

**Syllabus For**  
**Affiliated Engineering College**  
**Department of Civil Engineering**

Faculty of Engineering and Technology  
**University of Dhaka**

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## Semester -1

Sl No.	Course Number	Course Name	Hours/Week		Credit
			Theory	Practical/ Sessional	
1	PHY 101	Physical optics, Heat, Waves and Oscillation	3	-	3
2	PHY 102	Physics Sessional	-	3	1.5
3	Chem 101	Chemistry-I	3	-	3
4	Chem 102	Inorganic Quantitative Analysis	-	3	1.5
5	Math 101	Differential and Integral Calculus	3	-	3
6	Hum 101	English	2	-	2
7	Hum 102	Developing English Language Skills	-	3	0.75
8	CE 101	Civil Engineering Drawing -I	-	3	1.5
9	CE 102	Engineering Mechanics	4	-	4
<b>Subtotal=</b>			<b>15</b>	<b>12</b>	<b>20.25</b>

## Semester -2

Sl No.	Course Number	Course Name	Hours/Week		Credit
			Theory	Practical/ Sessional	
1	PHY 201	Structure of Matter, Electricity and Magnetism and Modern Physics	3	-	3
2	Chem 201	Chemistry- II	3	-	3
3	Hum 201	Sociology and Government	4	-	4
4	Math 201	Differential Equation and Statistics	3	-	3
5	CE 201	Civil Engineering Drawing –II	-	3	1.5
6	CE 202	Surveying	4	-	4
7	CE 203	Practical Surveying	-	3	1.5
9	EEE 201	Basic Electricity Sessional	-	3	0.75
<b>Subtotal=</b>			<b>16</b>	<b>9</b>	<b>20.75</b>

## Semester -3

Sl No.	Course Number	Course Name	Hours/Week		Credit
			Theory	Practical/ Sessional	
1	Hum 301	Engineering Economics	2	-	2
2	Math 301	Matrix, Vectors and Laplace Transform	3	-	3
3	CE 301	Engineering Materials	4	-	4
4	CE 302	Details of Constructions	-	3	1.5
5	CE 303	Engineering Geology and Geomorphology	3	-	3
6	CE 304	Materials Sessional	-	3	1.5
7	CE 305	Mechanics of Solids- I	3	-	3
8	CE 306	Structural Mechanics and Materials Sessional	-	3	1.5
10	Shop 301	Workshop (Carpentry shop, Machine shop and Welding shop) sessional	-	3	1.5
<b>Subtotal=</b>			<b>15</b>	<b>9</b>	<b>21.0</b>

## Semester -4

Sl No.	Course Number	Course Name	Hours/Week		Credit
			Theory	Practical/ Sessional	
1	Math 401	3-D Co-ordinate Geometry, Fourier Analysis, and Harmonic Functions	3	-	3
2	Hum 401	Principles of Accounting	2	-	2
3	CE 401	Numerical Methods and Basic Computer Programming	3	-	3
4	CE 402*	Mechanics of Solids- II	4	-	4
5	CE 403	Quantity Surveying	-	3	1.5
6	CE 404	Fluid Mechanics	4	-	4
7	CE 405	Fluid Mechanics Sessional	-	3	1.5
8	CSE 401	Computer Programming Sessional	-	3	1.5
<b>Subtotal=</b>			<b>14</b>	<b>11</b>	<b>20.5</b>

## Semester -5

Sl No.	Course Number	Course Name	Hours/Week		Credit
			Theory	Practical/ Sessional	
1	CE 501	Structural Analysis and Design- I	3	-	3
2	CE 502	Structural Analysis and Design Sessional- I	-	3	1.5
3	CE 503	Design of Concrete Structures- I	3	-	3
4	CE 504	Environmental Engineering-I	3	-	3
5	CE 505	Principles of Soil Mechanics	3	-	3
6	CE 506	Geotechnical Engineering Sessional-I	-	3	1.5
7	CE 507	Open Channel Flow	4	-	4
8	CE 508	Open Channel Flow Sessional	-	3	1.5
<b>Subtotal=</b>			<b>17</b>	<b>9</b>	<b>20.5</b>

## Semester -6

Sl No.	Course Number	Course Name	Hours/Week		Credit
			Theory	Practical/ Sessional	
1	CE 601	Structural Analysis and Design-II	3	-	3
2	CE 602	Design of Concrete Structures- II	4	-	4
3	CE 603	Concrete Structures Sessional	-	3	1.5
4	CE 604	Principles of Foundation Engineering	3	-	3
5	CE 605	Transportation Engineering- I: Transport & Traffic Design	3	-	3
6	CE 606	Transportation Engineering Sessional I	-	3	1.5
7	CE 607	Hydrology	3	-	3
8	CE 608	Environmental Engineering Sessional	-	3	1.5
<b>Subtotal=</b>			<b>17</b>	<b>9</b>	<b>20.5</b>

## Semester -7

Sl No.	Course Number	Course Name	Hours/Week		Credit
			Theory	Practical/ Sessional	
1	CE 700**	Project and Thesis	-	3	1.5
2	CE 701	Environmental Engineering- II	3	-	3
3	CE 702	Transportation Engineering- II: Highway Design & Railways	3	-	3
4	CE 703	Project Planning and Management	3	-	3
5	CE 704	Structural Analysis and Design-III	4	-	4
6	CE 705	Structural Analysis and Design Sessional II	-	3	1.5
7	CE 706	Irrigation and Flood Control	3	-	3
<b>Subtotal=</b>			<b>17</b>	<b>6</b>	<b>19.0</b>

