam specimen and (b) by pull-out test.
• Validation of experimental results through commercially package softwares.
• Non-destructive testing of concrete.
• **Drawings to be prepared for the following**
• Layout Drawing: General Layout of building showing position of columns, footings, beams and slabs with notifications, and slabs with notations
• Continuous Beams, Beam and Slab Floor System
• Dog legged Staircases
• Column Footings, Rectangular and Square

Recommended Books:

• Design of Steel Structures, Ramchandra, Standard book House Vol –I, II Delhi
• Steel Structures Design & Practice, Subramanian.N, Oxford University Press
• Design of Steel Structures, L.S.Negi, Tata Mc Graw Hill
• Design of steel structures, A .S Arya &Nemchand&Brothers

GEOTECHNICAL ENGINEERING-I(CE131603)

L-T-P= 3-2-0   **Credit=4**

Expected Weeks=12

Module No	Topic	Hours
1	**Soil:** Origin, Types of soils **Index properties of soil**: Soil as a three phase system, index properties and their relationships, grain size distribution, Atterberg limits, consistency, sensitivity &thixotropy, Indian Standard Soil Classification System.	5
2	**Soil Water Relationship:** Effective stress principle, capillary water – surface tension and capillary rise.	2
3	**Permeability of soil**: Darcy's law and its validity, discharge velocity and seepage velocity, Constant head and Falling head Permeability tests, permeability of stratified soil deposits, factors affecting permeability. **Seepage Analysis**: Laplace equation, velocity potential and stream function, flownet –its graphical construction and applications, seepage pressure, quick condition, seepage through homogeneous earth dam with and without filters.	7
4	**Compaction of soils :** Standard and modified proctor tests, optimum moisture content, maximum dry density and zero air void line, field compaction methods, factors affecting compaction, effect of compaction on soil.	4.5
5	**Consolidation of soils** : Spring Analogy, Pressure-voids ratio curves, coefficients of compressibility and volume change, consolidation settlement, determination of pre-consolidation pressure, Terzaghi's theory of one-dimensional consolidation, laboratory consolidation test, 'height of solids' method and 'change in voids ratio' method, determination of coefficient of consolidation by 'square root of time fitting' method and 'logarithm of time fitting' method, Introduction to Secondary Consolidation.	9
6	**Shear strength of soils**: Mohr's stress circle, Mohr-coulomb failure theory, direct shear test, triaxial test, unconfined compression test, vane shear test, Skempton's pore pressure parameters, shear strength of clay soils – UU, CU and CD, shear strength of sands, soil liquefaction.	6
7	**Slope stability analysis**: Stability analysis of finite and infinite slopes, factor of safety, Total stress and Effective Stress Methods of Analysis, Swedish slip circle method, Friction circle method, Taylor's stability number & curves.	6

8	**Pedogenesis:** Introduction, Causes	0.5
	Total	**40**

Books for references:

1) Basic and applied soil mechanics - Gopal Ranjan& A.S.R Rao
2) Soil Mechanics and Foundation - Dr. B.C Punmia, Ashok Kumar Jain, Arun Kumar Jain

Geotechnical Engineering-I Lab (CE 131613)

LABORATORY WORK: -
L-T-P= 0-0-4   **Credit=2**
Expected Weeks=12

Module No	Topic	Hours
1	Sieve analysis, Sedimentation analysis.	3
2	Dry Density by core cutter method and sand replacement method.	4
3	Moisture content by oven dry method and rapid moisture meter method.	0.5
4	Liquid Limit test by Cone Penetrometer, and by Casagrande apparatus. Plastic limit, Shrinkage limit.	6
5	Triaxial test.	5
6	Direct shear test.	3
7	Vane shear test, Unconfined compression test.	1.5
8	Compaction test.	2
9	Permeability test (Falling Head and Constant Head).	3
10	Consolidation test	9
	Total	**37**

Transportation Engineering – II(CE131604)

L-T-P= 3-2-0   **Credit=4**

Expected Weeks=12

Module No	Topic	Hours
	Railway Engineering	
1	**Railway Track:** Definition, cross-section of permanent way, requirements of an ideal permanent way, track capacity, railway gauges and gauge problem, stresses in the railway track, coning of wheel.	2
2	**Track Components:** Rails - Functions, requirements, cross-section, types of rail sections, composition of rail materials, selection of rails, length of rails, hogging and bulking of rail, roaring rails, kinks in rail, wear on rail, Rail joints, fastening & welding of rails, Creep of rails - Indications, creep theory, effects of creep, remedies; Sleeper - Functions, requirements, classification, spacing of sleepers and sleeper density; Ballast - Functions, requirements of good ballast, ballast material, size and selection of ballast, quantity and renewal of ballast; Definition – subgrade, embankment, cutting, level, formation. Choice of material for subgrade and slopes of embankment.	5
3	**Geometric Design:** Gradients, cant and cant deficiency, negative cant, widening of gauge on curves, transition curve.	3
4	**Points & Crossings:** Necessity, Design of turnouts, Crossings – component parts, types, description of track junctions.	2
5	**Stations & Yards:** Types of railway station, platform, loops, sidings. Yards – details of different types of railway yards and their functions, level crossing (Introduction).	2
6	**Signaling & Interlocking:** Requirements and principles of signaling, classification of signaling, CTC & ATC system. Interlocking of signals and points.	3
7	**Construction & maintenance of railway track:** Methods of construction, material requirements, maintenance of tracks, waste management.	2

