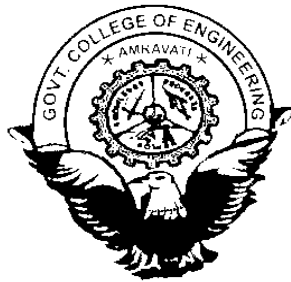# GOVT. COLLEGE OF ENGINEERING, AMRAVATI

B. TECH. (Civil Engineering)
CURRICULUM
II year

Department of Civil Engineering
2011-12

GOVERNMENT COLLEGE OF ENGINEERING, AMRAVATI.
Department of Civil Engineering.
B. Tech. (Civil Engineering)
SEM III

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	Credits
SHU301	Engineering Mathematics-III	3	--	---	3	10	15	15	60	---	---	100	3
CEU301	Engineering Geology & Hydrology	3	---	---	3	10	15	15	60	---	---	100	3
CEU302	Fluid Mechanics	3	1	---	4	10	15	15	60	---	---	100	4
CEU303	Strength of Materials	3	1	---	4	10	15	15	60	---	---	100	4
CEU304	Building Construction & Materials	3	---	---	3	10	15	15	60	---	---	100	3
SHU305	General Proficiency II	1	---	2	3	---	---	---	---	25	25	50	2
CEU305	Engineering Geology & Hydrology Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU306	Fluid Mechanics Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU307	Strength of Materials Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU308	Building Construction & Materials Lab	---	---	2	2	---	---	---	---	25	25	50	1
	Total	16	2	10	28	50	75	75	300	125	125	750	23

TA :Teacher Assessment   CT: Class Tests   ESE: End Semester Examination   ICA : Internal Contineous Accessment

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min.

SEM IV

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	Credits
CEU401	Engineering Economics & Humanities	3	--	---	3	10	15	15	60	---	---	100	3
CEU402	Transportation Engineering	3	1	---	4	10	15	15	60	---	---	100	4
CEU403	Surveying	3	1	---	4	10	15	15	60	---	---	100	4
CEU404	Concrete Technology	3	---	---	3	10	15	15	60	---	---	100	3
CEU405	Open Channel Flow & Hydraulic Machines	3	1	---	4	10	15	15	60	---	---	100	4
CEU406	Transportation Engineering Lab	---	---	2	2					25	25	50	1
CEU407	Surveying Lab	---	---	4	4	---	---	---	---	50	50	100	2
CEU408	Concrete Technology Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU409	Open Channel Flow & Hydraulic Machines Lab	---	---	2	2	---	---	---	---	25	25	50	1
	Total	15	3	10	28	50	75	75	300	125	125	750	23

TA :Teacher Assessment   CT: Class Tests   ESE: End Semester Examination   ICA : Internal Contineous Accessment

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min.

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SEM V

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	Credits
CEU501	Theory of Structures	3	1	---	4	10	15	15	60	---	---	100	4
CEU502	Design of Steel Structures	3	1	---	4	10	15	15	60	---	---	100	4
CEU503	Building Design & Drawing	2	---	---	2	10	15	15	60	---	---	100	2
CEU504	Advanced Surveying	3	1	---	4	10	15	15	60	---	---	100	4
CEU505	Water Treatment Process & Technology	3	---	---	3	10	15	15	60	---	---	100	3
CEU506	Design of Steel Structures Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU507	Building Design & Drawing Lab	---	---	4	4	---	---	---	---	50	25	75	2
CEU508	Advanced Surveying Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU509	Water Treatment Process & Technology Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU510	Self Study-I	---	---	----	--	---	---	---	---	25	---	25	1
	Total	**14**	**3**	**10**	**27**	**50**	**75**	**75**	**300**	**150**	**100**	**750**	**23**

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min. except course CEU502 and CEU503 for which the ESE duration will be 3 hrs.

Self study-I is based on one class test each, on the basis of 20% curriculum of the courses CEU501, CEU503, CEU504 and CEU505 to be declared by respective course coordinator at the beginng of the semester.

One faculty member shall be appointed as course coordinator for Self Study I and his/ her teaching work load shall be considered as one hr/week.