## Semester -8

Sl No.	Course Number	Course Name	Hours/Week		Credit
			Theory	Practical/ Sessional	
1	CE 700	Project and Thesis	3	-	3
2	CE 801	Professional Practice and Communication	2	-	2
3	CE 802	Socio-Economic Aspects of Development Projects	-	3	1.5
4	CE 803	Theory of Elasticity and Elastic Instability of Structures	Structure Group 2+2	-	4
5	CE 804	Pre-stressed Concrete			
6	CE 805	Design of Steel Structures			
7	CE 806	Introduction to Finite Element Method			
8	CE 807	Dynamics of Structures			
9	CE 808	Structural Analysis and Design Sessional	-	3	1.5
10	CE 809	Solid Hazardous Waste Management	Environmental Group 2+2	-	4
11	CE 810	Environmental Pollution Management			
12	CE 811	Sustainable Environmental Management			
13	CE 812	Design of Water Supply, Sanitation and Sewerage Systems Sessional	-	3	1.5
14	CE 813	Earth Retaining Structures	Geotechnical Group 2+2	-	4
15	CE 814	Elementary Soil Dynamics			
16	CE 815	Soil-Water Interaction			
17	CE 816	Geotechnical Engineering Sessional	-	3	1.5
18	CE 817	Transportation Engineering- III: Traffic Engineering Design and Management	Transport Group 2+2	-	4
19	CE 818	Transportation Engineering -IV: Pavement Management, Drainage and Airport			
20	CE 819	Transportation Engineering-V : Urban Transportation Planning and Management			
21	CE 820	Transportation Engineering Sessional- II: Pavement Design and Traffic Studies	-	3	1.5
			<b>Subtotal=</b>	<b>17.5</b>	

**Grand Total=(20.25+20.75+21.0+20.5+20.5+20.5+19.0+17.5)=160.00**

## Summary of Course Requirement for B.Sc. Engg. (Civil) Degree

	Courses	Requirements	Total credits to be offered	Remarks
A	Basic Science	15	15	
B	Mathematics	12	(12)	
C	Humanities	10.75	(10.75)	
D	Basic Engineering	42.25	(42.25)	
E	Civil Engineering Practice	9	(9)	
F	Structural Engineering	21.5	(26)	
G	Environmental Engineering	7.5	(13)	
H	Geotechnical Engineering	7.5	(13)	
I	Transportation Engineering	7.5	(13)	
J	Water Resource Engineering	11.5	(17)	
	Total	144.5		
Project and Thesis		4.5		
Optional Courses**				
Theory		8	(16)	
Sessional		3	(6)	
Grand Total		160		

## **Detail Outline of Undergraduate Courses**

### **CE 101: Civil Engineering Drawing-I**

1.50 credits, 3 hrs/week.

Introduction - Lines and lettering, ; Plane geometry: drawing of linear and curved geometric figures, e.g. pentagon, hexagon, octagon, ellipse, parabola, hyperbola. Solid geometry: Projections of cube, prism, prism, prism, cone, cylinder; developments, true shapes and sections of cube, pyramid, cone, prism; ; isometric and oblique drawings of cube, pyramid, cone. Plan, elevations and sections of one storied buildings and bridges.

### **CE 102: Engineering Mechanics**

4.00 credit, 4 hrs/week.

Introduction to SI Units, Fundamental concepts, Resultants and Components; coplanar concurrent forces; moments and parallel coplanar forces; non-concurrent non-parallel coplanar forces; non-coplanar forces; centroids; moment of inertia of areas; moment of inertia of masses. Friction; flexible cords; plane motion; force systems that produce rectilinear motion, work, kinetic energy; power, impulse and momentum.

### **CE 201 : Civil Engineering Drawing –II (Computer Aided Drawing )**

1.50 credit, 3 hrs/week.

Introduction to computer usage. Introduction to CAD packages and computer aided drafting: drawing editing and dimensioning of simple objects. Plan, elevations and sections of multi-storied buildings; reinforcement details of beams, slabs, stairs etc. Plan and section of septic tank; Detailed drawings of roof trusses; Plans, elevations and sections of culverts, bridges and other hydraulic structures; Building services drawings.

### **CE 202 : Surveying**

4.00 credit, 4 hrs/week.

Reconnaissance survey; linear measurements; traverse survey; levelling and contouring; calculation of areas and volumes; problems on heights and distances; curves and curve ranging, transition curve, vertical curves. Tacheometry: introduction, principles and problems on tacheometry. Astronomical surveying: definition, instruments, astronomical corrections, systems of time. Photogrammetry: introduction of terrestrial photography, aerial photography, reading of photo mosaic, scale; project surveying; errors in surveying; remote sensing; introduction to global positioning system (GPS).

### **CE 203 : Practical Surveying**

1.50 credit, 3 hrs/week.

Linear and angular measurement techniques; traverse surveying; leveling and contouring; curve setting; tacheometry; project surveying; modern surveying equipment and their applications.

### **CE 301 : Engineering Materials**

4.00 credit, 4 hrs/week.

Properties and uses of bricks, efflorescence; cement, cement chemistry, aggregates, cement and lime mortars, concrete, standard tests of bricks, Cement and concrete, salinity problem in concrete, corrosion



and its prevention, paints, varnishes, metallic coating. Design of concrete mixes; atomic structure and bonding; crystal structures, mechanical properties, yielding, fracture, elasticity, plasticity, properties and uses of rubber, timber and plastics. Concrete for special purposes. Ferrocement.

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**CE 302 : Details of Constructions**

1.50 credit, 3 hrs/week.

Foundations; different types of foundations; brick masonry; framed structures and bearing walls; arches and lintels; details of floors and roofs; pointing; plastering and interior finishing; scaffolding, staging; shoring and underpinning; thermal insulation and acoustics; House plumbing.

