<u>B.TECH (CIVIL ENGINEERING)</u>

<u>Batch 2016-20 onwards</u>

SCHEME OF B.TECH CIVIL ENGINEERING

Course code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credit
	Course: B.Tech. **Semester: 3rd**							
		L	T	P	Internal	External		
ACFE-16311	Functional English-I	1	1	-	50	-	50	2
ACAP-16312	Aptitude- I	1	1	-	50	-	50	2
ACCE-16301	Strength of Materials	3	1	-	40	60	100	4
ACCE-16302	Fluid Mechanics	3	1	-	40	60	100	4
ACCE-16303	Survey-I	3	1	-	40	60	100	4
ACCE-16304	Environmental Engineering-I	3	1	-	40	60	100	4
ACCE-16305	Building Materials	3	-	-	40	60	100	3
ACCE-16306	Fluid Mechanics Lab			2	30	20	50	1
ACCE-16307	Strength of Materials Lab			2	30	20	50	1
ACCE-16308	Survey-I Lab			2	30	20	50	1
ACCE-16309	Institutional Training(3rd sem)				60	40	100	2
		17	6	6	450	400	850	28
		Contact Hours= 29 hrs						

Course code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credit
	Course: B.Tech. **Semester: 4th**							
		L	T	P	Internal	External		
ACFE-16411	Functional English-II	1	1	-	50	-	50	2
ACAP-16412	Aptitude- II	1	1	-	50	-	50	2
ACAM-16401	Engineering Mathematics-III	3	1	-	40	60	100	4
ACCE-16401	Survey-II	3	1	-	40	60	100	4
ACCE-16402	Structural Analysis-I	3	1	-	40	60	100	4
ACCE-16403	Design of Concrete Structures-I	3	1	-	40	60	100	4
ACCE-16404	Building Construction	3	-	-	40	60	100	3
ACCE-16405	Building Construction Drawing			2	30	20	50	1
ACCE-16406	Concrete Technology Lab			2	30	20	50	1
ACCE-16407	Survey-II Lab			2	30	20	50	1
GF-400	General Fitness				100			1
		17	6	6	490	360	750	27
		Contact Hours= 29 hrs						

Course code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credit
	Course: B.Tech. **Semester: 5th**							
		L	**T**	**P**	**Internal**	**External**		
ACFE-16511	Functional English-III	1	1	-	50	-	50	2
ACAP-16512	Aptitude- III	1	1	-	50	-	50	2
ACCE-16501	Structural Analysis-II	3	1	-	40	60	100	4
ACCE-16502	Design of Concrete Structures-II	3	1	-	40	60	100	4
ACCE-16503	Transportation Engineering-I	3	1	-	40	60	100	4
ACCE-16504	Professional Practices	3	1	-	40	60	100	4
ACCE-16505	Irrigation Engineering-I	3	-	-	40	60	100	3
ACCE-16506	CADD Lab-I			2	30	20	50	1
ACCE-16507	Transportation Engineering Lab			2	30	20	50	1
ACCE-16508	Structural Analysis Lab			2	30	20	50	1
ACCE-16509	Survey Camp (5thSem)				60	40	100	2
		17	6	6	450	400	850	28
		Contact Hours= 29 hrs						

Course code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credit
	Course: B.Tech. **Semester: 6th**							
		L	**T**	**P**	**Internal**	**External**		
ACFE-16611	Functional English-IV	1	1	-	50	-	50	2
ACAP-16612	Aptitude- IV	1	1	-	50	-	50	2
ACCE-16601	Design of Steel Structures-I	3	1	-	40	60	100	4
ACCE-16602	Soil Mechanics & Foundation Engineering	3	1	-	40	60	100	4
ACCE-16603	Transportation Engineering-II	3	1	-	40	60	100	4
ACCE-16604	Hydrology	3	1	-	40	60	100	4
ACCE-16605	Environmental Engineering-II	3	-	-	40	60	100	3
ACCE-16606	Geotechnical Engineering Lab			2	30	20	50	1
ACCE-16607	Environmental Engineering Lab			2	30	20	50	1
ACCE-16608	Computer Applications Lab			2	30	20	50	1
GF-600	General Fitness				100			1
		17	6	6	490	360	750	27
		Contact Hours= 29 hrs						

	Course: B.Tech. Semester: 7th /8th							
Course code	**Course Name**	**Load Allocation**			**Marks Distribution**		**Total Marks**	**Credit**
		L	**T**	**P**	**Internal**	**External**		
ACCE-16801	Design of Steel Structures-II	3	1	-	40	60	100	4
ACCE-16802	Irrigation Engineering-II	3	1	-	40	60	100	4
ACCE-16XXX	Elective -I	3	-	-	40	60	100	3
ACCE-16XXX	Open Elective	3	-	-	40	60	100	3
ACCE-16803	CADD Lab			2	30	20	50	1
ACCE-16804	Irrigation Engineering Drawing			2	30	20	50	1
ACTP-16701	Pre Placement Activity			2	50	--	50	1
ACCE-16806	Major Project			2	100	100	200	2
GF-800	General Fitness				100		100	1
		12	2	8	470	380	850	20
	Contact Hours= 22 hrs							

	Course: B.Tech. Semester: 7th /8th							
Course code	**Course Name**	**Load Allocation**			**Marks Distribution**		**Total Marks**	**Credit**
		L	**T**	**P**	**Internal**	**External**		
ACCE-16701	Industrial Training				300	200	500	10
ACCE-16702	Software Training				150	100	250	5
					450	300	750	15

List of Electives (7th and 8th Semester)

S.No	Elective Code	Elective Name
1.	ACCE-16807	Prestressed Concrete
2.	ACCE-16808	Earth and Earth Retaining Structures
3.	ACCE-16809	Reinforced Earth and Geotextiles
4.	ACCE-16810	Pavement Design
5.	ACCE-16811	Traffic Engineering
6.	ACCE-16812	Bridge Engineering
7.	ACCE-16813	Advanced Reinforced Concrete Design
8.	ACCE-16815	Numerical Method in Civil Engineering
9.	ACCE-16816	Rock Mechanics and Engineering Geology
10.	ACCE-16817	Elements of Earthquake Engineering

List of Open Electives (7th and 8th Semester)

S.No	Elective Code	Elective Name
1.	ACCE-16814	Disaster Management
2.	ACCE-16818	Infrastructure Development & Management
3.	ACEE-16703	Non-Conventional Energy Sources
4.	ACCS-16712	HAINA(Routing and Switching Technology)
5.	ACCS-16613	Human Resource Management
6.	ACME-16704	Operation Research

3RD SEMESTER

ACCE-16301
STRENGTH OF MATERIALS

		L	T	P
Internal Marks	: 40			
External Marks	: 60	3	1	0
Total Marks	: 100			

Objectives:
a) To determine the stresses, strains, and displacements in structures and their components   due to the loads acting on them.
b) To draw shear force and bending moment diagrams.
c) To help students understand various fundamental issues of elasto-mechanics, i. e. the mechanics of solids, and deformable bodies.
d) To analyse columns under various supporting conditions with the help of Euler theory.
e) To understand various theories regarding failure of any column or beam in building.

Section-I
Simple Stress and Strains: Introduction; Concept of stress and strain; Stress-strain curves for ductile, brittle materials; Generalized Hooke's law, Stress-strain diagram of ductile and brittle material, statically determinate and indeterminate problems, compound and composite bars, thermal stresses. Elastic constants, relations between various elastic constants and its use; Lateral strain, volumetric strain, poisons ratio
Complex stress and strains: Introduction; Normal stress, tangential stress; Rectangular block subjected to normal stress along and across two planes, combination of normal and tangential stress; Concept of principal stress and its computation; Mohr circle; Principal strains, computation of principal stresses from the principal strains.

Section-II
Shear force and Bending moment diagrams: General equilibrium equations , Introduction to the concept of reaction diagrams—shear force and bending moment; Role of sign conventions; Types of load, beams,supports; Shear force and bending moment diagrams: simply supported, overhang and cantileverbeams subjected to any combination of point loads, uniformly distributed and varying load, andmoment; Relationship between load, shear force and bending moment
Bending and Shear Stresses: Introduction; Assumptions and derivation of flexural formula for straight beams; Centroid of simple and built up section, second moment of area; Bending stress calculation for beams of simple and built up section, composite sections (flitched sections); Shear stress; Variation of bending and shear stress along the depth of section.

Section-III
Columns and Struts: Stability of Columns; Buckling load of an axially loaded columns with various end conditions; Euler's and Rankine's formula; Columns under eccentric load, lateral load.
Torsion of Circular shafts: Torsion, basic assumptions, derivation of torsion equation; Sections under combined bending and torsion, equivalent bending and torsion.

Section-IV
Springs: Introduction; Classification; Applications
Failure theories: Maximum principal stress theory, Maximum shear stress theory, Distortion Energy theory, Strain Energy theory

References:
- Strength of Material by S. Ramamrutham
- Mechanics of Materials: E .Popov
- Strength of Materials: Rajput
- Strength of Materials: Sadhu Singh
- Strength of Materials by Gere, Cengage Learning

ACCE-16302
FLUID MECHANICS

				L	T	P
Internal Marks	: 40			**3**	**1**	**0**
External Marks	: 60					
Total Marks	: 100					

Objectives:
  a) To define the nature of a fluid.
  b) To understand the concept of floating and submerged bodies.
  c) To introduce viscosity effects on flow and characteristics of Newtonian and non-Newtonian fluids.
  d) To help students in measuring the flow through various weirs and notches.
  e) To help students in understanding the pressure drag and lift produced around submerged bodies of various shapes

Section-I

Fluid and their properties: Concept of fluid, difference between solids, liquids and gases;
ideal and real fluids, density, specific weight and relative density, viscosity and its dependence on temperature; surface tension and capillarity, vapour pressure and cavitation, Newtonian and non-Newtonian fluids, laminar and turbulent flow.
Fluid Statics: Concept of pressure, Pascal's law and its engineering hydrostatic paradox. Action of fluid pressure on plane (horizontal, vertical) submerged surface, resultant force and center of pressure, force on a curved surface due to hydrostatic pressure. Buoyancy and floatation, stability of floating and submerged bodies, Meta centric height and its determination.

Section-II

Flow Measurement: Manometers, Pitot tubes, venturimeter and orifice meters, orifices, mouth pieces, notches (Rectangular and V-notches) and weirs (Sharp crested Weirs).

Section-III

Fluid Kinematics: Classification of fluid flows, velocity and acceleration of fluid particle, local and convective acceleration, normal & tangential acceleration streamline, pathline and
streakline, flow rate and discharge mean velocity continuity equation in Cartesian co-ordinates.
Rotational flows- Rotational velocity and circulation, stream & velocity potential functions.
Fluid Dynamics: Euler's equation, Bernoulli's equation and steady flow energy equation; representation of energy changes in fluid system, impulse momentum equation.

Section-IV

Laminar: meaning of terms, Flow through circular section pipe, flow between parallel plates, stokes law. Transition from laminar to turbulent, Critical velocity and critical Reynolds Number,
Turbulent:- Turbulent flows, Equation for velocity distribution in smooth and rough pipes (no derivation).
Boundary Layer Analysis: Assumption and concept of boundary layer theory. Boundary-layer thickness, displacement, momentum & energy thickness, Laminar sub-layer, smooth and rough boundaries

References:
  • Fluid Mechanics & Hydraulic Machines : Dr. R.K. Bansal
  • Hydraulic and Fluid Mechanic by P.N.Modi&S.M.Seth
  • Engineering Fluid Mechanics by R.J.Garde&A.G.Mirajgaoker
  • Fluid Mechanics by Douglas JF, Gasiorek JM, Swaffield JP; Pitman

- Fluid Mechanics : Streetes VL & Wylie EB; Mcgraw Hill book company.
- Fluid Mechanics by White
- Introduction to Fluid Mechanics by Robert W.Fox& Alan T.McDonald
- Fluid Mechanics by Potter, Cengage Learning

ACCE-16303
SURVEY-I

			L	T	P
Internal Marks	: 40		**3**	**1**	**0**
External Marks	: 60				
Total Marks	: 100				

Objectives:
  a) To learn principal of working from whole to part.
  b) To help students in deciding the position of any point, its reference relative to least two permanent objects or stations whose position have already been well defined.
  c) To calculate Areas in the field by various methods.
  d) To help students in understanding basic terminology used in surveying
  e) To draw contour maps and find out reduced levels at various points on ground.

Section-I
Introduction: Definition, principles of surveying, different types of surveys, topographical map, scale of map.

Section-II
Chain and Compass Surveying: Measurement of distances with chain and tape, direct & indirect ranging, offsets, bearing and its measurement with prismatic compass, calculation of angles from bearings.
Plane Table Surveying: Setting up the plane table and methods of plane tabling.

Section-III
Levelling& Contouring: Setting up a level, booking and reducing the levels by rise & fall method and height of instrument method, correction due to curvature and refraction, characteristics of contours, methods of contouring, uses of contour maps.
Trigonometric Levelling: Height, distance and RL of inaccessible objects

Section-IV
Computation of Areas: General, Calculation of areas from the plan, Graphical Method, Area by Geometrical figures-by Division into Triangles, by Division into Squares, Areas by application of Formulae. The Trapezoidal Rule, The Simpson's Rule, Examples on the application of various formulae.