SEM VI

Course Code	Name of the Course	Teaching Scheme				Evaluation Scheme							
						Theory				Practical			
		Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	Credits
CEU601	Design of Reinforced Concrete Structures	3	--	---	3	10	15	15	60	---	---	100	3
CEU602	Geotechnical Engineering	3	---	---	3	10	15	15	60	---	---	100	3
CEU603	Water Resources Engineering	3	---	---	3	10	15	15	60	---	---	100	3
CEU604	Construction Management	3	---	---	3	10	15	15	60	---	---	100	3
CEU605	Estimating & Costing	3	---	---	3	10	15	15	60	---	---	100	3
CEU606	Design of Reinforced Concrete Structures Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU607	Geotechnical Engineering Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU608	Water Resource Engineering Lab	---	---	2	2	---	---	---	---	25	-	25	1
CEU609	Estimating & Costing Lab	---	---	2	2	---	---	---	---	25	-	25	1
CEU610	Minor Project	----	----	2	2	---	----	---	----	25	25	50	2
CEU611	Self Study-II	---	---	----	--	---	---	---	---	25	-	25	1
CEU612	Industrial Lecture-I*	1	---	----	1	---	---	---	---	---	---	---	---
CEU613	Seminar	---	---	2	2	---	---	---	---	25	-	25	1
	Total	**16**	**0**	**12**	**28**	**50**	**75**	**75**	**300**	**175**	**75**	**750**	**23**

TA :Teacher Assessment   CT: Class Tests   ESE: End Semester Examination   ICA : Internal Contineous Accessment

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min. except course CEU601 and CEU605 for which the ESE duration will be 3 hrs.

* Credits shall be awarded on the basis of combined assesment of CEU612 and CEU710.

Self study-II is based on one class test each, on the basis of 20% curriculum of the courses CEU601, CEU602,CEU603 and CEU604 to be declared by respective course coordinator at the beginng of the semester.

One faculty member shall be appointed as course coordinator for Self Study II and his/ her teaching work load shall be considered as one hr/week.

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SEM VII

Course Code	Name of the Course	Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	Credits
			Teaching Scheme						Evaluation Scheme				
							Theory			Practical			
CEU701	Advanced Theory of Structures	3	1	---	4	10	15	15	60	---	---	100	4
CEU702	Foundation Engineering	3	1	---	4	10	15	15	60	---	---	100	4
CEU703	Elective-I	3	---	---	3	10	15	15	60	---	---	100	3
CEU704	Interdisciplinary Elective	3	---	---	3	10	15	15	60	---	---	100	3
CEU705	Advanced Theory of Structures Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU706	Foundation Engineering Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU707	Software in Civil Engg Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU708	Project-Phase-I	---	---	4	4	---	---	---	---	100	--	100	2
CEU709	Industrial Visit / Training	---	---	---	--	---	---	---	---	50	---	50	2
CEU710	Industrial Lecture-II*	1	---		1	---	---	---	---	25	---	25	1
CEU711	Self Study-III	---	---	---	--	---	---	---	---	25	---	25	1
	Total	13	2	10	25	40	60	60	240	275	75	750	23

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min. except course CE U701 for which the ESE duration will be 3 hrs.

Students of this department shall select any one Interdisciplinary Elective offered by other department. Interdisciplinary Elective shown below will be offered to students of other department.

* Credits shall be awarded on the basis of combined assesment of CEU612 and CEU710.

Self study-III is based on one class test each, on the basis of 20% curriculum of the courses CEU701, CEU702 and CEU703 to be declared by respective course coordinator at the beginng of the semester.

One faculty member shall be appointed as course coordinator for Self Study III and his/ her teaching work load shall be considered as one hr/week.

SEM VIII

Course Code	Name of the Course	Theory Hrs /week	Tutorial Hrs/week	Practical Hrs/week	Total	TA	CT1	CT2	ESE	ICA	ESE	Total	Credits
			Teaching Scheme						Evaluation Scheme				
							Theory			Practical			
CEU801	Advanced Structural Design	3			3	10	15	15	60			100	3
CEU802	Environmental Engineering	3	---	---	3	10	15	15	60	---	---	100	3
CEU803	Elective -II	3	---	---	3	10	15	15	60	---	---	100	3
CEU804	Elective -III	3	---	---	3	10	15	15	60	---	---	100	3
CEU805	Advanced Structural Design Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU806	Environmental Engineering Lab	---	---	2	2	---	---	---	---	25	25	50	1
CEU807	Elective -II Lab	---	---	2	2	---	---	---	---	25	---	25	1
CEU808	Elective -III Lab	---	---	2	2	---	---	---	---	25	---	25	1
CEU809	Project	---	---	6	6	---	---	---	---	75	100	175	6
CEU810	Self Study-IV	---	---	---	--	---	---	---	---	25	----	25	1
	Total	12	0	14	26	40	60	60	240	200	150	750	23

TA :Teacher Assessment   CT: Class Tests   ESE: End Semester Examination   ICA : Internal Contineous Accessment

Note: The ESE duration for all theory cources shall be 2 hrs. 30 min. except course CE U801 for which the ESE duration will be 3 hrs.