**CE 303 : Engineering Geology and Geomorphology**

3.00 credit, 3 hrs/week.

Minerals; identification of minerals, common rock forming minerals; physical properties of minerals; mineraloids rocks; types of rocks, cycle of rock change; earthquake and seismic map of Bangladesh. Structural geology; faults; types of faults; fold and fold type; domes; basins; erosional process; quantitative analysis of erosional land forms. Channel development; channel widening; valley shape; stream terraces; alluvial flood plains; deltas and alluvial fans; channel morphology; channel patterns and the river basin; geology and geomorphology of Bangladesh;

**CE 304 : Materials Sessional**

1.50 credit, 3 hrs/week.

General discussion on preparation and properties of concrete. Test for specific gravity. Unit weight, voids and bulking of aggregates; moisture content and absorption of coarse and fine aggregates; normal consistency and initial setting time of cement; direct tensile and compressive strengths of cement mortar; gradation of coarse and fine aggregates; design and testing of a concrete mix.

**CE 305 : Mechanics of Solids I**

3.00 credit, 3 hrs/week.

Fundamental concepts of stress and strain. Mechanical properties of materials; strain energy; stresses and strains in members subjected to tension, compression, shear and temperature changes; bending moment and shear force diagrams of beams and frames; flexural and shearing stresses in beams; shear centre; thin walled pressure containers; rivetted and welded joints.

**CE 306 : Structural Mechanics and Materials Sessional**

1.50 credit, 3 hrs/week.

Tension, direct shear and impact tests of mild steel specimen, compression test of timber specimen, slender column test; static bending test; hardness test of metals; helical spring tests; determination of shear centre; load-deflection behavior of simple beam.

**CE 401 : Numerical Methods and Basic Computer Programming**

3.00 credit, 3 hrs/week.

Basic components of computer system, FORTRAN / C/C++ language, numerical solution of algebraic and transcendental equations, matrices, solution of systems of linear equations, curve-fitting by least squares, finite differences, divided differences, interpolation, computer applications to Civil Engineering problems, numerical differentiation and integration, numerical solution of differential equations.

### **CE 402 : Mechanics of Solids-II**

4.00 credit, 4 hrs/week.

Torsional stresses in shafts and tubes; Compound stresses; Helical springs; Transformation of stresses; deflection of beams by direct integration, moment area, elastic load and conjugate beam methods; buckling of columns.

### **CE 403 : Quantity Surveying**

1.50 credit, 3 hrs/week.

Quantity estimates of items of civil works e.g. building, bridge, truss and highway. Analysis of rates; use of software in quantity surveying; Specifications of materials of construction projects

### **CE 404: Fluid Mechanics**

4.00 Credit, 4 hrs/week.

Development and scope of fluid mechanics. Fluid properties. Fluid statics. Kinematics of fluid flow. Fluid flow concepts and basic equations continuity equation, Bernoulli's equation, energy equation, momentum equation and forces in fluid flow. Similitude and dimensional analysis. Steady incompressible flow in pressure conduits, laminar and turbulent flow, general equation for fluid friction. Empirical equations for pipe flow. Minor losses in pipe flow. Fluid measurement: Pitot tube, orifice, mouthpiece, nozzle, venturimeter, weir. Pipe flow problems pipes in series and parallel, branching pipes, pipe networks.

### **CE-405: Fluid Mechanics Sessional**

1.5 Credit, 3 hrs/week.

Centre of pressure. Proof of Bernoulli's theorem. Flow through Venturimeter. Flow through orifice. Coefficient of velocity by coordinate method. Flow through mouthpiece. Flow over V notch. Flow over sharp crested weir. Fluid friction in pipe

### **CSE 401 : Computer Programming Sessional**

1.50 credit, 3 hrs/week.

Programming concepts and algorithms. Number systems; internal representation of data. Elements of structured programming language: data types, operators, expressions, control structures, functions, pointers and arrays, input and output. Concept of Object Oriented Programming (OOP): encapsulation, inheritance, polymorphism and abstraction. Template functions and classes. Development of programs related to Civil Engineering.

### **CE 501 : Structural Analysis and Design-I**

3.00 credit, 3 hrs/week

Stability and determinacy of structures; analysis of statically determinate trusses and arches; influence lines; moving loads on beams, frames and trusses; cables and cable supported structures.

**CE 502 : Structural Analysis and Design Sessional I**

1.50 credit, 3 hrs/week.

Analysis of steel structures e.g. truss, plate girder; design of members and joints of structures; use of software in analysis and design problems.

**CE 503 : Design of Concrete Structures-I**

3.00 credit, 3 hrs/week.

Fundamental behavior of reinforced concrete; introduction to WSD and USD methods; analysis and design of singly reinforced, doubly reinforced and T-beams according to WSD and USD methods; diagonal tension; bond and anchorage according to WSD and USD methods; one way slabs.

**CE 504 : Environmental Engineering- I**

3.00 credit, 3 hrs/week.

Water Supply Engineering: introduction; water demands; water supply sources; ground water exploration: aquifer properties and ground water flow, well hydraulics, water well design, drilling, construction and maintenance; water demand for rural communities; shallow hand tube wells and deep set Tara pumps for problem areas. Surface water collection and transportation; head works; pumps and pumping machineries; water distribution system; analysis and design of distribution network; fire hydrants; water meters; leak detection; unaccounted for water. Water quality requirements; water treatment - plain sedimentation, flocculation and settlement, filtration, disinfection; miscellaneous treatment methods; low cost treatment methods for rural communities.