References:
  • Duggal, S.K., Surveying Vol I & II, Tata McGraw Hill (2006)
  • Punmia, B.C., Jain, Ashok Kumar and Jain, Arun Kumar, Surveying Vol. I and II, Laxmi Publications (2005)
  • Agor, R., Surveying, Khanna Publishers (1982)
  • Bhavikatti,S.S. Surveying &Levelling Volume I&II (2009)

ACCE-16304

ENVIRONMENTAL ENGINEERING – I

Internal Marks	: 40	**L**	**T**	**P**
External Marks	: 60	3	1	0
Total Marks	: 100			

Objectives:
 a) To impart broad knowledge of ecology and the environment.
 b) Students will be able to emphasize on the Indian natural environment and major issues facing the world.
 c) To assist in collecting water from various sources and supplying for domestic usage after proper treatment.
 d) To know about various quality parameters required to determine the purity of water for drinking purpose.
 e) To forecast the water demand in particular area for proper design of water distribution network.

Section-I
Introduction: Beneficial uses of water, water demand, per capita demand, variations in demand, water demand for fire fighting, population forecasting and water demand estimation.
Water sources and development: Surface and ground water sources; Selection and development of sources; Assessment of potential; Flow measurement in closed pipes, intakes and transmission systems.

Section-II
Pumps and pumping stations: Types of pumps and their characteristics and efficiencies; Pump operating curves and selection of pumps; pumping stations.

Section-III
Quality and Examination of Water: Impurities in water, sampling of water, physical, chemical and bacteriological water quality parameters, drinking water quality standards and criteria.
Water treatment: Water treatment schemes; Basic principles of water treatment; Design of plain sedimentation, coagulation and flocculation, filtration – slow, rapid and pressure; Disinfection units; Fundamentals of water softening, fluoridation and deflouridation, and water desalination and demineralization, taste and odour removal.

Section-IV
Transportation of Water: Pipes for transporting water and their design, water distribution systems and appurtenances; Water supply network design and design of balancing and service reservoirs; operation and maintenance of water supply systems.
Rural water supply: Principles, selection of source, rain water harvesting, quantitative requirements, low cost treatment techniques.

References:-

- Water Supply Engineering- Environmental Engg. (Vol. – I) by B.C. Punmia, Ashok Jain, Arun Jain, Laxmi Publications, New Delhi.
- Environmental Engg. - A design Approach by Arcadio P. Sincero and Gregoria P. Sincero,Prentice Hall of India, New Delhi.

- "Environmental Engg." By Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, McGraw Hill, International Edition
- Water Supply Engineering- Environmental Engg. (Vol. – I) by S.K. Garg, Khanna Publishers, Delhi.
- Water Supply and Sewerage by Steel EW and McGhee, Terence J.; McGraw Hill.

ACCE-16305
BUILDING MATERIALS

				L	T	P
Internal Marks	: 40			**3**	**0**	**0**
External Marks	: 60					
Total Marks	: 100					

Objectives:
a) To promote development, production, standardisation and large-scale application of cost- effective innovative building materials and construction technologies in housing and building sector.
b) To promote new waste-based building materials and components through technical support and encouraging entrepreneurs to set up production units in urban and rural regions.
c) To help students in selecting different materials used for construction based on type of load coming and climatic conditions.

Section-I

Building Stones and Aggregates: General, Characteristics of a good building stone, Deterioration and preservation of stones, Common building stone of India & their Uses-Artificial stones
Classification of aggregate, properties, sieve analysis, fineness modulus
Bricks: General, Constituents of bricks, Composition of good brick earth, Qualities of good bricks, Classification of bricks, Tests on bricks, Varieties of fire bricks

Section-II

Cement: Composition of cement, Raw Materials, Manufacturing process, Varieties of cement, Hydration of cement, Properties, testing of cement.
Concrete : Introduction, Constituents of concrete, Batching of materials, Manufacturing process of cement concrete, transportation and placing of concrete, compaction of concrete, curing of concrete workability and factors affecting it, Methods to determine workability, segregation and bleeding of concrete, Strength of concrete and factors affecting it, durability and permeability of concrete, factors affecting permeability of concrete, creep and shrinkage of concrete, BIS method of mix design

Section-III

Timber: Structure of a tree, classification of trees, Defects in timber, Qualities of a good timber, Seasoning of timber , Decay of timber, Preservation of timber, uses and testing of timber, fire proofing of timber, important Indian timbers
Plastic: Definition, classification of plastics, composition and raw materials, manufacturing, characteristics and uses, extruded profiles, pipes and their fittings, wood plastic composite(WPC), fiber reinforced plastics.

Section-IV

Miscellaneous materials: Paints, Distempering, White and color washing, Varnishes, Glass and glass products, Commercial forms of iron & steel & their uses
Composite Materials: Fibre reinforced concrete, Fly ash concrete, Ferro-cement, Light-weight concrete and introduction to polymer concrete

References:
- Building Material, Rangawala
- Concrete Technology, MS Shetty

ACCE-16306
FLUID MECHANICS LAB

		L	T	P
Internal Marks	: 30	0	0	2
External Marks	: 20			
Total Marks	: 50			

Objectives:
  a) To determine discharge coefficient in case of flow over weirs and notches.
  b) To demonstrate losses in pressure of flow due to bends, sudden change in size of pipes in water distribution network.
  c) To know the velocity distribution inside pipes.

List of Experiments

Part-A

  1. To determine the meta-centric height of a floating vessel under loaded and unloaded conditions.
  2. To study the flow through a variable area duct and verify Bernoulii's energy equation.
  3. To determine the coefficient of discharge for an obstruction flow meter (venturimeter /orifice meter)
  4. To determine the discharge coefficient for a Vee notch or rectangular notch.

Part-B

  5. To determine the coefficient of discharge for Broad crested weir.
  6. To determine the hydraulic coefficients for flow through an orifice.
  7. To determine the head loss in a pipe line due to sudden expansion / sudden contraction/ bend.

ACCE-16307
STRENGTH OF MATERIALS LAB

Internal Marks	: 30		**L**	**T**	**P**
External Marks	: 20		**0**	**0**	**2**
Total Marks	: 50				

Objectives:
  a) To draw stress strain curves for various materials in tension and compression
  b) To demonstrate hardness, impact strength of various materials by different methods.
  c) To test mild steel bars required to be used as building material.

List of Experiments

Part-A

1. Draw Stress Strain curve for Ductile and Brittle material in tension.
2. Draw Stress Strain curve for Ductile and Brittle material in compression.
3. To determine the impact strength by Izod and Charpy test.
4. To determine the hardness of the given material by Rockwell and Brinell hardness testing machine.

Part-B

5. Draw load deflection curve for spring in loading and unloading conditions.
6. Draw shear stress, shear strain curve for ductile and brittle material in torsion strength testing
7. To determine the fatigue strength of the material.
8. To determine the impact strength by Izod and Charpy test.
9. To carry out bend test on steel bars

ACCE-16308
SURVEY-I LAB

Internal Marks	: 30		**L T P**	
External Marks	: 20		**0 0 2**	
Total Marks	: 50			

Objectives:
  a) To measure distance and angles between various stations on ground by theodolite, chain and tape
  b) To help students in carrying out plane table surveying for drawing plan of particular region accurately.

List of Experiments

Part-A

1. Measurement of distance, ranging a line, plotting of details in chain survey, offsetting
2. Measurement of bearing and angles with compass, adjustment of traverse by graphical method.
3. Plane table survey using Radiation and Intersection methods
4. Setting of Plane Table using Two Points/ Three Points Problem.

Part-B

5. Different methods of leveling, height of instrument.
6 Rise & fall methods.
7. Determination of height of an inaccessible object with instrument axis in the same plane as the Object and in different planes.
8. Contouring by spot leveling.

4THSEMESTER

ACAM-16401
ENGINEERING MATHEMATICS-III

Internal Marks	: 40		**L T P**
External Marks	: 60		**3 1 0**
Total Marks	: 100		

Objectives:
a) Students should be proficient in the application of the laws of logic tomathematical   statements e.g. Integral transformations, use of complex variables.
b) To analyse the data based on statistics and   probability, this also enables students to make use of data through curve filling and   different equations.

Section-I
Fourier Series: Periodic functions, Euler's formula. Even and Odd functions, half rangeexpansions
Laplace Transforms: Laplace transforms of various standard functions, properties of
 Laplace transforms, inverse Laplace transforms, transform of derivatives and integrals. Applications to solution of ordinary linear differential equations with constant coefficients

Section-II
Partial Differential Equations: Formation of partial differential equations. Solution of homogenous partial differential equations with constant coefficients
Function of Complex variable: Analytic function, Cauchy- Riemann equations,
Harmonic functions, Cauchy's integral theorem, Cauchy's integral formula and derivative of analytic Function .Taylor's and Laurent's expansions (without proof), Singular points, poles, residue, Integration of function of complex variables using the method of residues.

Section-III
Solution of Equations: Solution of Algebraic and Transcendental equations by
Bisection method, Regula- Falsi method, Newton - RaphsonMethod. Solution of linear system of equations by Gauss- Elimination   method, Guass - jardan method. LU   DecompositionMethod. Interpolation.(Newton forward – Backward, Gauss Forward- backward, Newton divided difference, Lagrange's interpolation).

Section-IV
Curve fitting: Fitting of Data in straight line, second degree equation, linear curve
and Exponential curve by least Square method. Solution of linear differential equations by initial value problems.(Euler methods and R.K order methods).

References
- KreyszingE.. Advanced Engineering Mathematics , Eighth edition. John wiely. New Delhi
- Grewal B.S. Higher Engineering Mathematics. Khanna Publisher. New Delhi.
- Ian N. Sneedon. Elements of Partial differential equation. Mcgraw – Hill. Singapore.
- Bindra. J. S. Applied Engineering. Volume – III. Kataria Publications.
- Advanced Engineering Mathematics, O'Neil.CengageLearing.
- Babu Ram Advance Engineering Mathematics. Pearson Education.
- N.P Bali. Laxmi Publication.

ACCE-16401
SURVEY-II

		L	**T**	**P**
Internal Marks	: 40	**3**	**1**	**0**
External Marks	: 60			
Total Marks	: 100			

Objectives:
a) To understand the concept of Tachometry for computing angles as well as distance measurement.
b) To understand the use of electromagnetic waves in distance measurement.
c) To help students in understanding Spatial data models in Geographical information system for locating positions on ground.
d) To have basic knowledge in remote sensing and its application in locating geographic positions of various stations

Section-I

Theodolite: Different types of Theodolites, temporary & permanent adjustment, traversing with a Theodolite, adjustment of closing error by Bowditch & transit rules.

Section-II

Tachometry: Different types of tachometry, calculation of vertical and horizontal distances, substance bar. Tachometric leveling with both angle of depression and elevation, errors due to curvature &refraction.

Triangulation: Selection of stations and base line, corrections for base line, triangulation networks, correction (least square method)

Section-III

Curves: Different types of curves, Designation of Curve and calculation of ordinates, and angles, their layout obstacles in curves.

Section-IV

Photogrammetry & Remote Sensing: Introduction, Basic Principles of photogrammetry, Photo-Theodolite, Elevation of a Point by Photographic Measurement, Aerial Camera, Scale of Vertical Photograph, Introduction to remote sensing, interaction of EMR with Earth Surface Working Principles and Instrumentation.

GIS & GPS: Introduction, concepts and terminology, Utility of GIS, Essential components of a GIS, Introduction, working principle and various applications of GPS related to Civil Engg.

References:

- Surveying, By C.L. Kochher – DanpatRai& Sons
- Surveying by Kanetkar
- Kaplan, E.D., Understanding GPS : Principles and applications
- Campbell, J.B. Taylvor and Francis, "Introduction to Remote Sensing".

ACCE-16402
STRUCTURAL ANALYSIS- I

Internal Marks	: 40	**L**	**T**	**P**
External Marks	: 60	**3**	**1**	**0**
Total Marks	: 100			

Objectives:
a) To apply basic knowledge of bending moment and shear force in analysing various elements of buildings
b) Students will be able to identify determinate, indeterminate, stable and unstable structures.
c) To determine forces and deflections in determinate trusses, beams and frames.
d) To help students in determining forces in indeterminate trusses, beams and frames by the force method.
e) To analyse various structures like cables and suspension bridges, dams and retaining walls.
f) To help students in drawing influence line diagrams required for fast and accurate analysis of beams.

Section-I

Displacements: Concept; Governing differential equation for deflection of straight beams; Following methods for determination of structural displacements:

1. Geometric Methods: Double integration; Macaulay's method; Moment area method; Conjugate beam method.
2. Energy Methods: Strain energy in members, , Betti's and Maxwell's Laws of reciprocal deflections, Concept of Virtual work and its applications, Castigliano's theorems, unit load method, deflections of trusses and 2D-frames.

Section-II

Determinate Structures: Concept of determinacy; Analysis of determinate structural elements—truss, arch, beam, frame, cables; Internal forces in determinate structures; Reaction diagram-- Bending moment, shear force, radial shear, normal thrust diagrams for the determinant structures.
1. Analysis of plane trusses, compound and complex trusses using method of joints, method of joints, tension coefficients.
2. Analysis of three-hinged arch of various shapes under different loading conditions.
3. Analysis of simple portal frame, cables under different loading conditions.
4. Analysis of cables under point load and UDL with ends at same or different levels.

Section-III

Moving Loads and Influence Line Diagrams: Concept of influence line diagram, rolling loads; Bending moment and shear force diagrams due to single and multiple concentrated rolling loads, uniformly distributed moving loads; Equivalent UDL; Muller Breslau principle; Influence lines for beams, girders with floor beams and frames; calculation of the maximum and absolute maximum shear force and bending moment; Concept of envelopes; Influence line for displacements; Influence line for bar force in trusses.

Section-IV

Analysis of Cables and Suspension Bridges: General cable theorem, shape, elastic stretch of cable, maximum tension in cable and back-stays, pressure on supporting towers, suspension bridges, three hinged stiffening girders.