8	**Rapid Transit System:** Types, Advantages, Disadvantages.	1
	Airport Engineering	
9	**Introduction:** Airport terminology, component parts of aeroplane, aircraft characteristics, classification.	1
10	**Airport Survey & Planning:** Objectives, types of survey; Planning - topographical and geographical features, air traffic characteristics, and development of new airports, Factors affecting site selection, airport obstructions, zoning laws.	2
11	**Airport Layout:** Runway Design- Runway orientation, wind rose diagram, basic runway length, corrections of runway length & problems, geometric design of runway, airport capacity, runway configuration, Taxiway Design- geometric design, exit taxiways, holding aprons.	4
12	**Terminal Area & Airport Layout:** Terminal building, Terminal area, planning of terminal building, Apron: size of the gate position, number of gate position, aircraft parking system; Hanger: general planning considerations, blast considerations, typical airport layouts.	4
13	**Airport pavement Design:** Objectives, design factors, design of flexible and rigid pavements, LCN method of pavement design.	2.5
14	**Airport Marking & Lighting:** Marking and lighting of runways, taxiways and approach areas.	0.5
15	**Airport Drainage:** Requirement of airport drainage, design data, surface drainage design, subsurface drainage design.	0.5
16	**Air Traffic Control:** Air traffic control aids - En route aids and landing aids.	0.5
	Water Transportation	
17	**Harbours** - selection of site, entrance and channel requirement, ship characteristics and their influence on ports management and operations, harbour maintenance. **Harbour layout**: harbour works, break waters, jetties, wharves, piers, berthing facilities, types and construction, dolphins. Navigational aids: buoys & lighthouses. Port facilities - docks, transit sheds and warehouses, general layout, containers and container yard, layout and handling equipment.	4

	Tunneling	
18	Introduction, Precautions in Construction	**1**
	Total	**40**

Transportation Engineering – II Lab: - (CE 131614)

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

Expected Weeks=12

Module No	Topic	Hours
1	Penetration test, Ductility determination	3
2	Viscosity determination	2
3	Softening Point determination, Flash and fire point determination	3
4	Stripping Value determination	3
5	Marshal Stability test	9
	Total	20

REFERENCES:-

1. **Railway Engineering** – Saxena& Arora.
2. **Railway Engineering** - Chandra & Agarwal.
3. **Airport Engineering** – Rangawala.

ENVIRONMENTAL ENGINEERING I (CE131605)

L-T-P= 3-2-0   **Credit=4**

Expected Weeks=12

Module	Topics	Hours
1	Water Supply systems, Need for planned water supply schemes,Sources of Water, Water demand and Potable, industrial and agricultural waterrequirements, Population forecast,Components of water supply system; Transmission of water, Distribution system, Various valves used in W/S systems, service reservoirs and design.	10
2	Importance of environmental sanitation. Quality of water: Wholesomeness and palatability; physical, chemical, bacteriological standards. Treatment of water; impurities in water-processes for their removal – typical flow-sheets.Sedimentation: Design,tube settlers. Coagulation and flocculation: mechanisms, common coagulants, rapid mixing and flocculating devices, Jar test, coagulant aids	9
3	Filtration: classification, basic design consideration, pressure filters: construction and operation. Water softening: lime soda and Base Exchange methods, principle,design considerations, sludge disposal. Miscellaneous treatments: removal of iron and manganese, taste, odour and colour, principles and methods; de-fluoridation, reverse osmosis.	9
4	Disinfection: chlorination, chemistry, kinetics, chlorine demand, free and combined chlorine, break point chlorination, super chlorination,de-chlorination, chlorine residual, use of iodine, ozone, ultraviolet rays and chlorine dioxide as disinfectants, well water disinfection. Introduction to advanced treatment methods	9
5	Government authorities and their roles in water supply, sewerage disposal. Solid waste management and monitoring/control of environmental pollution.	3

Environmental Engineering I Lab (CE 131615)

L-T-P= 0-0-2   **Credit=1**
Expected Weeks=12

• Alkalinity
• Hardness
• pH
• Turbidity
• Chlorides
• Solids: suspended solids, dissolved solids, total solids, volatile solidsiri

Recommended Books:

• Water Supply Engineering., Dr.B.C.Punmia,,Ashok Kumar Jain,Arun Kumar Jain; Laxmi Publications (P) Ltd.
• Introduction to Environmental Engineering, Vesilind, PWS Publishing Company 2000
• Water Supply and Sewerage, E.W. Steel
• Environmental Engineering by H.S.Peavy, D.R. Rowe, G.Tchobanoglous; 1991, Tata-Mcgraw Hill