Self study-IV is based on one class test each, on the basis of 20% curriculum of the courses CEU801, CEU802 CEU803 and CEU804 to be declared by respective course coordinator at the beginng of the semester.

One faculty member shall be appointed as course coordinator for Self Study IV and his/ her teaching work load shall be considered as one hr/week.

Electives

CEU703 Elective-I	CEU704 Interdisciplinary Elective	CEU803 Elective-II	CEU804 Elective-III
A) Advanced Structural Analysis	A) Optimization and Modelling	A) Structural Dynamics	A) Hydraulic Structures
B) Advanced Soil Mechanics	B) Industrial Building Planning & Design	B) Earthquake Resistant Design	B) Advanced Design of Steel Structure
C) Matrix Analysis of Structures	C) Interior Designs & Drawing	C) Pavement Design & Construction	C) Finite Element Method
D) Environmental Pollution & Soild Waste Management	D) Project Management	D) Advanced Wastewater Treatment	D) Ground Improvement Technology
E) Railways, Tunnels & Airport Engineering		E) Advanced Foundation Engineering	E) Remote Sensing & GIS
F) Advanced Fluid Mechanics		F) Advanced Construction Management	F) Advanced Water Treatment Process & Technology

SHU301 ENGINEERING MATHEMATICS-III

Teaching Scheme 03 L + 00 T   Total 03   Credit: 03
Marking scheme: 15CT1 + 15CT2 + 10TA + 60 ESE   Total Marks: 100
Duration of ESE: 2Hrs.30min

Linear Differential Equations with constant coefficients:

General solution to L.D.E. of nth order with constant coefficients, rules for finding C.F., General method for finding P.I., P.I. of some standard functions, Method of Variation of Parameters, Cauchy's and Legendre's L.D.E., applications of L. D. E. to deflection of beam, bending moments.

Partial Differential Equations:

Complete solution of PDE, Linear and non-linear PDE of types (i) $f(p, q)= 0$, (ii)$f(p, q, z)= 0$, (iii)$f(p, q, x, y)= 0$,(iv)$f(p, q, x, y, z)= 0$ i.e. Lagrange's form $Pp+Qq=R$ and Clairaut's form $z = px + qy + f(p, q)$, (v) Equations reducible to above forms. Complete solution of PDE of first and second order by method of separation of variables.

Laplace Transform:

Definition, standard formulae and properties of LT., Inverse Laplace Transform, Convolution Property.

Numerical Methods:

Solution of system of linear equations by Crout's method, Gauss Siedal method.

Numerical solution of ordinary differential equations: Taylor's series method, Modified Euler's method, Runge Kutta method.

Statistics:

Correlation: coefficient of Correlation, lines of regression, Curve fitting by least square method. Probability distribution: Binomial, Poisson and Normal.

Text Books:

1. Text Book of Applied Mathematics, P. N. Wartikar and J.N.Wartikar, Pune Vidyarthi Griha, Pune, 2001.
2. Higher Engineering Mathematics, B. S. Grewal, Khanna Publication, 40th edition, New Delhi, 2007.

Reference Books:

1. Advanced Engineering Mathematics, Kreyzig, John Wiley & Sons, 9th edition, 1995.
2. Advanced Engineering Mathematics, John Bird, 5th edition, Elsevier Publication 2007.
3. Higher Engineering Mathematics, C. R. Wiley, 8th edition, John Wiley and Sons, 1999.

CEU301 ENGINEERING GEOLOGY AND HYDROLOGY

Teaching scheme: 03 L + 00 T   **Total 03**   **Credit: 03**

Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE   **Total Marks: 100**

Duration of ESE: 2hrs.30 min.

ENGINEERING GEOLOGY

Different branches of Geology and importance of geology in Civil Engineering.

Mineralogy: Study of common rock forming and ore minerals with reference to its physical properties.

Petrology: Rock cycle, rock weathering and soil formation, origin, classification and textures of igneous sedimentary and metamorphic rocks, study of common rock types.