References:

- Basic structural Analysis C.S.Reddy; Tata McGraw-Hill Education
- Analysis of Structures Vol- I and Vol.-II Vazirani&Ratwani; Khanna Publishers
- Intermediate structural Analysis C.K.Wang; McGraw-Hill
- Advanced Structural Analysis, A.K. Jain, Nem Chand & Bros., Roorkee.
- Theory of Structures, Vol. I, S.P. Gupta &G.S.Pandit, Tata McGraw Hill, New Delhi.

ACCE-16403
DESIGN OF CONCRETE STRUCTURES-I

		L T P
Internal Marks : 40		
External Marks : 60		3 1 0
Total Marks : 100		

Objectives:
a) To learn the fundamentals of design, analysis, and proportioning of reinforced concrete members and structures.
b) To accomplish this objective, the following topics will be covered: behavior of beams, one-way slabs, and columns.
c) To learn methods for analysis and design of these elements under flexure, shear, and axial loads will be examined.

Note: Relevant Indian Code of Practices are permitted in Examination.

Section-I
Objectives and Methods of Analysis and Design
Properties of Concrete and Steel

Section-II
Design Philosophies of Working Stress Method and Limit State Method
Limit State of Collapse - Flexure
Computation of Parameters of Governing Equations
Determination of Neutral Axis Depth and Computation of Moment of Resistance

Section-III
Numerical Problems on Singly Reinforced Rectangular Beams
Doubly Reinforced Beams – Theory and Problems
Flanged Beams – Theory and Numerical Problems
Shear, Bond, Anchorage, Development Length and Torsion

Section-IV
Compression Members: Definitions, Classifications, Guidelines and Assumptions,
Design of Short Axially Loaded Compression Members, Design of Short Compression Members under Axial Load with Uniaxial and biaxial Bending, Preparation of Design Charts, Design of Slender Columns
Reinforced Concrete Slabs: One and Two way Slabs

References:
- Properties of Concrete by A.M.Neville – Prentice Hall
- Concrete Technology by M.S.Shetty. – S.Chand& Co.;
- Concrete Technology by M.L. Gambhir. – Tata Mc. Graw Hill Publishers, New Delhi
- Concrete Technology by A.R. Santha Kumar, Oxford university Press, New Delhi
- Advanced Design of Structures N. Krishna Raju
- Advanced RCC Design Pillai&Mennon; Tata MacGraw Hill
- Limit State Design Ramachandra
- Limit State Design A.K. Jain
- Limit State Design of Reinforced Concrete P.C. Vergese

ACCE-16404
BUILDING CONSTRUCTION

				L	T	P
Internal Marks	: 40			3	0	0
External Marks	: 60					
Total Marks	: 100					

Objectives:
a) To help students understand various types of structures constructed in the field and their relative merits and demerits.
b) To develop and promote methodologies and technologies for natural disaster mitigation & management and retrofitting.
c) To know various terminology used in case of different components of building

Section-I

Masonry Construction: Introduction, various terms used, types of bonds, their merits and demerits, stone masonry-Dressing of stones, Classifications of stone masonry, safe permissible loads, Brick masonry-bonds in brick work, laying brick work, structural brick work-cavity and hollow walls, reinforced brick work, Defects in brick masonry, composite stone and brick masonry, glass block masonry.

Walls and Foundation: Load bearing and non-load bearing walls, Thickness considerations, partition and cavity walls design of masonry wallsTypes of foundations, causes of failures of foundation and remedial measures

Section-II

Damp Proofing: Sources, Causes of dampness in buildings, bad effects of dampness, methods of damp proofing, materials used for DPC

Arches and Lintels: Introduction to terms used in Arches; different types of arches; brick and stone arches, types and functions of lintels

Roofs and Floors: Introduction, terms used, types of roof trusses and roof coverings, various types of floors commonly used and their suitability for different buildings, factors for selecting suitable floor for building.

Section-III

Doors and Windows: Introduction, terms used, location of doors and windows, types of doors and windows, methods of fixing doors and window frames in walls, ventilators

Plastering and pointing: Objects, Methods of plastering, Materials and types, Defects in plastering, Special material for plastered surface, Distempering, white washing and color washing of plastered surface

Section-IV

Stairs & Stair cases: Suitability of location, stairs in multi-storeyed buildings, Residential and public buildings, dimensions, Requirements, classification, types of stairs, Lift & escalators

Building Services: Plumbing service, Electrical services, Air conditioning, Acoustics and sound insulation, Fire protection measures, introduction to scaffolding and shuttering.

References:
- Building Construction by Sushil Kumar, Standard Publisher and Distributors.
- Building Construction by B. C. Punima, Laxmi Publisher House

ACCE-16405
BUILDING DRAWING

		L	**T**	**P**
Internal Marks	: 30			
External Marks	: 20	0	0	2
Total Marks	: 50			

Objectives:
   a) To draw working drawings of buildings.
   b) To draw various components of buildings with all specifications.

List of Experiments

Part-A
   1. Typical drawings of Bonds in brick work
   2. Plan and Sectional Elevation of stair case
   3. Plan and Sectional Elevation of Doors
   4. Plan and Sectional Elevation of Windows

Part-B
   5. Typical drawing of cavity walls
   6. working drawings of arches
   7. working drawings of roofs
   8. Detailed working drawings of buildings (Plan and Elevation)

ACCE-16406
CONCRETE TECHNOLOGY LAB

Internal Marks	: 30		**L**	**T**	**P**
External Marks	: 20		**0**	**0**	**2**
Total Marks	: 50				

Objectives:
a) To calculate various properties of cement like setting time, specific gravity etc required for smooth working of construction projects.
b) To perform various tests on concrete that is most important material in construction.
c) To design concrete mix according to prescribed Indian standards for taking different types of loading safely.

List of Experiments

Part-A

1. To Determine the Specific Gravity of and Soundness of cement
2. To Determine the Standard Consistency, Initial and Final Setting Times of Cement and Compressive Strength of Cement.
3. To Determine the Fineness Modulus, Bulk Density, Water Absorption and Specific gravity of Fine and Coarse Aggregates.
4. To Determine the Slump, Compaction Factor and Vee-Bee Time of Concrete.

Part-B

5. Mix Design of Concrete by IS methods
6. To Determine the Compressive Strength of Concrete by Cube and Cylinder.
7. To carry out the Split Tensile and Flexural strength of Concrete.
8. Compressive strength of Brick and Tile as IS standard

ACCE-16407
SURVEY-II LAB

		L	T	P
Internal Marks	: 30			
External Marks	: 20	0	0	2
Total Marks	: 50			

Objectives:
  a) To measure distance and angles between various stations on ground by theodolite, chain and tape
  b) To help students in carrying out plane table surveying for drawing plan of particular region accurately.
  c) To demonstrate use of total station and its applications in traversing the fields/aerial photographs and stereoscopic analysis.

List of Experiments

Part-A

  1. Setting up temporary and permanent adjustment of a theodolite.
  2. Measurement of horizontal angles by repetition.
  3. Reiteration methods using a theodolite.
  4. Measurement of vertical angle by theodolite.

Part-B

  5. Determination of tachometric constants. Determination of reduced levels by tachometric observations.
  6. Setting out a transition curve.
  7. Setting out of circular curves in the field using different methods.
  8. Surveying by Total Station

<u>**5TH SEMESTER**</u>

ACCE-16501
STRUCTURAL ANALYSIS-II

		L	T	P
Internal Marks	40			
External Marks	60	3	1	0
Total marks	100	**Credits**		4

Pre-requisite: Structural Analysis-1
Objectives:
  a) To impart the principles of elastic structural analysis and behaviour of indeterminate structures.
  b) To impart knowledge about various methods involved in the analysis of indeterminate structures.
  c) To apply these methods for analyzing the indeterminate structures to evaluate the response of structures
  d) To enable the student get a feeling of how real-life structures behave
  e) To make the student familiar with latest computational techniques and software used for structural analysis.

<u>**SECTION-I**</u>
Indeterminate Structures: Concept of indeterminate /redundant structures; Static and kinematic indeterminacies; stability of structures; internal forces
Indeterminate Structural Systems: Pin-jointed and rigid-jointed structural systems;Deformation of redundant structures-sway and non-sway frames, Static equilibrium and deformation compatibility checks; Effects of support settlement and lack of fit.
<u>**SECTION-II**</u>
Fixed Beam - member loading, sinking of supports, Analysis of redundant beams, frames, trusses, arches using following methods:
a) Conventional Methods: Slope deflection method; Moment distribution method;Rotation contribution method (Kani's Method).
<u>**SECTION-III**</u>
Fixed Beam - member loading, sinking of supports, Analysis of redundant beams, frames, trusses, arches using following methods:
b) Classical Methods: Methods of consistent deformation; Theorem of three moments.
c) Approximate Methods: Portal method; Cantilever method
<u>**SECTION-IV**</u>
Influence Line Diagrams: Concept and application in the analysis of statically indeterminatestructures; Influence line for bar forces in the statically indeterminate trusses, beams and frames.
Books Recommended:
1. Basic structural analysis - C.S. Reddy Tata McGraw-Hill
2. Intermediate structural analysis - C. K. Wang. McGraw Hill
3. Indeterminate structural analysis - J. Sterling Kinney Addison-Wesley
Educational Publishers
4. Theory of structures - B.C. Punima, Laxmi Publications
5. Structural Analysis, DevdasMenon, Narosa Publishers.

ACCE-16502
DESIGN OF CONCRETE STRUCTURES-II

		L	**T**	**P**
Internal Marks	40			
External Marks	60	**3**	**1**	**0**
Total marks	100	**Credits**		**4**

Note: Relevant Indian Codes of Practice and Design handbooks are permitted (as per note mentioned below) in Examination.

Objectives:
   a) To introduce the students to the fundamentals of reinforced concrete design with emphasis on the Design of Foundations, Stairs,
   b) In addition, student will learn how to analyze and design reinforced concrete structural members under bending, shear, and/or axial loads according to the building code requirements

SECTION-I

1. **Stairs** : Types and Design of Stairs
2. **Foundations** - Theory and Design: Isolated Footing (Square, Rectangular), Combined Footing(Rectangular, Trapezoidal, Strap).

SECTION-II

3. **Compression Members**: Definitions, Classifications, Guidelines and Assumptions, Design of Short Axially Loaded Compression Members, Design of Short Compression Members under Axial Load with Uniaxial and biaxial Bending.
4. Design of Continuous beams and curved beam.

SECTION-III

5. Design of Domes.
6. Design of Retaining walls: Cantilever type retaining wall, Counterfort type retaining wall.

SECTION-IV

7. Introduction to water retaining structures. Design of circular and rectangular water tanks resting on ground.

Books Recommended:
1. Reinforced Concrete Design; Pillai&Menon; Tata McGraw-Hill Education
2. Limit state Design of Reinforced Concrete; Varghese P C; Prentice-Hall of India Pvt. Ltd".
3. Reinforced Cement Concrete, Mallick and Rangasamy; Oxford-IBH.

BIS Codes of practice and Design Handbooks:
1. *IS 456-2000*- Indian Standard. Plain and Reinforced concrete -Code of practice
2. *IS 3370- Code of practice for concrete structures for storage of liquids
3. *Design Aid SP 16
4. Explanatory hand book SP24.
5. Detailing of Reinforcement SP 34 Note: The codes marked with * are permitted in examination.

ACCE-16503
TRANSPORTATION ENGINEERING – I

				L	T	P
Internal Marks	40					
External Marks	60			3	1	0
Total marks	100			Credits	4	

Objectives:
   a) Understand the principles and practices of transportation engineering.
   b) Understand the interactions between transportation planning and land use planning, economics, social planning and master plans.
   c) Understand the principles of Traffic Engineering.

<div align="center">SECTION-I</div>

1. Introduction: Importance of Transportation, Different Modes of Transportation,Characteristics of Road Transport.
2. Highway Development & Planning: Principles of Highway Planning, RoadDevelopment in India, Classification of Roads, Road Patterns, Planning Surveys.
3. Highway Alignment: Requirements, Alignment of Hill Roads, Engineering Surveys.

<div align="center">SECTION-II</div>

4. Highway Geometric Design: Cross Section Elements, Carriageway, Camber, SightDistances, Horizontal Curves, Extra-widening, Super-elevation, Vertical Curves.
5. Highway Materials: Properties of Sub-grade and Pavement Component Materials, Testson Sub-grade Soil
6. Highway Construction: Earthen/Gravel Road, Water Bound Macadam, Wet MixMacadam, Bituminous Pavements, Cement Concrete Pavements.

<div align="center">SECTION-III</div>

7. Highway Drainage and Maintenance: Importance of drainage and maintenance, Surface Drainage and Subsoil Drainage, Construction in Water-logged areas, Pavement Failures, Pavement Evaluation, Maintenance and Strengthening Measures.
8. Highway Economics & Financing: Total Transportation Cost, Economic Analysis,Sources of Highway Financing.
9. Traffic Characteristics: Road User Characteristics, Driver Characteristics, VehicularCharacteristics.

<div align="center">SECTION-IV</div>

10. Traffic Studies: Volume Studies, Speed Studies, O-D Survey, Parking Study.
11. Traffic Safety and Control Measures: Traffic Signs, Markings, Islands, Signals, Causeand Type of Accidents, Use of Intelligent Transport System.
12. Traffic Environment Interaction: Noise Pollution, Vehicular Emission, PollutionMitigation Measures.