**CE 505 : Principles of soil Mechanics**

3.00 credit, 3 hrs/week

Introduction to geotechnical engineering; formation, type and identification of soils; soil composition; soil structure and fabric; index properties of soils; engineering classification of soils; soil compaction; principles of total and effective stresses; permeability and seepage; stress-strain-strength characteristics of soils; compressibility and settlement behavior of soils; lateral earth pressure; stress distribution.

**CE 506 : Geotechnical Engineering Sessional-I**

1.50 credit, 3 hrs/week.

Field identification tests; grain size analysis by sieve and hydrometer; specific gravity test; atterberg limits test; permeability tests; unconfined compression test; compaction test; relative density test; direct shear tests; consolidation tests.

**CE 507: Open Channel Flow**

4.00 Credit, 4 hrs/week.

Open channel flow and its classification. Velocity and pressure distributions. Energy equation, specific energy and transition problems. Critical flow and control. Principles of flow measurement and devices. Concept of uniform flow, Chezy and Manning equations, estimation of resistance coefficients and computation of uniform flow. Momentum equation and specific momentum.

Hydraulic jump. Theory and analysis of gradually varied flow. Computation of flow profiles. Design of channels.

**CE 508: Open Channel Flow Sessional**

1.5 Credit, 3 hrs/week.

Broad crested weir. Sluice gate. Venturi flume. Parshall flume. Cut throat flume. Hydraulic jump. Velocity distribution profile. Manning's roughness coefficient. Specific force and specific energy.

**CE 601 : Structural Analysis and Design-II**

3.00 credit, 3 hrs/week.

Wind and earthquake loads; approximate analysis of statically indeterminate structures. e.g. braced trusses, portal frames, mill bent and multi storied building frames; deflection of beams, trusses and frames by virtual work method; space trusses; analysis of statically indeterminate structures by consistent deformation.

**CE 602 : Design of Concrete Structures II**

4.00 credit, 4 hrs/week.

Two-way slabs; columns; footings; retaining walls, reinforced concrete floor and roof systems. Review of codes; yield line method; introduction of prestressed concrete. Analysis and preliminary design of prestressed beam section.

**CE 603 : Concrete Structures Sessional**

1.50 credit, 3 hrs/week.

Analysis and design problems based on CE-503; design of a slab bridge, simple girder bridge and a low-rise building.

**CE 604 : Principles of Foundation engineering**

3.00 credit, 3 hrs/week.

Soil investigation techniques; settlement computation; types of foundations; bearing capacity of shallow and deep foundations; settlement and distortion of foundations; design and construction of footings, rafts and piles; slope stability analyses.

**CE 605 : Transportation Engineering- I: Transport & Traffic Design**

3.00 credit, 3 hrs/week.

Introduction to transportation engineering; development of transportation systems; elements of transportation system; transportation in Bangladesh; modal share; transportation planning concepts: collection, study and analysis of basic data; highway location and surveys; geometric design of highways: elements of design, cross-section elements, curves and sight distances; road intersections; traffic engineering: the road/traffic system, vehicle and traffic characteristics, traffic control devices, traffic studies, parking and roadway lighting; waterways and terminals.

**CE 606 : Transportation Engineering Sessional-I**

1.50 credit, 3 hrs/week.

Tests of bituminous materials, tests on subgrade, sub-base and base materials; bituminous mix design; roadway capacity analysis; application of analytical, simulation and statistical packages.

**CE 607: Hydrology**

3.00 Credit, 3 hrs/week.

Hydrologic cycle. Weather and Hydrology. Precipitation, Evaporation and transpiration. Infiltration. Streamflow. Application of telemetry and remote sensing in hydrologic data acquisition. Rainfall runoff relations. Hydrographs, unit hydrographs. Hydrologic routing. Statistical methods in hydrology.

**CE 608 : Environmental Engineering Sessional**

1.50 credit, 3 hrs/week.

Water and wastewater sampling techniques, sample preservation, physical, chemical and biological tests of water and wastewater; breakpoint chlorinating, alum coagulation, sampling and laboratory analysis of air, sampling and laboratory analysis of solid waste.

**CE 700 : Project and Thesis**

4.50 credit, 9 hrs/week.

Experimental and theoretical investigation of various topics in structural engineering, concrete technology, environmental engineering, transportation engineering and geotechnical engineering. Individual or group study of one or more topics from any of the above fields. The students will be required to submit thesis/project report at the end of the work.

**CE 701 : Environmental Engineering-II**

3.00 credit, 3 hrs/week.

Wastewater Engineering: introduction; water supply, sanitation and health; estimation of wastewater; wastewater collection systems; hydraulics of sewer; design, construction and maintenance of sanitary sewer and storm drainage system; sewer appurtenances; plumbing system. Microbiology of sewage and waste water; wastewater characteristics; preparatory, primary and secondary treatment methods and disposal; treatment and disposal of industrial effluents; sludge treatment and disposal; sanitation for low income communities - on-site sanitation systems for rural communities; low cost small bore sewerage for small townships; design and construction of septic tanks, soak wells and subsurface drain fields; rural sanitation in Bangladesh. Sustainability of water and sanitation services; participatory development approach in water and sanitation sector; community management of water and sanitation services; introduction to environment, environmental pollution; environment protection and management.

**CE 702 : Transportation Engineering Engineering II: Highway Design & Railways**

3.00 credit, 3 hrs/week.

Highway materials; subgrade, subbase and base courses; soil stabilization and soil aggregates in road constructions; low-cost roads; production, properties and uses of bituminous materials and mix design methods; design, construction and maintenance of flexible and rigid road pavements; equipments;

railways: general requirements, alignment, permanent way, station and yards, signalling, points and crossings, maintenance.