Books Recommended:
1. Khanna S.K., and Justo, C.E.G. "Highway Engineering", Nem Chand and Brothers, Roorkee, 1998.
2. Kadiyali, L.R. "Principles and Practice of Highway Engineering", Khanna Publishers, New Delhi, 1997.
3. Flaherty, C.A.O. "Highway Engineering", Volume 2, Edward Arnold, London, 1986.
4. Sharma, S.K. "Principles, Practice & Design of Highway Engineering", S. Chand & Company Ltd., New Delhi, 1985.
5. Mannering, "Principles of Highway Engineering & Traffic Analysis", Wiley Publishers, New Delhi.

ACCE-16504
PROFESSIONAL PRACTICES

		L	T	P
Internal Marks	40			
External Marks	60	3	1	0
Total marks	100	Credits		4

Objectives:
   a) To understand the principle of estimating and costing in civil engineering.
   b) To self analysis the cost of the structures.

SECTION-I

Estimates-Method of building estimates and its types, site plan, index plan, layout plan, plinth area, floor area, Technical sanction, administrative approval, estimate of buildings, roads, earthwork, R.C.C. works, Sloped roof, roof truss, masonry platform, complete set of estimate.

SECTION-II

Schedule of Rates and analysis of rates- For earthwork, concrete work, D.P.C., brick work, plastering, pointing, roadwork.

SECTION-III

Specifications- For different classes of building and roads specification.

Types of contracts- Tenders, tender form, submission and opening of tenders, measurement book, muster roll, piecework agreement and work order.

SECTION-IV

Accounts-Division of accounts, cash, receipt of money, cash book, temporary advance, imprest, accounting procedure.

Arbitration: Acts and legal decision making process.

Books Recommended:
1. Estimating and Costing by B.N. Datta, UBSPD, New Delhi
2. Estimating and Costing by G.S. Birdie, DhanpatRai Publication New Delhi.
3. Estimating and Costing(CIVIL)   by D D KOHLI, S. CHAND Publication New Delhi.
3. Estimating and Costing by V.N. Chakravorty, Calcutta
4. Civil Engg. Contracts & Estimates by B.S. Patil, Orient-Longman Ltd., New Delhi.

ACCE-16505
IRRIGATION ENGINEERING-I

				L	T	P
Internal Marks	**40**					
External Marks	**60**			**3**	**0**	**0**
Total marks	**100**			**Credits**		**3**

Objectives:
   a) To take up the basic concepts of irrigation and construction of various hydraulic structures.
   b) To introduce students to basic concepts of water, their interactions, as well as irrigation and drainage systems design, planning and management.

SECTION-I
Introduction: Importance of Irrigation engineering. Its necessity.Purpose and objective of irrigation.Benefits of irrigation.Advantages and disadvantages of irrigation.
Methods of Irrigation: Water requirement of crops. Factors affecting water requirement. Quality of irrigation water.Impurities in irrigation water.Classification of irrigation water.Consumptive use of water (Evapo-transpiration). Factors affecting consumptive use of water. Water depth or delta.Duty of water.Base Period.Relation between delta, duty and base period.Soil fertility. Crop rotation and necessity for rotation.

SECTION-II
Canal Irrigation: Classification of canals. Canal alignment.General considerations for alignment.Alignment of field channel or water courses.Bandhera irrigation.Location of Bandheras.Working of Bandhera system.Design of bandhera.Phad system of irrigation.Advantages and disadvantages of Bandhera system.Suitability of bandhear system. Silt theory. Kennedy Theory.Lacey's theory. Lacey's theory applied to channel design. Drawbacks ofKennedy theory.Comparison of Lacey's and Kennedy theory. Design of Unlined canals based on Kennedy and Lacey's theory.
Lined Canals: Types of lining.Selection of lining types.Economics of Lining of canals.Calculation of benefits.Annual cost of extra expenditure on lining.Maintenance of lining of canals.Measurement of discharge in channels.Area velocity method.Chemical method. Weir method, stage discharge curves. Design of Lined canals.Method of providing drainage behind lining.

SECTION-III
Losses in Canals, Water Logging and Drainage: Losses in canals. Water Logging.Causes and effects of water logging.Remedial measures.Drainage of land.Types of drains. Design considerations for Surface drains. Under drains or tile drains. Layout of Tile drain system.
Investigation and Preparation of Irrigation Projects: Introduction. Various purposes served by WRD projects (Water Resource Development Projects), Classification of WRD Projects. Water resources of multi purpose projects. Compatibility of Multi purpose projects and use.Planning of WRD Projects.Estimation of Benefit Cost ratio. Capital Budgeting. Some common pitfalls of Water resources planning.

SECTION-IV
Tube Well Irrigation: Tube Wells. Types of strainers.Aquifers.Porosity.Specific Yield.Specific Retention. Storage coefficient. Yield of an open well. Interference among wells. Selection of suitable sites for Tube well.
River Training Works: River Training. Classification of river training works. Guide Bank systems. Design consideration. Groynes or Spuns.Repelling Groynes.Impermeable and permeable Groynes.Pitched Islands. Natural and artificial cut-offs and design considerations. Artificial Cut-offs.

Books Recommended:
Principles & practice of Irrigation Engg.S.K.Sharma; S. Chand, Limited.
Irrigation & Water Power Engg.B.C. Punmia, PandeB.B.Lal; Laxmi Publications (p) Ltd
Fundamentals of Irrigation Engg.Dr. Bharat Singh; Nem Chand & Bros
Irrigation Engg.& Hydraulic Structure S.R.Sahasrabudhe; S. K. Kataria& Sons
Irrigation Engg.& Hydraulic Structure Varshney, Gupta & Gupta; Nem Chand and Brothers
Irrigation Engg.& Hydraulic Structure Santosh Kumar Garg; Khanna Publishers

ACCE-16506
CADD LAB-I

			L	T	P
Internal Marks	30				
External Marks	20		0	0	2
Total marks	50		**Credits**		1

Structural Drawings of Reinforced Concrete Elements as per ACCE-16502

Objectives:-

a) To practice the designs of stairs and footing on AutoCAD.

   List of Experiments:

Part-A

1) Types of stairs
2) Isolated Square Footing
3) Isolated Rectangular Footing
4) Isolated Circular Footiing
5) Combined Rectangular Footing
6) Continuous Beam

Part-B

7) Curved Beam
8) Cantilever Retaining Wall
9) Counterfort Retaining Wall
10) Spherical Dome
11) Conical Dome
12) Rectangular Water Tanks
13) Square Water Tanks

ACCE-16507
TRANSPORTATION ENGINEERING LAB

			L	T	P
Internal Marks	30				
External Marks	20		0	0	2
Total marks	50		**Credits**		1

Objectives:
   a) To understand the importance of aggregates used in highway construction.
   b) To know about the different properties of material used in construction of roads.
   c) To perform all the test on aggregate, Bitumen and Subgrade soil.

List of Experiments:

Part-A

I Tests on Road Aggregates
2. Crushing Value Test
3. Los Angles Abrasion Value Test
4. Impact Value Test
5. Shape Test (Flakiness and Elongation Index)

Part-B

II Tests on Bituminous Materials and Mixes
6. Penetration Test
7. Ductility Test
8. Softening Point Test
9. Flash & Fire Point Test
10. Bitumen Extraction Test

III Field Tests
11. Benkelman Beam Pavement Deflection Test

IV Tests on Sub-grade Soil
1. California Bearing Ratio Test

Books/Manuals Recommended :
1. Khanna S.K., and Justo, C.E.G. "Highway Material & Pavement Testing", Nem Chand and Brothers, Roorkee.

ACCE-16508
STRUCTURAL ANALYSIS LAB

			L	T	P
Internal Marks	30				
External Marks	20		0	0	2
Total marks	50		**Credits**		1

Objectives:
   a) Distinguish between statically determinate and indeterminate structures.
   b) Apply equations of equilibrium to structures and compute the reactions.
   c) Draw the shearing force and bending moment diagrams.
   d) Calculate the internal forces in cable and arch type structures.

List of Experiments:

Part-A

1. Deflection of a simply supported beam and verification of Clark-Maxwell'stheorem.
2. To determine the Flexural Rigidity of a given beam.
3. To verify the Moment- area theorem for slope and deflection of a given beam.
4. To determine the moment required to produce a given rotation (rotational stiffness) at one end of the beam when the other end is pinned.
5. Study of behavior of columns and struts with different end conditions.

Part-B

6. Experiment on three-hinged arch.
7. Experiment on two-hinged arch.
8. Deflection of a statically determinate pin jointed truss.
9. Forces in members of redundant frames.
10. Experiment on curved beams.

Books/Manual Recommended:
A Laboratory Manual on Structural Mechanics by Dr. Harwinder Singh; New
Academic Publishing Comp. Ltd.

6THSEMESTER

ACCE-16601
DESIGN OF STEEL STRUCTURES-I

				L	T	P
Internal Marks	40					
External Marks	60			3	1	0
Total marks	100			Credits		4

Objectives:
  a) The objectives of this are to learn the behavior and design of structural steel components (members and connections in two - dimensional (2D) truss and frame structures)
  b) To gain an educational and comprehensive experience in the design of simple steel structures.

Note: Relevant Indian Codes of Practice are permitted in Examination.

SECTION-I
1. Introduction: Properties of structural steel, I.S. rolled sections, I.S. specifications.

2. Connections: Bolted and welded connections for axial and eccentric loads.

SECTION-II
3. Tension members: Design of members subjected to axial tension.

4. Compression members: Design of axially loaded members, built-up columns, laced and battened columns including the design of lacing and battens.

SECTION-III
5. Flexural members: Design of laterally restrained and un-restrained rolled and built-up sections.

6. Column bases: Design of slab base, gusseted base.

SECTION-IV
7. Roof truss: Design loads, combination of loads, design of members (including purlins) and joints, detailed working drawings.

Books/Codes Recommended:
1) Limit state design of steel structures: S K Duggal, McGraw Hill

2) Design of steel structures: N Subramanian Oxford Higher Education

3) Design of steel structures (Vol. 1): Ram Chandra Standard Book House - Rajsons

4) Design of steel structures (by limit state method as per IS: 800-2007): S SBhavikatti I K International Publishing House

5) IS 800: 2007 (General construction in steel-Code of practice)*

6) SP: 6(1) (Handbook for structural engineers-Structural steel sections)* * permitted in Examination

ACCE-16602
SOIL MECHANICS & FOUNDATION ENGINEERING

		L	T	P
Internal Marks	40			
External Marks	60	3	1	0
Total marks	100	**Credits**		4

Objectives:

a) To discuss and evaluate the feasibility of foundation solutions to different types of soil conditions considering the time effect on soil behavior.
b) To build the necessary theoretical background for design and construction of foundation system.
c) To Study the nature of the soil behavior for different foundation.

SECTION-I
INTRODUCTION: Concept of Soil Mechanics and Geotechnical Engineering. Formation of soil, Types of soil, Need and importance of studying soil mechanics & foundation engineering.

INDEX PROPERTIES: Concept of phase diagram of soil.Determination of moisture content, in situ density and specific gravity of soil as per Indian Standards.Weight-Volume relationships and related numerical problems. Properties of fine grain soils especially clay and determination of Atterberg Limits of clayey soils. Grain size analysis of coarse and fine grain soils.

SECTION-II
COMPACTION & CONSOLIDATION: Definition and Difference between compaction and consolidation. Factors affecting compaction and consolidation.Methods of compaction.Terminology in consolidation.Settlement due to consolidation.Terzaghi's One Dimensional equation of consolidation.Calculation of void ratio and coefficient of consolidation in lab by various methods.

PERMEABILITY: Definition and concept of Darcy Law. Determination of Coefficient of Permeability in lab by various methods. Average coefficient of permeability in stratified soils. Seepage forces and pressure.Concept of Critical hydraulic gradient.

SECTION-III
EARTH PRESSURE: Determination of effective, total and neutral stress in soil. Basic terminology in Lateral Earth Pressure.Determination of Lateral Earth pressure on retaining walls by Rankine and Coulomb theories with their relative merits and demerits.Boussinesq's and Westergard analysis to determine pressure below point load, uniformly loaded circular and rectangular area.

STRENGTH OF SOIL: Concept of Shear Strength , Mohr Failure Envelope. Tests to determine shear strength of soil in lab and Field Vane Shear Test. Drainage conditions in Triaxial test. Skempton's Pore Pressure Parameters. Types of failure in shallow foundations.Failure due to settlement, equations to compute settlement and permissible settlement as per Indian Standards.

SECTION-IV
SITE INVESTIGATION: Need and importance of site investigation, Methods and tests performed like SPT and DCPT. Corrections applied to SPT N value. Sampler, its usage and types.Types of samples.Borehole log for SPT and preparation of soil investigation report.

FOUNDATIONS: Concept of shallow and deep foundations, their difference and various types. Terminology related to bearing capacity of soil. Determination of Bearing Capacity of soil as per Indian Standards.Plate Load Test, its usage and relative merits and demerits.Types of caissons, components of

well foundation, various forces acting on well foundation and different methods to rectify Tilt and Shift in well foundation.Necessity of pile foundations, different types with relative merits and demerits.Cyclic Pile load test, its procedure and usage.Concept of Negative Skin Friction.

Books Recommended:
1. Soil Mech. & Foundation Engg, by K.R.Arora Standard *Publishers* Distributors
2. Geotechnical Engineering, by P. Purshotama Raj *Tata Mcgraw Hill*
3. Soil Mech. & Foundation Engg., by V.N.S.Murthy CBS *Publishers* & Distributors.
4. Principle of Geotechnical Engineering by B.M.DasCengage Publisher
5. Basic and applied Soil Mechanics by GopalRanjan and A.S.R.Rao New Age International Publishers
6. Geotechnical Engineering by Gulati and Datta, Tata McGraw Hill
7. Problems in Soil mechanics and Foundation Engineering by B.P.Verma, Khanna Publishers

ACCE-16603
TRANSPORTATION ENGINEERING – II

				L	T	P
Internal Marks	40					
External Marks	60			3	1	0
Total marks	100			Credits	4	

Objectives:
a) Understand the principles and practices of Railway engineering.
b) Understand the principles of Airport Engineering.

SECTION-I

1) Introduction to Railway Engineering: History of Railways, Development of Indian Railway, Organisation of Indian Railway, Important Statistics of Indian Railways. Railway Gauges: Definition, Gauges on World Railways, Choice of Gauge, Uniformity of Gauge, Loading Gauge, Construction Gauge.

2) Railway Track: Requirements of a Good Track, Track Specifications on Indian Railways, Detailed Cross-Section of Single/Double Track on Indian Railways. Components of Railway Track: Rails, Sleepers, Ballast, Subgrade and Formation, Track Fixtures & Fastenings, Coning of Wheels, Tilting of Rails, Adzing of Sleepers, Rail Joints, Creep of Rails.

3) Geometric Design of Railway Track: Alignment, Gradients, Horizontal Curve, Super elevation, Equilibrium Cant, Cant Deficiency, Transition Curves.

SECTION-II

4) Points and Crossings: Functions, Working of Turnout, Various types of Track Junctions and their layouts, Level-crossing.

5) Railway Stations & Yards: Site Selection, Classification & Layout of Stations, Marshaling Yard, Locomotive Yard, Equipment at Railway Stations & Yards

6) Signaling and Interlocking: Objectives, Classification of Signals, Types of Signals in Stations and Yards, Automatic Signaling, Principal of Interlocking.

SECTION-III

7) Modernization of Railway Tracks: High Speed Tracks, Improvement in existing track for high speed, Ballast less Track, MAGLEV, TACV Track.

Airport Engineering

8) Introduction to Airport Engineering: Air Transport Scenario in India and Stages ofDevelopment, National and International Organizations.

9) Airport Planning: Aircraft Characteristics, Factors for Site Selection, Airport Classification, General Layout of an Airport. Obstructions and Zoning Laws, Imaginary Surfaces, Approach Zones and Turning Zones.

SECTION-IV

10) Runway Orientation and Design: Head Wind, Cross Wind, Wind Rose Diagram, Basic Runway Length, Corrections, Geometric Design Elements, Runway Configuration.

11) Taxiway and Aircraft Parking: Aircraft Parking System. Main Taxiway, Exit Taxiway, Separation Clearance, Holding Aprons.

12) Visual Aids: Marking and Lighting of Runway and Taxiway, Landing Direction Indicator, and Wind Direction Indicator, IFR/VFR.

Books Recommended:
1. Chandra S., and Aggarwal, "Railway Engineering", M.M. Oxford University Press, New Delhi, 2007.
2. Saxena, S.C., and Arora, S.P., "A Text Book of Railway Engineering", DhanpatRai and Sons, Delhi, 1997.

3. J. S. Mundrey, "Railway Track Engineering", McGraw Hill Publishing Co., 2009

4. Khanna, S.K., Arora, M.G., and Jain, S.S., "Airport Planning and Design", Nem Chand & Bros. Roorkee, 1999.

5. Horenjeff, R. and McKelvey, F., "Planning and Design of Airports", McGraw Hill Company, New York, 1994.

6. Norman J. Ashford, SalehMumayiz, Paul H. Wright, "Airport Engineering: Planning, Design and Development of 21st Century", Wiley Publishers, 2011

ACCE- 16604
HYDROLOGY

		L	T	P
Internal Marks	40			
External Marks	60	3	1	0
Total marks	100	Credits		4

Objectives:
a) To know diverse methods of collecting the hydrological information, which is essential, to understand surface and ground water hydrology.
b) To know the basic principles and movement of ground water and properties of ground water flow.

SECTION-I

Introduction:
Hydrological cycle, scope and application of hydrology to engineering problems, water budget equation, drainage basins and its characteristics, hypsometric curves.

Precipitation:
Forms and types of precipitation, measurement of precipitation, recording and non recording rain-gauges, rain-gauge station, rain-gauge network, estimation of missing data, presentation of rainfall data, mean precipitation, depth -area -duration relationship, frequency of point rainfall, maximum probable precipitation.

SECTION-II

Evaporation & Transpiration:
Process, evaporimeters and empirical relationships, reservoir evaporation and methods of its control, transpiration, evapotranspiration and its measurement, Penman's equation and potential evapotranspiration.

Infiltration:
Infiltration process, infiltration capacity and measurement of infiltration, infiltration indices.

SECTION-III

Runoff:
Factor affecting run-off, estimation of runoff, rainfall-run off relationships, measurement of stage-staff gauge, wire gauge, automatic stage recorder and stage hydrograph, measurement of velocity-current meters, floats, methods of stream flow measurement: area velocity method, moving boat method, slope area method, electromagnetic method, ultra-sonic method and dilution technique, stage-discharge relationship.

SECTION-IV

Hydrograph:
Discharge hydrograph, components and factors affecting shape of hydrograph, effective rainfall, unit hydrograph and its derivation, unit hydrograph of different durations, use and limitations of UH, triangular UH, Snyder's synthetic UH.

Floods:
Rational methods, empirical formulae, UH method, flood frequency methods, Gumbel's method.

Books Recommended:
1   Engineering Hydrology by K.Subramanya, TMH, New Delhi
2   Hydrology by H.M.Raghunath.
3   Hydrology for Engineers by Linsely, Kohler, Paulhus.
4   Elementary Hydrology by V.P.Singh.

ACCE-16605
ENVIRONMENTAL ENGINEERING – II

				L	T	P
Internal Marks	40					
External Marks	60			3	0	0
Total marks	100			**Credits**		3

Objectives:
   a) To provide a coherent development to the students for the courses in sector of engineering like Waste Water treatment, slid Waste Management, house drainage etc.
   b) To analyze the Waste water sources and waste water characteristics. To develop various waste water treatment process.

SECTION-I

1. Introduction: Terms & definitions, systems of sanitation and their merits and demerits. Separate system, Combined system and Partially combined system of sewerage., choice of sewerage system and suitability to Indian conditions.

2. Sewerage System: Generation and estimation of community Sewage, flow variations, storm water flow. Design of sewers, construction & maintenance of sewers, sewer appurtenances.

SECTION-II

3. House Drainage: Principles of house drainage, traps, sanitary fittings, systems of plumbing, drainage lay out for residences.

4. Characteristics of Sewage: Composition of domestic and industrial sewage, grab and composite sampling. Physical, Chemical and microbiological characteristics of sewage, biological decomposition of sewage, BOD and BOD kinetics, effluent disposal limits.

SECTION-III

5. Treatment of Sewage: Introduction to unit operations and processes - Primary treatment; screening (theory), grit chamber (theory), rectangular and circular sedimentation tanks (theory and design), Secondary treatment units; Activated Sludge Process (theory and design), High rate and Low rate trickling filters (theory and design). Sludge Handling and disposal; thickening, stabilization, dewatering, drying and disposal.

SECTION-IV

6. Low Cost Sanitation Systems: Imhoff tanks (theory and design), septic tank (theory and design), soakage pit/soil absorption systems; stabilization ponds (theory and design); macrophyte ponds (Theory); oxidation ponds (theory and design), Oxidation ditches (Theory); and constructed wetland systems.

7. Wastewater Treatment Plants and Advanced Wastewater Treatment: Treatment Plants; site selection, plant design, operation and maintenance aspects. Advanced wastewater treatment for nutrient removal, disinfection and polishing.

Books Recommended:
1. Waste Water Engg. (Environmental Engg.-II) by B.C.Punmia, Ashok Jain, Laxmi Publications, New Delhi.

2. Environmental Engg. - A design Approach by Arcadio P. Sincero and Gregoria P. Sincero, Prentice Hall of India, New Delhi.

3. "Waste Water Engineering - Treatment and Reuse" by Metcalf & Eddy, TMH, New Delhi.

4. "Environmental Engg." By Howard S. Peavy, Donald R. Rowe & George Tchobanoglous, McGraw Hill, International Edition

5. Environmental Engineering (Vol. II) by S.K. Garg, Khanna Publishers, Delhi.

ACCE-16606
GEOTECHNICAL ENGINEERING LAB

			L	T	P
Internal Marks	30				
External Marks	20		0	0	2
Total marks	50		**Credits**		1

Objectives:

a) Provide civil engineering students ith the basic knowledge to carry out field investigations and to identify soils in geotechnical engineering practice of soil samples for testing and observation of soil behavior.

List of Experiments:

Part-A

1. Determination of in-situ density by core cutter method.
2. Determination of in-situ density by Sand replacement method.
3. Determination of Liquid Limit & Plastic Limit.
4. Grain size analysis of sand and determination of uniformity coefficient (Cu) and coefficient of curvature (Cc).
5. Determination of OMC and Maximum Dry Density of soil by light compaction.
6. Determination of Relative Density of soil.

Part-B

7. Determination of coefficient of permeability by Constant Head Method.
8. Determination of coefficient of permeability by Variable Head method.
9. Unconfined Compression Test for fine grained soil.
10. Direct Shear Test(Demonstration)
11. Triaxial Test(Demonstration)
12. Standard Penetration Test (Demonstration)

Books/Manual Recommended:
Soil Testing Engineering, Manual ByShamsherPrakash and P.K. Jain. Nem Chand & Brothers

ACCE -16607

ENVIRONMENTAL ENGINEERING LABORATORY

			L	T	P
Internal Marks	30		0	0	2
External Marks	20				
Total marks	50		**Credits**		1

Objectives:
- a) To make the students aware about water and its importance to human survival.
- b) Understand how to classify and analyze various quality parameters of raw water.

List of Experiments:

Part-A

1. To measure the pH value of a water/waste water sample.

2. Determination of Hardness of a given water sample

3. To measure D.O. of a given sample of water.

4. To find acidity/alkalinity of a given water sample.

5. To find MPN for the bacteriological examination of water.

6. To find the turbidity of a given waste water/water sample

Part-B

7. To find B.O.D. of a given waste water sample.

8. Determination of total solids, dissolved solids, suspended solids of a given water sample.

9. To determine the concentration of sulphates in water/wastewater sample.

10. To find chlorides in a given sample of water/waste water.

11. To determine optimum Alum dose for Coagulation.

12. To determine the COD of a wastewater sample.

Books/Manual Recommended:

Applied chemistry, DrSunita Rattan, Katson books, Delhi.

Chemistry for EnviromentalEngg.and Science by Sawyer & McCarty, TMH, New Delhi

Standard Methods for the examination of water & wastewater, APHA, AWWA, WE

ACCE-16608
COMPUTER APPLICATIONS LAB

			L	**T**	**P**
Internal Marks	30				
External Marks	20		0	0	2
Total marks	50		**Credits**		1

Objectives:

a) To understand the basic use staad pro to design the various structural elements

List of Experiments:

Part-A

Design and Analysis of the following using Staad pro.
1. Steel portal frame
2. Reinforced concrete frame
3. Analysis of slab

Part-B
4. Analysis of trusses
5. Design of G+3 storey Building (with report of BM and SF diagrams)

7ᵀᴴSEMESTER
ACCE-16801
Design of Steel Structures-II

			L	T	P
Internal Marks	: 40				
External Marks	: 60		**3**	**1**	**0**
Total Marks	: 100				

Objectives:
   a) To understand the designing principle of various structural members as plate girder, steel foot bridge, industrial shed.

Note: Use of relevant Indian Standards is allowed.

SECTION-I

1) Elements of a plate girder, design of a plate girder, curtailment of flanges, various type of stiffeners.

SECTION-II

2) Design of steel foot bridge with parallel booms and carrying wooden decking, using welded joints.

SECTION-III

3) Complete design of an industrial shed including:
i) Gantry girder
ii) Column bracket
iii) Mill bent with constant moment of inertia
iv) Lateral and longitudinal bracing for column bent

SECTION-IV

4) Design of single track railway bridge with lattice girders having parallel chords (for B.G.)
i) Stringer
ii) Cross girder
iii) Main girders with welded joints
iv) Portal sway bracings
v) Bearing rocker and rollers

BOOKS & CODES RECOMMENDED:
1) Limit state design of steel structures: **S K Duggal**
2) Design of steel structures: **N Subramanian**
3) Design of steel structures (Vol. 2): **Ram Chandra**
4) Design of steel structures: **L S Negi**
5) Design of steel structures (by limit state method as per IS: 800-2007): **S S Bhavikatti**
6) IS 800: 2007 (General construction in steel-Code of practice)*
7) SP: 6(1) (Handbook for structural engineers-Structural steel sections)*
* permitted in Examination

ACCE-16802
IRRIGATION ENGINEERING-II

		L	T	P
Internal Marks	: 40	**3**	**1**	**0**
External Marks	: 60			
Total Marks	: 100			

Objectives:
   a) To take up the basic concepts of irrigation and construction of various hydraulic structures.
   b) To introduce students to basic concepts of water, plants, their interactions, as well as irrigation and drainage systems design, planning and management.

SECTION-I

1. **Head Works**:Types of head works, Functions and investigations of a diversion head work : component parts of a diversion head work and their design considerations, silt control devices.
2. **Theories of Seepage**: Seepage force and exit gradient, assumptions and salient features of Bligh's Creep theory, Limitations of Bligh's Creep theory, salient features of Lane's weighted Creep theory and Khosla's theory, Comparison of Bligh's Creep theory and Khosla's theory, Determination of uplift pressures and floor thickness.