### **CE 703 : Project Planning and Management**

3.00 credit, 3 hrs/week.

Principles of management; principles of construction management; construction contracts and specifications; inspection and quality control; construction safety; construction planning and scheduling: PERT, CPM, case studies, resource scheduling; PERT: a cost accounting system, linear programming. Psychology in administration; materials management; demand forecasting; inventory control; stores management; procurement. Project planning and evaluation; feasibility reports, cash flow, pay back period, internal rate of return. Benefit-cost ratio, construction equipments and plants. Replacement studies.

### **CE 704: Structural Analysis and Design-III**

4.00 credit, 4 hrs/week.

Analysis of statically indeterminate structures by displacement method; slope deflection, moment distribution, stiffness matrix; member stiffness; stiffness transformations; assembly of stiffness matrices and solution for beams, frames and trusses. Flexibility matrix. Influence lines for statically indeterminate beams, frames, arches and grids. Structural forms and their applications.

### **CE 705: Structural Analysis and Design Sessional-II**

1.50 Credit, 3 hrs/week.

Design of various reinforced concrete structures, e.g. cantilever bridge and multistoried building.

### **CE 706: Irrigation and Flood Control**

3.00 Credit, 3 hrs/week.

Importance of irrigation. Sources and quality of irrigation water. Soil water relationship. Consumptive use and estimation of irrigation water requirements. Methods of irrigation. Design of irrigation canal system. Irrigation structures. Irrigation pumps. Problems of irrigated land. Flood and its control.

### **CE 801 : Professional Practices and Communication**

2.00 credit, 2 hrs/week.

The project cycle; project proposal; contractual provisions; techniques of specification writing; evaluation of bids; project evaluation. Interpretation of literature, documents etc.; communicating; preparation of report; industrial and labour relations; professional ethics in Civil Engineering.

**CE 802 : Socio-Economic Aspects of Development Projects**

1.50 credit, 3 hrs/week.

Economic and social structure; development and economic growth; socio-economic indicators; population, prosperity and poverty; employment of workforce; population displacement; rehabilitation strategy; productivity, land loss, land use and land ownership patterns; fisheries and aquaculture; deforestation and afforestation; communication, commerce, industries and other economic benefits; water supply, sanitation, health and nutrition; inequalities in distribution of benefits and losses; socio-economic survey; case studies.

**CE 803 : Theory of Elasticity and Elastic Instability of Structures**

2.00 credit, 2 hrs/week.

Introduction to theory of elasticity; plane stress and plane strain conditions; Two-dimensional problems in rectangular and polar coordinates; torsion of circular and noncircular shafts; instability of structures; stability functions.

**CE 804: Prestressed Concrete**

2.00 credit, 2 hrs/week.

Prestressed concretes: materials; prestressing systems; loss of prestress; analysis of sections for flexure, shear, bond and bearing; beam deflections and cable layout; partial prestress. Design of prestressed sections for flexure, shear, bond and bearing.

**CE 805: Design of Steel Structures**

2.00 credit, 2 hrs/week.

Behaviour of structural steel members and steel frames; code requirements; design of tension and compression members by WSD and LFD methods; design of beam, beam-columns; Joint design.

**CE 806: Introduction to Finite Element Method**

2.00 credit, 2 hrs/week.

Introduction to finite element method as applied to Civil Engineering problems. One dimensional stress deformation and time dependent flow problem. Two dimensional plane stress and plane strain analysis of stress deformation problems.

**CE 807 : Dynamics of Structures**

2.00 credit, 2 hrs/week.

Formulation of equation of motion; free vibration response; SDOF and MDOF systems; response to harmonic and impulse loading and vibration analysis by Rayleigh's method.

**CE 808: Structural Analysis and Design Sessional-III (Computer Aided Analysis and Design of Structures)**

1.50 credit, 3 hrs/week.

Use of structural analysis and design software; design of various reinforced concrete structures, e.g. building, water tower, folded plate roof.

**CE 809 : Solid Hazardous Waste Management**

2.00 credit, 2 hrs/week.

Solid Waste Management: sources and types of solid wastes; physical and chemical properties of solid wastes; solid wastes generation; on-site handling, storage and processing; collection of solid wastes; transfer stations and transport; ultimate disposal methods; resources and energy recovery; soil pollution. Industrial solid waste collection and disposal; hazardous waste management.

**CE 810 : Environmental Pollution Management**

2.00 credit, 2 hrs/week.

Environment Pollution and Its Control: water pollution - sources and types of pollutants; waste assimilation capacity of streams; dissolved oxygen modelling; ecological balance of streams; industrial pollution; heavy metal contamination; detergent pollution and eutrophication; ground-water pollution ; marine pollution; pollution control measures - water quality monitoring and management. Air pollution - sources and types of pollutants; effects of various pollutants on human health, materials and plants; air pollution meteorology; global warming and greenhouse effects ; air pollution monitoring and control measures.

**CE 811 : Sustainable Environmental Management**

2.00 credit, 2 hrs/week.

Environment and Development Projects: environment and sustainable development; environmental policies and legislation; environmental implication of sectoral development; environmental quality standards; environmental issues and priorities; environmental impact assessment of development schemes - baseline studies, assessment methodologies; economics of environmental management; special topics.

**CE 812 : Design of Water Supply, Sanitation and Sewerage System Sessional**

1.50 credit, 3 hrs/week.

Design of water supply and sewage system; design of water and wastewater treatment plant; computer application in environmental engineering, field visits and reporting.

**CE 813 : Earth Retaining Structure**

2.00 credit, 2 hrs/week.