SECTION-II

3. **Design of Weirs**: Weirs versus barrage, types of weirs, main components of weir, causes of failure of weir and design considerations with respect to surface flow, hydraulic jump and seepage flow. Design of barrage or weir.
4. **Energy Dissipation Devices**: Use of hydraulic jump in energy dissipation, Factors affecting design, Types of energy dissipators and their hydraulic design.

SECTION-III

5. **Canal Regulators**: Offtake alignment, cross-regulators – their functions and design, Distributory head regulators, their design, canal escape.
6. **Canal Falls**: Necessity and location, types of falls and their description, selection of type of falls, Principles of design, Design of Sarda type, straight glacis and Inglis or baffle wall falls.

SECTION-IV

7. **Cross-Drainage works** : Definitions, choice of type, Hydraulic design consideration, Aqueducts their types and design, siphon aqueducts – their types and design considerations, super passages, canal siphons and level crossing.
8. **Canal Out-lets** : Essential requirements, classifications, criteria for outlet behaviours, flexibility, proportionality, sensitivity, sensitiveness, etc. Details and design of nonmodular, semi-modular and modular outlets.

Books
1. Irrigation Engg. & Hydraulic Structure by Santosh Kumar Garg, Khanna Publishers
2. Design of Irrigation Structures by R.K. Sharma, Oxford IBH Pub
3. Irrigation Engg. and Hydraulics Structures by S.R. Sahasrabudhe, . Katson Publishing
4. Irrigation Practice and Design Vol. I to VII by K.B. Khushlani. Oxford IBH Pub
5. P.N. Modi; Irrigation with Resources and with Power Engineering, Standard Book House
6. Irrigation Engg. Vol. I & II by Ivan E. Houk, John Wiley and sons

ACCE-16803
CADD LAB

		L	T	P
Internal Marks	: 30			
External Marks	: 20	0	0	2
Total Marks	: 50			

Objectives:

a) To practice all the structural drawing on AutoCAD as per ACCE-16801

Structural Drawings of Design of Steel Structures-II (ACCE-16801)

* As per requirement of the teacher

ACCE-16804
IRRIGATION ENGINEERING DRAWING

Internal Marks	**: 30**	**L**	**T**	**P**
External Marks	**: 20**	**0**	**0**	**2**
Total Marks	**: 50**			

Objectives:

a) To make the students to design various environmental and irrigation structures.
b) To make the students to design various concept of reinforced concrete structures regarding irrigation operations.

Design and drawing of :-

Part-A

1. SARDA fall.
2. Canal head regulator.
3. Launching Apron
4. Vertical drop weir

Part-B

5. Impervious floors using bligh creep theory including hydraulic gradient line.
6. Transition(Expansion & Contraction using Mitra's and chaturvedi's formula)
7. Transition(Expansion & Contraction using chaturvedi's method)

* Minimum of 5 Drawing to be prepared.

* As per requirement of the teacher

ACTP-16701

PRE PLACEMENT ACTIVITIES

Internal Marks	: 50		**L**	**T**	**P**
External Marks	: 00		**0**	**0**	**2**
Total Marks	: 50				

Objectives:
a) To Bridge the gap that currently exists between the Industry and fresh professionals for recruitment purposes.
b) To minimize Stage fear.
c) To build confidence among students.
d) To make students know the Importance of Training & Placements.

SECTION-I

Activity 1. INTRODUCTION : Self Introduction and Resume Building Skills . Spoken skills, non-verbal/ behavioral aspects ,brief family background, Education, Technical- Non Technical Skills, Accolades and Achievements and Hobbies and Interests.

SECTION-II

Activity2. Mock Interview: Mock Interviews to prepare the students for handling frequently asked Interview based Questions.

SECTION-III

Activity3. Extempore:

SECTION-IV

Activity4. PPT Presentation: Power Point Presentations on Social, Political, Socio-Political, Economical topics of National & International importance.

ACCE-16806
MAJOR PROJECT

				L	**T**	**P**
Internal Marks	:100			0	0	2
External Marks	:100					
Total Marks	: 50					

Students are required to work on project in any of the areas related to Civil Engineering. The students will work 2 hrs per week with his / her supervisor(s).

ACCE-16807
PRESTRESSED CONCRETE

Internal Marks	: 40			**L**	**T**	**P**
External Marks	: 60			**3**	**1**	**0**
Total Marks	: 100					

Objectives:

a) Students will understand the general mechanical behavior of prestressed concrete.
b) Students will be able to analyze and design prestressed concrete flexural members.
c) Students will be able to analyze and design for vertical and horizontal shear in prestressed concrete.

Note: IS 1343 is permitted in examination.

SECTION-I

Materials for prestressed concrete and prestressing systems
High strength concrete and high tensile steel – tensioning devices – pretensioning systems – post tensioning systems.

SECTION-II

Analysis of prestress and bending stresses
Analysis of prestress – resultant stresses at a sector – pressure line or thrust line and internal resisting couple – concept of load balancing – losses of prestress – deflection of beams.

Section-III

Strength of prestressed concrete sections in flexure, shear and torsion
Types of flexural failure – strain compatibility method – IS:1343 code procedure – design for limit state of shear and torsion.

Section-IV

Design of prestressed concrete beams and slabs
Transfer of prestress in pre tensioned and post tensioned members – design of anchorage zone reinforcement – design of simple beams – cable profiles – design of slabs.

Books
1. N. Krishna Raju, Prestressed concrete, Tata McGraw Hill
2. T.Y. Lin, Ned H. Burns, Design of Prestressed Concrete Structures, John Wiley & Sons.
3. P. Dayaratnam, Prestressed Concrete, Oxford & IBH
4**.** R. Rajagopalan, Prestressed Concrete.
5. IS 1343 2012 **Code of Practice for Prestressed Concrete**

ACCE-16808
EARTH AND EARTH RETAINING STRUCTURES

		L	T	P
Internal Marks	: 40	3	1	0
External Marks	: 60			
Total Marks	: 100			

Objectives:

a) To understand lateral earth pressure theories and pressure theories and design of retaining walls.
b) To design anchored bulkheads by different methods.
c) To understand pressure envelops and design of various components in braced cuts and cofferdams.
d) To understand stability of earth dams and its protection and construction.

SECTION-I

Earthen Dam
Introduction to Earthen dams, types of dams, selection of type of dam based on material availability, foundation conditions and topography
Design details – crest, free board, upstream and down stream slopes, upstream and down stream slope protection – central and inclined cores – types and design of filters
Seepage analysis and control – seepage through dam and foundations – control of seepage in earth dam and foundation

SECTION-II

Stability analysis – critical stability conditions – evaluation of stability by Bishop's and sliding wedge methods under critical conditions
Construction techniques – methods of construction – quality control
Instrumentation – measurement of pore pressures
Earth pressure theories – Rankine's and Coulomb's earth pressure theories for cohesionless and cohesive backfills – computation of earth pressures for various cases – inclined – with surcharge – submerged and partly submerged – stratified backfills

SECTION-III

Rigid retaining structures – active and passive earth pressures against gravity retaining walls – computation of earth pressures by Trial wedge method – a mathematical approach for completely submerged and partly submerged backfills – Perched water table – importance of capability tension in earth pressure.
Graphical methods of earth pressure computation – trial wedge method for coulomb's and Rankine's conditions, for regular and irregular ground and wall conditions – Rebhan's construction for active pressure – friction circle method – logarithmic spiral method.
Design of gravity retaining wall – cantilever retaining walls

SECTION-IV

Flexible retaining structure – type and methods of construction – design strength parameters – safety factor for sheet pile walls – computation of earth pressures against cantilever sheet piles in cohesionless and cohesive soils – anchored sheet piles – free earth method – fixed earth method – Rowe's moment reduction method – stability of sheet piling
Diaphragm walls and coffer dams – type of diaphragm walls and their construction techniques in

various soil types – earth pressure on braced cuts and coffer dams – design of coffer dams

Reference books

1. Huntington, Earth pressure on retaining walls.
2. Bowles, Foundation Analysis and Design.
3. Jones, Earth Reinforcements & Soil structures.
4. Prakash, Ranjan & Sasan, Analysis & Design of Foundation & Retaining Structures.

ACCE-16809
REINFORCED EARTH AND GEOTEXTILES

		L	T	P
Internal Marks	: 40			
External Marks	: 60	3	1	0
Total Marks	: 100			

Objectives:

a) To understand the emerging trends of Geosynthetic in Geotechnical Engineering

SECTION-I

Reinforced Earth – The mechanisms of the reinforced earth techniques – Design principles – Materials used for construction – Advantages of reinforced earth – Reinforced earth construction with GI sheets and strips

SECTION-II

An overview of Geosynthetics, Description of Geotextiles – Geogrids – Geonets – Geomembranes – Geocomposites – Geocells – Designing with Geotextiles – Geotextile properties and test methods – Functions of Geotextile – Design methods for separation – stabilization – filtration – Drainage, Soil anchors.

SECTION-III

Designing with Geogrids – Geogrid properties and test methods – Designing with Geonets – Geonet properties and test methods – Designing with Geomembranes – Geomembrane properties and test methods – construction practices with Geotextiles, Geogrids, Geonets, Geomembranes

SECTION-IV

Design of liquid Contaminant liners – liquid contaminant liners – Covers for reservoirs- Water conveyance (Canal liners)-- solid material liners – underground storage tanks – Design of pavements Geo composites as liquid / Vapour Barriers –Improvement in bearing capacity – Erosion Control for waterways.

Reference books
1. Robert M. Koerner, *Designing with Geosynthetics*, Prentice Hall – 1989
2. G.V Rao & GVS Suryanarayana Raju, *Engineering with Geosynthetics*, Tata Mc Graw Hill Publishing Co. New Delhi
3. Korener, *Construction & Geotechnical Methods In Foundation Engineering*, McGraw Hill
4. Shukla, S.K. and Yin, J.H. Fundamental of Geosynthetic Engineering, Taylor & Francis
5. Swamisaran, Reinforced Soil and its Engineering Application, New Age Publication
6. Gulati, S.K. and Datta, M., Geotechnical Engineering, TMH

ACCE-16810
PAVEMENT DESIGN

		L T P
Internal Marks	: 40	
External Marks	: 60	3 1 0
Total Marks	: 100	

Objectives:
  a) To identify the pavement components and design bituminous mixes,
  b) To Analyze and design flexible and rigid pavements iii. evaluate structural condition of pavement.

Note: Use of IRC:37-2012 and IRC:58-2011 shall be allowed in the examination.
SECTION-I

1. **Introduction:** Types of pavement structure. Functions of pavement components, Factors affecting pavement design, Design wheel load, Strength characteristics of pavement materials. Comparison of flexible and rigid pavements.
SECTION-II

2. **Design of Flexible Pavements:** General design considerations, Methods for design of flexible pavements – Group Index Method, Triaxial Test Method, Hveem Stabilometer Method, McLeod's Method, Indian Roads Congress Method.

SECTION-III

3. **Design of Bituminous Mixes:** Mix Design Approaches, Marshall Method of Bituminous Mix Design, Superpave

4. **Design of Rigid Pavements:** General design considerations, Westergard's Analysis, Methods for design of rigid pavements - PCA method, AASHTO Method, Indian Roads Congress Method, Types and design of Joints in cement concrete pavements.

SECTION-IV

5. **Modern Design Concepts:** Reinforced Concrete Pavement, Airport Pavement Design, Bituminous Pavement with Cemented Base, Interlocking Concrete Block Pavement, Full Depth Bituminous Pavement, Ultrathin White Topping, Perpetual Pavement, Pavement Overlays.
Books Recommended:
1. Yoder, E. J., and M. W. Witczak, "Principals of Pavement Design", Wiley Publication.
2. Khanna, S. K., and C. E. G. Justo, "Highway Engineering", Nem Chand & Bros., Roorkee.
3. Sharma, S. K., "Principles, Practice and Design of Highway Engineering", S. Chand & Co.
4. Chakraborty,P. and A.Das, "Principles of Transportation Engineering", Prentice Hall India.
5. Yang H. Huang, "Pavement Analysis and Design", Prentice Hall.

ACCE-16811
TRAFFIC ENGINEERING

			L T P
Internal Marks	: 40		
External Marks	: 60		3 1 0
Total Marks	: 100		

Objectives:

   a) To have an overall knowledge of the traffic components and assess the traffic characteristics and related problems. ...
   b) To provide knowledge of traffic control devices and its techniques in transportation interaction.

SECTION-I
1. Introduction: Elements of Traffic Engineering, Components of traffic system – road users, vehicles, highways and control devices.
2. Vehicle Characteristics: IRC standards, Design speed, volume, Highway capacity and levels of service, capacity of urban and rural roads, PCU concept and its limitations.

SECTION-II

3. Traffic Stream Characteristics: Traffic stream parameters, characteristics of interrupted and uninterrupted flows.
4. Traffic Studies: Traffic volume studies, origin destination studies, speed studies, travel time and delay studies, parking studies, accident studies.

SECTION-III

5. Traffic Regulation and Control: Signs and markings, Traffic System Management, At-grade intersections, Channelisation, Roundabouts.
6. Traffic Signals: Pre-timed and traffic actuated. Design of signal setting, phase diagrams, timing diagram, Signal co-ordination.

SECTION-IV

7. Grade Separated Intersections: Geometric elements for divided and access controlled highways and expressways.
8. Traffic Safety: Principles and practices, Road safety audit.
9. Intelligent Transportation System: Applications in Traffic Engineering

Books Recommended:
1. William, R.M. and Roger, P.R., "Traffic Engineering", Prentice Hall.
2. Hobbs, F.D., "Traffic Planning and Engineering", Pergamon Press.
3. Khisty, C.J. and Kent, B.L., "Transportation Engineering – An Introduction", Prentice Hall of India Pvt. Ltd.
4. Kadiyali, L.R., "Traffic Engineering & Transport Planning", Khanna Publishers, New Delhi.
5. Mannering, "Principles of Highway Engineering & Traffic Analysis", Wiley Publishers, New Delhi.

ACCE-16812
BRIDGE ENGINEERING

		L T P
Internal Marks	: 40	
External Marks	: 60	3 1 0
Total Marks	: 100	

Objectives:

a) To understand various types of sub-structures and foundations, bearing, joints and appurtenances required for bridges.
b) Able to learn about methods of construction and maintenance of bridges along with causes of bridge failure.

SECTION-I

1. Introduction: Definition and components of a bridge, Classification of bridges, Choice of a bridge type.
2. Investigation for Bridges: Need for investigation, Selection of bridge site, Determination of design discharge for River Bridge, Linear waterway, Economical span, Vertical clearance, Scour depth, Afflux, Traffic projection.

SECTION-II

3. Standard Specifications for Road Bridges: IRC Bridge Codes, Width of carriageway, Clearances, Dead load, I.R.C. standard live loads, Impact effect, Wind load, Longitudinal forces, Centrifugal forces, Horizontal forces due to water current, Buoyancy effect, Earth pressure, Deformation stresses, Erection stresses, Temperature effects, and Seismic force.
4. Reinforced Concrete Bridges: Types of RCC bridges; Culverts - Box Culvert, Pipe Culvert, Solid slab bridge, T-beam girder bridges, Hollow girder bridges, Balanced cantilever bridges, Continuous girder bridges, Rigid frame bridges, Arch bridges, Pre-stressed concrete bridges.

SECTION-III

5. Steel Bridges: Types of Steel bridges; Beam bridges, Plate girder bridges, Box girder bridges, Truss bridges, Arch bridges, Cantilever bridges, Cable stayed bridges, Suspension bridges.
6. Sub-structure and Foundation: Piers and abutments, materials for piers and abutments, Types of foundations; Shallow, Pile, and Well foundations. Relative merits of piles and well foundations, Pneumatic Caissons, Box Caissons.

SECTION-IV

7. Bearings, Joints & Appurtenances: Importance of Bearings, Different types of bearings-Expansion Bearings, Fixed Bearings, Elastomeric Bearings, Expansion joints, Wearing Course, Approach Slab, Footpath, Handrails.
8. Construction and Maintenance of Bridges: Methods of construction of concrete and steel bridges. Formwork and falsework for concrete bridges, Causes of Bridge failures, Inspection and maintenance.

Books Recommended:
1. Johnson, Victor, "Essentials of Bridge Engineering", Oxford University Press.
2. Khadilkar, C. H., "A Text book of Bridge Construction", Allied Publishers.
3. Rangwala, S. C., "Bridge Engineering", Charotar Publishing House Pvt. Ltd.
4. Raina, V. K., "Concrete Bridges Handbook", Shroff Publishers and Distributors.
5. Ponnuswamy, S. "Bridge Engineering", McGraw Hill Education.

ACCE-16813
ADVANCED REINFORCED CONCRETE DESIGN

		L	**T**	**P**
Internal Marks : 40
External Marks : 60
Total Marks : 100

L T P
3 1 0

Objectives:

a) The aim of this course is to keep students up to date with various advanced mechanics and theories on reinforced concrete structures and to develop your skills to conduct analysis and practical design of real-life RC structure.

Note: No Indian Codes of Practice and Design handbooks are permitted, so paper setter is expected to provide required data from relevant IS codes, for any numerical or design part.

SECTION-I

Large span concrete roofs – Classification- Behaviour of Flat slabs- Direct design and equivalent frame method- Codal provisions

Forms of Shells and Folded plates- Structural behaviour of cylindrical shell and folded plate- Method of analysis-beam action, arch action and membrane analysis- Codal provisions- Design of simply supported circular cylindrical long shells and folded plates.

SECTION-II

Yield line analysis of slabs- virtual work and equilibrium method of analysis- simply supported rectangular slabs with corners held down- uniform and concentrated loads- design of simply supported rectangular and circular slabs

SECTION-III

Analysis of deep beams- Design as per IS 456-2000

Analysis of stresses in concrete chimneys- uncracked and cracked sections- Codal provisions- Design of chimney

SECTION-IV

Retaining walls -Analysis and Design of cantilever and counterfort retaining walls with horizontal and inclined surcharge.

Overhead water tanks- rectangular and circular with flat bottom- spherical and conical tank roofsstaging-

Design based on IS 3370

Reference books

1. Reinforced Concrete Structural Elements- Purushothaman. P, Tata Mc Graw Hill
2. Design and Construction of Concrete Shell Roofs- G.S.Ramaswamy
3. Reinforced Concrete – Ashok K Jain, Nem Chand Bros. Roorkee
4. Plain and Reinforced Concrete – Jain & Jaikrishna, Vol. I & II, Nem Chand Bros. Roorkee
5. Reinforced Concrete Chimneys- Taylor C Pere,
6. Yield Line Analysis of Slabs- Jones L L, Thomas and Hudson
7. Design of deep girders, Concrete Association of India
8. Reinforced Concrete, Mallick & Gupta- Oxford & IBH
9. IS 456-2000
10. IS2210-1998- Criteria for design of reinforced concrete shell structures and folded plates
11. IS 4998-1998- Criteria for design of reinforced concrete chimneys
12. IS 3370- 1991- Part 1-4- Code of Practice for concrete structures for the storage of liquids

ACCE-16815
NUMERICAL METHODS IN CIVIL ENGINEERING

		L	**T**	**P**
Internal Marks	: 40			
External Marks	: 60	**3**	**1**	**0**
Total Marks	: 100			

Objectives:
   a) The aim of the course is to develop a sound understanding of the various numerical techniques, principles and their application to Civil engineering problems.
   b) Fundamental principles and basics of numerical methods will be covered.

SECTION-I

Unit I: Fourier Series: Periodic functions, Euler's formula. Even and Odd functions, half range expansions

Unit II: Laplace Transforms: Laplace transforms of various standard functions, properties of Laplace transforms, inverse Laplace transforms, transform of derivatives and integrals. Applications to solution of ordinary linear differential equations with constant coefficients

SECTION-II

Unit III: Partial Differential Equations: Formation of partial differential equations. Solution of homogenous partial differential equations with constant coefficients

Unit IV: Function of Complex variable: Analytic function, Cauchy- Riemann equations, Harmonic functions, Cauchy's integral theorem, Cauchy's integral formula and derivative of analytic Function .Taylor's and Laurent's expansions (without proof), Singular points, poles, residue, Integration of function of complex variables using the method of residues.

SECTION-III

Unit V: Solution of Equations: Solution of Algebraic and Transcendental equations by Bisection method, Regula- Falsi method, Newton - Raphson Method. Solution of linear system of equations by Gauss- Elimination method, Guass - jardan method. LU Decomposition Method. Interpolation.(Newton forward – Backward, Gauss Forward- backward, Newton divided difference, Lagrange's interpolation).

SECTION-IV

Unit VI: Curve fitting: Fitting of Data in straight line, second degree equation, linear curve and Exponential curve by least Square method. Solution of linear differential equations by initial value problems.(Euler methods and R.K order methods).

Suggested Readings/ Books
 Kreyszing E.. Advanced Engineering Mathematics , Eighth edition. John wiely. New Delhi
 Grewal B.S. Higher Engineering Mathematics. Khanna Publisher. New Delhi.
 Ian N. Sneedon. Elements of Partial differential equation. Mcgraw – Hill. Singapore.
 Bindra. J. S. Applied Engineering. Volume – III. Kataria Publications.
 Advanced Engineering Mathematics, O'Neil.Cengage Learing.
 Babu Ram Advance Engineering Mathematics. Pearson Education.
 N.P Bali. Laxmi Publication.

ACCE-16816
ROCK MECHANICS AND ENGINEERING GEOLOGY

		L	T	P
Internal Marks	: 40	3	1	0
External Marks	: 60			
Total Marks	: 100			

Objectives:
   a) To understand the Rock Engineering concepts and approaches in the design and construction.

SECTION-I

General Geology : Importance of Engg. Geology applied to Civil Engg. Practices. Weathering, definition, types and effect. Geological works of rivers, wind, glaciers as agents of erosion, transportation and deposition.
Rocks & Minerals : Minerals, their identification, igneous, sedimentary & metamorphic rocks. Classification of rocks for engineering purposes. Rock quality designation (RQD).

SECTION-II

Structural Geology: Brief idea about stratification, apparent dip, true dip, strike and in conformities. Folds, faults & joints : definition, classification relation to engineering operations.
Engineering Geology: Geological considerations in the Engg. Projects like tunnels, highways, foundation, dams, reservoirs. Earthquake : Definition, terminology, earthquake waves, intensity, recording of earthquake.

SECTION-III

Engineering properties of rocks and laboratory measurement : Uniaxial compression test, tensile tests, permeability test, shear tests, size and shape of specimen rate of testing. Confining pressure, stress strain curves of typical rocks. Strength of intact and fissured rocks, effect of anisotropy, effect of saturation and temperature

SECTION-IV

In-situ determination of Engg. Properties of Rock masses : Necessity of in-situ tests, uniaxial load tests in tunnels and open excavations, cable tests, flat jack test, shear test, pressure tunnel test. Simple methods of determining in situ stresses,bore hole test
Improvement in properties of Rock masses : Pressure grouting for dams and tunnels, rock reinforcement rock bolting.

Suggested Readings / Books:
 Introduction to Rock Mechanics : Richard E. Goodman.
 Engg. Behaviour of rocks : Farmar, I.W.
 Rock Mechanics and Engg. : Jaager C.
 Fundamentals of Rock Mechanics : Jaager and Cook
 Engineering Geology : D.S.Arora
 Engineering Geology : Parbin Singh
 Rock Mechanics for Engineering : B.P. Verma

ACCE-16817
ELEMENTS OF EARTHQUAKE ENGINEERING

Internal Marks	: 40		**L**	**T**	**P**
External Marks	: 60		**3**	**1**	**0**
Total Marks	: 100				

Objectives:
   a) The students will get a diverse knowledge of earthquake engineering practices applied to real life problems
   b) The students will learn to understand the theoretical and practical aspects of earthquake engineering along with the planning and design aspects.

Note: No Indian Codes of Practice and Design handbooks are permitted, so paper setter is expected to provide required data from relevant IS codes, for any numerical or design part.

SECTION-I
1. Introduction to Earthquakes, Causes of Earthquakes, Basic Terminology, Magnitude, Intensity, Peak ground motion parameters.
2. Past Earthquakes and Lessons learnt, Various Types of Damages to Buildings.

SECTION-II
3. Introduction to theory of Vibrations, Sources of Vibrations, Types of Vibrations, Degree of Freedom, Spring action and damping, Equation of motion of S.D.O.F. systems, Undamped, Damped system subjected to transient forces, general solution, green's function.
4. Lateral Force analysis, Floor Diaphragm action, moment resisting frames, shear walls.

SECTION-III
5. Concepts of seismic design, Lateral Strength, Stiffness, ductility and structural configuration.
6. Introduction to provisions of IS 1893-2002 Part-I for buildings. Estimation of lateral forces due to earthquake.

SECTION-IV
7. Introduction to provisions of IS 4326.
8. Introduction to provision of IS 13920.

References :
1. Earthquake Resistant Design of Structures, Pankaj Agrawal, Manish Shrikhande, PHI Learning
2. Dynamics of Structures: Theory and Applications to Earthquake Engineering, AK Chopra, Prentice Hall
3. Dynamics of Structures, R.W. Clough and Joseph Penzien, McGraw-Hill Education
4. Structural Dynamics by Mario & Paz, Springer.
5. Earthquake Resistant Design by David J. Dowrick, Wiley India Pvt Ltd
6. Elements of Earthquake Engg by Jai Krishna, A.R. Chandrasekaran, Brijesh Chandra, South Asian Publishers.
7. IS 1893-2002 Indian Standard Criteria for Earthquake Resistant Design of Structures.
8. IS 4326-1993 2002 Indian Standard for Earthquake Resistant Design and Construction of Buildings.
9. IS 13920-1993 2002 Ductile detailing of Reinforced Concrete Structures subjected to Seismic Forces.

ACCE-16814
DISASTER MANAGEMENT

		L T P
Internal Marks	: 40	**3 1 0**
External Marks	: 60	
Total Marks	: 100	

Objectives:

a) To provide basic conceptual understanding of disasters and its relationships with development.
b) To gain understand approaches of Disaster Risk Reduction (DRR) and the relationship between vulnerability, disasters, disaster prevention and risk reduction.

SECTION-I

Introduction to Disaster Management: Define and describe disaster, hazard, emergency, vulnerability, risk and disaster management; Identify and describe the types of natural and non-natural disasters. Important phases of Disaster Management Cycle.
Disaster Mitigation and Preparedness: *Natural Hazards*: causes, distribution pattern, consequences and mitigation measures for earth quake, tsunami, cyclone, flood, landslide drought etc. *Man-made hazards*: causes, consequences mitigation measures for various industrial hazards/disasters, Preparedness for natural disasters in urban areas.

SECTION-II

Hazard and Risk Assessment: Assessment of capacity, vulnerability and risk, vulnerability and risk mapping, stages in disaster recovery and associated problems.
Emergency Management Systems (EMS): Emergency medical and essential public health services, response and recovery operations, reconstruction and rehabilitation.