Foundation for structures subjected to lateral loads; retaining walls and abutments; operation and methods of construction, dewatering and slurry-wall construction. Flexible earth retaining structures, sheet piles, cofferdams, caissons; machine foundations- elementary vibrations, shear modulus and elastic constants, foundation design for vibration, fundamentals of soil liquefaction.



**CE 814 : Elementary Soil Dynamics**

2.00 credit, 2 hrs/week.

Foundation for structures subjected to lateral loads; retaining walls and abutments; operation and methods of construction, dewatering and slurry-wall construction. Flexible earth retaining structures, sheet piles, cofferdams, caissons; machine foundations- elementary vibrations, shear modulus and elastic constants, foundation design for vibration, fundamentals of soil liquefaction.

**CE 815 : Soil-Water Interaction**

2.00 credit, 2 hrs/week.

Introduction to critical state soil mechanics, SHANSEP and stress path methods; Stress deformation and failure of soil masses. One, two and three dimensional consolidation problems; pore pressure coefficients; soil structure-interaction; earthquake and liquefaction problems; soil improvement; numerical solution of geotechnical engineering problems.

**CE 816 : Geotechnical Engineering Sessional-II**

1.50 credit, 3 hrs/week.

Computer aided design of foundations, retaining walls and reinforced soils, slope stability analysis, techniques of soil improvement, use of computer in geotechnical engineering.

**CE 817 : Transportation Engineering III: Traffic Planning & Management**

2.00 credit, 2 hrs/week.

The transportation planning process; traffic management concepts; traffic accident investigations; city road and street networks: grade separation and interchanges, pedestrian and bicycle facilities. The urban bypass; environmental aspects of highway traffic and transportation projects; elements of traffic flow.

**CE 818 : Transportation Engg IV: Pavement Management, Drainage and Airport**

2.00 credit, 2 hrs/week.

Highways drainage and drainage structures. Evaluation and strengthening of pavements; importance, advantages and trends in air transportation; planning and design of airports; aircraft characteristics related to airport design; types and elements of airport planning studies; airport configuration; geometric design of the landing area; Terminal area; heliports; design of airport pavements; lighting, marking and signing; Airport drainage.

**CE 819 : Transportation Engg V: Urban Transportation Planning and Management**

2.00 credit, 2 hrs/week.

Highway needs study; highway planning, economics and financing; evaluation and analysis of transportation projects. management, monitoring; organization and implementation of transportation projects; selected case studies; traffic engineering administration and legislation; urban public transportation and freight movement.

**CE 820 : Transportation Engineering Sessional II: Pavement Design and Traffic Studies**

1.50 credit, 3 hrs/week.

Design of rigid and flexible highway and air field pavements; geometric design: road intersections and interchanges; capacity calculations; traffic studies and design.

### **Phy 101: Physical optics, Heat, Waves and oscillation**

3.00 Credit, 3 hrs/week.

**Physical Optics:** theories of light: Huygen's principle and construction. Interference of light: Young's double slit experiment, Fresnel bi-prism, Newton's rings, interferometers. Diffraction of light: Fresnel and Fraunhofer diffraction, diffraction by single slit, diffraction by double slit, diffraction gratings, polarization, production and analysis of polarized light, optical activity, optics of crystals.

**Heat and Thermodynamics:** Temperature, zeroth law of thermodynamics. Thermometers: constant volume, platinum resistance, thermocouple. First law of thermodynamics and its application, molar specific heats of gases, isothermal and adiabatic relations, work done by a gas. Kinetic theory of gases: explanation of gas laws, kinetic interpretation of temperature, equipartition of energy and calculation of ratio of specific heats, mean free path, Vander Waals equation of state, second law of thermodynamics: reversible and irreversible processes, Carnot cycle, efficiency, Carnot's theorem, entropy.

**Waves and Oscillations. oscillations:** Simple harmonic motion, damped simple harmonic oscillations, forced oscillations, resonance, vibrations of membranes and columns. Combination and composition of simple harmonic motions, Lissajous' figures. Transverse and longitudinal nature of waves, travelling and standing waves, intensity of a wave, energy calculation of progressive and stationary waves, phase velocity, group velocity. Sound waves: velocity of longitudinal wave in a gaseous medium. Doppler effect. architectural acoustics: Sabine's formula, requisites of a good auditorium.

### **Phy 102: Physics Sessional**

1.50 Credit, 3 hrs/week.

Determination of the specific heat of a liquid by the method of cooling. Determination of the thermal conductivity of a bad conductor by Lee's method. Determination of the pressure co-efficient of air by constant volume air thermometer. Determination of the frequency of a tuning fork by Melde's apparatus.

Determination of the focal length of concave lens by auxiliary lens method. Measurement of unknown resistance and verification of the laws of resistance by P.O. (Post Office ) box. Comparison of the

E.M.F's of two cells by potentiometer. Determination of the mechanical equivalent of heat by electrical method. Determination of the radius of curvature of a plano-convex lens by Newton's ring method. Determination of threshold frequency for the photoelectric effect of a photocathode and the value of the Planck's constant. To plot thermo-electromotive force-temperature (calibration) curve for a given thermocouple. Determination of the melting point of a solid using the calibration curve. Determination of the specific rotation of sugar solution by a polarimeter. Determination of the temperature co-efficient of the resistance of the material of a wire. Determination of the refractive index of the material of a prism using spectrometer. Determination of the spring constant and the effective mass of a loaded spring.

### **Phy 201: Structure of matter, Electricity and magnetism and Modern physics**

3.00 Credit, 3 hrs/week.

**Structure Matter: States of matter:** solid, liquid and gas. Classification of solids: amorphous, crystalline, ceramics and polymers. Atomic arrangement in solids. Different types of bonds in solids: metallic, Vander Waals, covalent and ionic bond, packing in solids, interatomic distances and forces of equilibrium, x-ray diffraction; Bragg's law. Plasticity and elasticity. Distinction between metal, insulator and semi-conductor.