SECTION-III

Capacity Building: Gender sensitive disaster management approach and inculcate new skills and sharpen existing skills of government officials, voluntary activists, development of professional and elected representative for effective disaster management, role of media in effective disaster management, overview of disaster management in India, role of agencies like NDMA, SDMA and other International agencies, organizational structure, role of insurance sector, DM act and NDMA guidelines..
Application of Geoinformatics and Advanced Techniques: Use of Remote Sensing Systems (RSS) and GIS in disaster Management, role of knowledge based expert systems in hazard scenario, using risks-time charts to plan for the future, early warning systems.

SECTION-IV

Integration of public policy: Planning and design of infrastructure for disaster management, Community based approach in disaster management, methods for effective dissemination of information, ecological and sustainable development models for disaster management.
Case Studies: Lessons and experiences from various important disasters with specific reference to Civil Engineering.

Books/References:
1. Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill.Pub

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2. Natural Disaster management, Jon Ingleton (Ed), Published by Tudor Rose, Leicester

3. Disaster Management, R.B. Singh (Ed), Rawat Publications

4. ESCAP: Asian and the Pacific Report on Natural Hazards and Natural Disaster Reduction.

5. www.http//ndma,gov,in

6. Disaster Management –Future Challenges & Opportunities by Jagbir Singh, I.K. International Publishing House.

ACCE-16818
INFRASTRUCTURE DEVELOPMENT & MANAGEMENT

			L T P
Internal Marks : 40

Internal Marks : 40   L T P
External Marks : 60   3 1 0
Total Marks : 100

Objectives:
   a) To provide students with a thorough grounding in the key concepts of Infrastructure development.
   b) To illustrate how these concepts and standard management tools can be used to for Infrastructure-management.
   c) To be able to apply this knowledge to the analysis of specific infrastructure development issues in India

SECTION-I

Introduction: Impact of Infrastructure development on economic development, standard of living and environment. Reasons for rise of public sector and government in infrastructural activities. Changed socio-economic scenario and current problems and related issues.
Policies on Infrastructure Development: A historical review of the Government policies on infrastructure. Current public policies on transportations, power and telecom sectors. Plans for infrastructure development. Legal framework for regulating private participation in roads and highways, Ports & Airports, Power and Telecom.

SECTION-II

Construction and Infrastructure: Construction component of various infrastructure sectors. Highway, ports and aviation, oil and gas, power, telecom, railways, irrigation. Current scenario, future needs, investment needed, regulatory framework, government policies and future plans. Technological and methodological demands on construction management in infrastructure development projects.

SECTION-III

Infrastructure Management: Importance, scope and role in different sectors of construction.
Highway Sector: Repayment of Funds, Toll Collection Strategy, Shadow tolling, and direct tolls, Maintenance strategy, Review of toll rates & structuring to suit the traffic demand,
Irrigation Projects: Large / Small Dams - Instrumentation, monitoring of water levels, catchments area, rainfall data management, prediction, land irrigation planning & policies, processes Barrages, Canals.

SECTION-IV

Power Projects: Power scenario in India, Estimated requirement, Generation of Power distribution strategies, national grid, load calculation & factors, Hydropower - day to day operations, management structures, maintenance, Thermal Power, Nuclear Power.
Airports: Requisites of domestic & International airports & cargo & military airports, facilities available, Terminal management, ATC.
Railways: Mass Rapid Transport System MRTS, LRT, Multi-modal Transport System.

Books Recommended:
1. Chandra, Prassanna, "Projects, Planning, Analysis, Selection, Financing, Implementation and Review", Tata McGraw-Hill, New Delhi, 2006.
2. Raghuram, G. & Jain, R., "Infrastructure Development & Financing Towards a Public-Private

Partnership", Macmillan India Ltd., New Delhi, 2002.
3. India Infrastructure Report 2001 & 2002, Oxford University Press, New Delhi, 2001/02.
4. NICMAR, "Construction Business Opportunities in Infrastructure Development in India", NICMAR, Mumbai, 2001.
5. Parikh Kirit S., "India Development Report, 1999-2000", Oxford University Press, New Delhi, 2002.
6. GOI Rakesh Mohan Committee, "The India Infrastructure Report", National Council of Applied Economic Research, New Delhi, 1996

ACEE-16703
Non Conventional Energy Sources

Internal Marks : 40   **L   T   P**
External Marks : 60   **3   -   -**
Total Marks : 100

Objectives:
   a) Demonstrate the generation of electricity from various Non-Conventional sources of energy, have a working knowledge on types of fuel cells.
   b) Estimate the solar energy, Utilization of it, Principles involved in solar energy collection and conversion of it to electricity generation

SECTION-I
INTRODUCTION: Limitation of conventional energy sources, need and growth of alternative energy source, basic scheme and application of direct energy conservation.

SECTION-II

MHD GENERATORS: Basic principles, gaseous, conduction and hall effect, generator and motor effect, different types of Magneto-Hydro-Dynamic (MHD) generator, types of MHD material, conversion effectiveness, analysis of constant area MHD generator, practical MHD generator, application and economic aspects.
THERMO-ELECTRIC GENERATORS: Thermoelectric effects, Seeback effect, Peltier effect, Thomson effect, thermoelectric converters, figures of merit, properties of thermoelectric material, brief description of the construction of thermoelectric generators, application and economic aspect.

SECTION-III

PHOTOVOLTAIC EFFECT AND SOLAR ENERGY: Photovoltaic effect, different types of photovoltaic cells, cell fabrication, characteristics of photovoltaic cells, conversion efficiency, solar batteries, application, solar radiation analysis, solar energy in India, solar collectors, solar furnaces and applications.
FUEL CELLS: Principle of action, Gibb's free energy, general description of fuel cells,types, construction, operational characteristics and application.

SECTION-IV

MISCELLANEOUS SOURCES: Geothermal system, hydro-electric plants, wind power, tidal energy, Bio-mass energy
BOOKS RECOMMENDED:
1. Gupta B. R., Generation of Electrical Energy, S. Chand.
2. Rai, G.D., Non Conventional Energy Sources, Khanna Publishers (2005).
3. Rao, S. and Parulekar, B.B., Energy Technology: Non Conventional, Renewable and Conventional, Khanna Publishers (2005).
 4. Wadhwa, C.L., Generation, Distribution and Utilization of Electric Energy, New Age International (P) Limited, Publishers (2007).
 5. Simon , Christopher A., Alternate Source of Energy, Rowman and LittleField Publishers Inc.(2007).
 6. Venikov, V.A. and Putyain, E.V., Introduction to Energy Technology, Mir Publishers (1990).
7. Chakrabarti A., Soni M. L., Gupta P. V. and Bhatnagar U. S., Power System Engineering, Dhanpat Rai and Co.
8. Kothari D.P., Singal K.C. and Ranjan R., Renewable Energy Sources and Emerging Technologies, Prentice Hall (India)

ACCS-16712
HAINA (Routing and Switching Technology)

Internal Marks : 40   **L   T   P**

External Marks : 60   **3   -   -**

Total Marks : 100

Objectives:
   a)   To understand the basics of routing and switching technology
SECTION-I
Basic Enterprise Network Architectures, Enterprise Network Constructs, Ethernet Framing, IP Addressing, Internet Control Message Protocol, Address Resolution Protocol, Transport Layer Protocols, Data Forwarding Scenario, Expanding the Huawei Enterprise Network, Navigating The CLI, File System Navigation and Management.
SECTION-II
VRP Operating System Image Management, Establishing a Single Switched Network, Spanning Tree Protocol, Rapid Spanning Tree Protocol, Segmenting the IP Network, IP Static Routes, Distance Vector Routing with RIP, Link State Routing with OSPF, DHCP Protocol Principles, FTP Protocol Principles, Telnet Protocol Principles, Advanced Enterprise Solutions Overview.
SECTION-III
Link Aggregation, VLAN Principles, GARP and GVRP, VLAN Routing, Wireless LAN Overview, Bridging Enterprise Networks with Serial WAN Technology, Frame Relay Principles Establishing DSL Networks with PPPoE, Network Address Translation, Establishing Enterprise Radio Access Network Solutions, Access Control Lists, AAA.
SECTION-IV
Securing Data with IPsec VPN, Generic Routing Encapsulation, Simple Network Management Protocol, eSight Network Management Solutions, Introducing IPv6 Networks, IPv6 Routing Technologies, IPv6 Application Services DHCPv6.
Suggested Readings/Books
1. Routing and Switching Technology Student Guide Volume I
2. Routing and Switching Technology Lab Guide Volume I
3. Routing and Switching Technology Student Guide Volume II
4. Routing and Switching Technology Lab Guide Volume II

ACCS-16613
HUMAN RESOURCE MANAGEMENT

Internal Marks: 40	**L T P**	
External Marks: 60	**3 0 0**	
Total Marks: 100		

Objectives:
a) To enable the students to understand the HR Management and system at various levels in general and in certain specific industries or organizations.
b) To help the students focus on and analyse the issues and strategies required to select and develop manpower resources
c) To develop relevant skills necessary for application in HR related issues
d) To Enable the students to integrate the understanding of various HR concepts along with the domain concept in order to take correct business decisions

SECTION-I

UNIT- 1
Introduction: Introduction to Human Resource Management and its definition, functions of Human Resource Management & its relation to other managerial functions. Nature, Scope and Importance of Human Resource Management in Industry, Procurement and Placement: Need and Process of Human Resource Planning.

SECTION-II

UNIT-2
Methods of Recruitment; Psychological tests and interviewing; Meaning and Importance of Placement and Induction, The Contract Labour (Regulation & Abolition) Act 1970.Training

& Development: Difference between training and Development; Principles of Training; Employee Development; Promotion-Merit v/s seniority Performance Appraisal, Career Development &Planning. Job analysis & Design: Job Analysis: Job Description & Job Specification and Job Satisfaction.

SECTION-III

UNIT-3
Motivation, Factors affecting motivation, and its Theories, Workers ' Participation, Quality of work life. The Compensation Function: Basic concepts in wage administration, company's wage policy. Job Evaluation, Issues in wage administration, Bonus & Incentives, Payment of Wages Act-1936,Minimum Wages Act-1961,Human Relations and Industrial Relations, Factors required for good Human Relation Policy in Industry ;Employee , Employer relationship Causes and Effects of Industrial disputes; Employees Grievances &their Redressal
, Absenteeism, Labour Turnover, Changing face of the Indian work force and their environment, Importance of collective Bargaining;

SECTION-IV

UNIT-4
Role of Trade unions in maintaining cordial Industrial Relations, Fringe &retirement terminal benefits, administration of welfare amenities, Meaning and Importance of Employee Safety, Accidents-Causes &

their Prevention, Safety Previsions under the Factories Act 1948;Welfare of Employees and its Importance, Social security, Family Pension Scheme, ESI act 1948,
Workmen's Gratuity Act 1972, Future challenges for Human Resource Management.

 Recommended Text Books:
1. T.N.Chhabra- Human Resource Management (Dhanpat Rai & Co.)
Recommended Reference Books:
1. Lowin B. Flippo – Pr

Principles of personnel Management (Mc Graw-Hill)

ACME-16704
OPERATION RESEARCH

Internal Marks: 40   **L T P**
External Marks: 60   **3 0 0**
Total Marks: 100
Objectives:
   a) This module aims to introduce students to use quantitive methods and techniques for effective
       decisions–making; model formulation and applications that are used in solving business decision
       problem

SECTION-I

Detailed Contents
1. Introduction: Origin of OR and its role in solving industrial problems: General approach for solving
OR problems. Classification of mathematical models: various decision making environments.

2. Deterministic Models: Formulation of deterministic linear mathematical models: Graphical and
simplex techniques for solution of linear programming problems, Big M method and two phase method,
Introduction to duality theory and sensitivity analysis: transportation, assignment and sequencing models.

SECTION-II

3. Game theory: Solution of simple two person zero-sum games: Examples of simple competitive
situation.

4. Sequencing Problems: Types of sequencing problems, Shortest processing time rule, Processing of jobs
through different machines.

SECTION-III

5. Replacement Models : Replacement of items that deteriorate, Replacement of items whose
maintenance and repair costs increase with time, replacement of items that fail suddenly; replacement of
items whose maintenance costs increase with time and value of money also changes, individual
replacement policy, group replacement policy.

SECTION-IV

6. Network models : Shortest route and traveling sales - man problems, PERT & CPM introduction,
analysis of time bound project situations, construction of networks, identification of critical path, slack
and float, crashing of network for cost reduction, resource leveling and smoothening.

Books:
1. Operations Research, Hira D.S & Gupta P.K, S. Chand & Co.
2. Principles of Operations Research, Wagner H.M Prentice Hall
3. Operations Research, Taha, H.A Macmillan Publishing Co.

ACCE-16701/ACCE-16702
SOFTWARE AND INDUSTRIAL TRAINING

Internal Marks **: 450**
External Marks **: 300**
Total Marks **: 750**

Course **Duration Internal External Total**

a) Software Training Minimum 6 week   150   100   250

b) Industrial Training Minimum 12 week   300   200   500

*List of Software for Training to be learnt during Training Period

Any software that enhances professional capability in civil engineering practice a partial

indicative list is mentioned below:

1. GT STRUDAL

2. PRIMA VERA

3. GEOTECH

 4. ARCVIEW GIS

5. GEO 5

 6. GEO STUDIO PROF 2004

7. AUTOCAD CIVIL 3D

8. MX ROAD

9. 3DS MAX

10. GEOMATIC

11. STAAD PRO

12. HDM-4

13. PLAXIS

14. Any other relevant software