**Electricity and Magnetism:** Electric charge, Coulomb's law. the electric field: calculation of the electric field strength, E; a dipole in an electric field, electric flux and Gauss's law, some application of Gauss's law; electric potential V, relation between E and V, electric potential energy. Capacitors; capacitance, dielectrics: an atomic view, dielectrics and Gauss's law; current and resistance: current and current density, Ohm's law, resistivity: an atomic view, Ampere's law, Faraday's law, Lenz's law, self inductance and mutual inductance.

**Magnetic properties of matter:** magnetomotive force, magnetic field intensity, permeability, susceptibility, classifications of magnetic materials, magnetisation curves. Modern Physics. Michelson Morley's experiment, Galilean transformation, special theory of relativity, Lorentz-transformation, relative velocity, length contraction, time dilation, mass-energy relation. Photo-electric effect, Compton effect, de-Broglie wave, Bohr's atom model. Radioactive decay, half life, mean life, isotopes, nuclear binding energy, alpha, beta, gamma decay.

### **Chem 101 : Chemistry-I**

3.00 Credit, 3 hrs/week.

Atomic structure, periodic table, chemical bonds. Chemistry of cement, silicates and limes. Physical and chemical properties of water. Different types of solutions, concentration units. Chemical equilibria and thermochemistry.

### **Chem 102 : Inorganic Quantitative Analysis (Sessional)**

1.5 Credit, 3 hrs/week.

**Volumetric analysis:** acid-base titration, oxidation-reduction titrations, determination of Fe, Cu and Ca volumetrically.

### **Chem 201 : Chemistry-II**

3.00 Credit Hours, 3 hrs/week.

**Reactions kinetics:** rate of chemical reactions; order and molecularity of reactions, different types of rate expressions, methods of determining rate and order, effect of temperature on reaction rate and energy of activation. **Colloid and colloidal solution:** classification, preparation, purification, properties, protective action and application of colloids. **Chemical corrosion:** introduction to chemical corrosion, corrosion of metals and alloys in dry and wet environments, mechanism of corrosion, atmospheric and soil corrosion and their protective measures. **Chemistry of environmental pollution:** environment and its characteristics, chemistry of toxic metal and non-metal pollutants, analytical techniques used in the determination of pollutants, chemical concept of DO, BOD, COD and threshold odor number, chemistry involved in water treatment plants, quality of industrial waste water.

**Polymers:** chemistry of polymerization, different types of polymers and their properties, polymer degradation, elastomers and composite materials.

**Paints and varnishes:** introduction to paints and varnishes, pretreatment of the surface, metallic, non-metallic and organic protective coating, types of paints and their uses.

### **Math 101: Differential and Integral Calculus**

3.00 Credit, 3 hrs/week.

**Differential Calculus:** Limit, Continuity and differentiability.  $n$ -th derivatives of standard functions. Leibniz's theorem. Rolle's theorem, Mean value theorem. Expansion in finite and infinite forms.

Indeterminate form. Partial differentiation. Euler's theorem. Tangent and Normal. Subtangent and subnormal in partial and polar co-ordinates. Maxima and minima of functions of single variables. Curvature.

**Integral Calculus:** Integration by parts. Standard integrals. Integration by the method of successive reduction. Definite integrals. Improper integrals. Beta function. Gamma function. Multiple integrals. Area, Volume of solids of revolution

### **Math 201: Differential Equation and Statistics**

3.00 Credit, 3 hrs/week.

**Differential Equation:** Definition. Formation of differential equations. Solution of first order differential equations by various methods. Solution of differential equation of first order and higher degrees. Solution of general linear equations of second and higher orders with constant co-efficient. Solution of Euler's homogeneous linear equations. Solution of differential equations in series by the method of Frobenius. Bessel's functions, Legendre's polynomials and their properties.

**Partial Differential Equation:** Introduction. Equations of the linear and non-linear first order. Standard forms. Linear equations of higher order-. Equations of the second order with variable co-efficient.

**Statistics:** Frequency distribution. Mean, median, mode and other measures of central tendency. Standard deviation and other measures of dispersion. Moments, skewness and kurtosis. Elementary probability theory and discontinuous probability distribution, e.g. binomial, poisson and negative binomial. Continuous probability distributions, e.g. normal and exponential. Characteristics of distributions. Elementary sampling theory. Estimation. Hypothesis testing and regression analysis.

### **Math 301: Matrices, Vectors and Laplace Transform**

3.00 Credit, 3 hrs/week.

**Matrices:** Definition of matrix. Algebra of matrices. Multiplication of matrices. Transpose of a matrix and inverse of matrix. Rank and elementary transformation of matrices. Solution of linear equations. Linear dependence and independence of vector. Quadratic forms. Matrix polynomials. Determination of characteristic roots and vectors. Null space and nullity of matrix. Characteristic subspace of matrix.

**Vector Analysis:** Scalars and vectors, equality of vectors. Addition and subtraction of vectors. Multiplication of vectors by scalars. Position vector of a point. Resolution of vectors. Scalar and vector product of two vectors and their geometrical interpretation. Triple products and multiple products. Application to geometry and mechanics. Linear dependence and independence of vectors. Differentiation and integration of vectors together with elementary applications. Definition of line, surface and volume integral. Gradient, divergence and curl of point functions. Various formulae. Gauss's theorem, Stoke's theorem, Green's theorem and their applications.

**Laplace Transforms:** Definition. Laplace transforms of some elementary functions. Sufficient conditions for existence of Laplace transforms. Inverse Laplace transforms. Laplace transforms of derivatives. The unit step function. Periodic function. Some special theorems on Laplace transforms. Partial fraction. Solutions of differential equations by Laplace transforms. Evaluation of improper integral.

### **Math 401 : 3-D Co-ordinate Geometry, Fourier Analysis, Harmonic Functions**

3.00 Credit, 3 hrs/week.

**3-D Co-ordinate Geometry:** System of co-ordinates. Projection. Direction Cosines. Equations of planes and lines. Angle between lines and planes. Distance from a point to a plane. Co-planar lines. Shortest distance between two given straight lines. Standard equation of conicoids; sphere ellipsoid. Hyperboloid of one sheet, hyperboloid of two sheets. Tangent planes. Normal lines. Condition of tangency.

**Fourier Analysis:** Real and complex form. Finite transform. Fourier Integral. Fourier transforms and their uses in solving boundary value problems. Harmonic functions: Definition of harmonics. Laplace equation in cartesian, polar cylindrical and spherical co-ordinates. Solutions of these equations together with applications. Gravitational potential due to a ring. Steady-state temperature. Potential inside or outside of a sphere.

**Properties of harmonic functions.**

### **EEE 201 : Basic Electricity Sessional**

0.75 Credit, 3 hrs/week.

Laboratory Experiments based on Basic Electricity (Electrical units and standards, Electrical network and circuit solution series, parallel and mesh current methods. Instantaneous current, voltage and power, effective current and voltage, average power. Sinusoidal single phase RLC circuits: phasor algebra, balanced three phase circuits. Electrical wiring for residential and commercial loads. Introduction to transformers and induction motors.)

### **Hum 101: English**

2 Credit, 2 hrs/week.

English phonetics: the places and manners of articulation of the English sounds. Vocabulary English grammar: construction of sentences, some grammatical problems. comprehension. Composition on current affairs. Precis writing. Report writing. Commercial correspondence and tenders. Short stories written by some well known classic writers.

### **Hum 102: Developing English Language Skills**

0.75 Credit, 3 hrs/week.

Reading skill: skimming, scanning, predicting, inferring; analysis and interpretation of texts; omprehension from literary and non-literary texts. Writing skill: product approach, process approach: brain storming, self-evaluation, peer evaluation, revision/rewriting, teacher's evaluation; techniques of writing: comparison and contrast, problem and solution, cause and effect, classification, illustration; writing paragraph, essay and report. Listening skill: listening to recorded texts; learning to take useful notes and answering questions. Speaking skill: dialogue in peer work; participation in discussion and debate; extempore speech; narrating events; story telling; presentation.

### **Hum 201: Sociology and Government**

4.00 Credit, 4 hrs/week.

**Sociology:** Scope, some Basic Concepts. Social evolution and techniques of production, culture and civilization. Social structure of Bangladesh. Population and world resources. Oriental and Occidental societies, Industrial revolution. Family urbanization and industrialization, Urban Ecology, Co-operative and Socialist movements. Rural Sociology.

**Government:** Some basic concepts of government and Politics. Functions, organs and forms of modern state and Government; socialism, Fascism, Marxism, U.N.O. Government and politics of Bangladesh. Some major administrative systems of developed countries. Local self-government.

### **Hum 301 : Engineering Economics**

2.00 Credit, 2 hrs/week.

Economics and engineering; microeconomics and macroeconomics; theory of demand and supply and their elasticities; demand estimation; price determination; indifference curve technique; theory of production; theory of cost and cost estimation; market structure; national income accounting, depreciation; circular flow of income and expenditure; cost-benefit analysis; pay back period, NPV, IRR, inflation; economic feasibility of engineering undertakings.

### **Hum 401: Principles of Accounting**

2.00 Credit, 2 hrs/week.

Principles of accounting: accounts, transactions, the accounting procedures and financial statements. Cost in general: objectives and classifications. Overhead costing. Cost sheet under job costing operating costing and process costing. Marginal costing: tools and techniques, cost-volume-profit analysis. Relevant costing: analyzing the profitability within the firm, guidelines for decision making. Long-run planning and control: capital budgeting.

### **Shop 301: Workshop (Carpentry shop, Machine shop and Welding shop) Sessional**

1.50 Credit, 3 hrs/week.

#### **Carpentry shop (3/2 hrs./week)**

Wood working tools; Wood working machine: Band saw, scroll saw, circular saw, jointer, thickness planer, disc sander, wood lathe; Types of sawing; Common cuts in wood works; Types of joint; Defects of timber: Natural defects and artificial defects; Seasoning; Preservation; Substitute of timber; Commercial forms of timber. Characteristics of good timber; Use of fastening; Shop practice: Practical job, planning and estimating of a given job.

#### **Machine shop (3/4 hrs/week)**

Kinds of tools; Common bench and hand tools; Marking and layout tools, measuring tools, cutting tools, machine tools, bench work with job. Drilling, Shaper, Lathe and Milling Machines: Introduction, type, size and capacity, uses and applications.

#### **Welding shop (3/4 hrs/week)**

Methods of metal joints: Riveting, grooving soldering, welding; Types of welding joints and welding practice; Position of arc welding and polarity: Flat, vertical, horizontal, overhead; Electric Arc welding and its machineries; Welding of different types of materials: Low carbon steel, cast iron, brass, copper, stainless steel, aluminium; Types of electrode, fluxes and their composition; Arc welding defects; Test of Arc welding: Visual, destructive and non-destructive tests. Types of gas welding system and gas welding equipment; Gases and types of flame; welding of different types of materials; Gas welding defects; test of gas welding.