Structural Geology: Outcrop; dip strike, elementary ideas about folds, joints, faults and unconformity, effect of these structures in foundation.

Earthquakes engineering: Earthquake waves, causes and effects, magnitudes and intensity, earthquake zones of India, seismic coefficient.

Geological Investigation: Surface and sub-surface investigation, direct and indirect. Rock as a material of construction, Study of engineering properties of rocks and soils. Geological studies related to site selection for dam and reservoirs, tunnel alignment, bridges, roads, etc. Case histories of some major projects of tunnels, dams and reservoirs.

HYDROLOGY

Introduction: Definition and its importance, hydrological, cycle, Hydrologic equation.

Precipitation: Forms, Types, factor affecting, measurement, rain gauge network, estimation of missing data, consistency of data, mean area precipitation, artificial rain.

Evaporation: Process, factor affecting, measurement and estimation, control of evaporation.

Evapo-transpiration: factor affecting, measurement and estimation

Infiltration: Process, factor affecting, measurement, infiltration indices

Run off: Factor affecting, estimation of runoff, rainfall- runoff correlation

Flood: Flood classification, importance, estimation of flood, flood control techniques, brief description of flood Routing. Channel flow routing.

Hydrographs: Typical flood control hydrograph, base flow separation, depression storage, overland flow, unit hydrograph, s-curve hydrograph, Synthetic unit hydrograph.

Ground Water: Ground and surface water resources, aquifer parameters, specific yield and specific capacity, artificial ground water recharging.

Text Books:

1. General and Engineering Geology, Parbin Singh, 6th edition, Kataria S. K. Sons, 2001.
2. Hydrology, Subramanyam K, 2nd edition, Tata McGraw Hill, 2003.

Reference Books:
1. Water Resources Systems Planning and Management, Chaturvedi M. C., Tata McGraw Hill,1987
2. Geology of India, , Wadia D.N. , 4th edition Tata McGraw Hill, , New Delhi, 1978.
3. A Text Book of Geology, Mukharjee 4th edition, The World Press Private Ltd, Calcutta, 2005.
4. Handbook of Hydrology, Chow, Y. T., McGraw Hill, 1988
5. Hydraulics & Fluid Mechanics, Modi and S.M. Seth, 14th edition, Standard Book House, New Delhi, 2009

CEU302- FLUID MECHANICS

Teaching scheme: 03 L + 01 T   **Total 04**   **Credit: 04**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE   **Total Marks: 100**
Duration of ESE: 2hrs.30 min.

Introduction: Fluid & Fluid Mechanics, Applications in Civil Engineering, Physical properties of fluids-mass density, unit weight, specific gravity, compressibility, bulk modulus, surface tension, viscosity, Newton's law of viscosity, Dynamic and kinematic viscosity, classification of fluids

Fluid Statics: Hydrostatic law, pressure at a point, Pascal's law, Pressure head, Atmospheric pressure, Absolute and gauge pressure, total pressure and center of pressure, Pressure diagram, Determination of Total pressure on plane and curves surfaces of water tanks, earthen and gravity dams, spillways, spillway gates, sluice gates, sluice valves.

Buoyancy and Floatation: Introduction, Buoyant force and center of buoyancy, Archimedes Principle, Principle of floatation, Metacenter and metacentric height, Equilibrium of floating bodies.

Fluid kinematics: Types of flow-steady & unsteady, uniform & non-uniform, laminar & turbulent, one, two & three dimensional, rotational & irrotational, compressible and incompressible, Stream line, Streak line, Path line, Stream tube, Stream function, Velocity potential, Flow net- uses, limitations & methods of drawing, Discharge, Continuity equation of fluid flow

Fluid Dynamics: Euler's equation of motion, Bernoulli's equation, assumption and limitations, different forms of energy heads, loss of head, Modified form of Bernoulli's theorem, Energy gradient line and Hydraulic gradient line, Impulse momentum equation.

Flow through pipes: Major losses and minor losses, Darcy Weisbach equation, Factor affecting friction factor, Coefficient of friction for commercial pipes, Moody's diagram, Flow through simple pipes, Flow through pipes in series, Flow through pipes in parallel, siphons pipes, Equivalent pipes, Water hammer in pipes-causes, effects & remedial measures, Transmission of power through pipe flow

Flow measurements: Velocity measurements: Pitot tube- basic principle of working, types, **Discharge measurement for pipes:** Venturimeter-principle, equation

for discharge, orifice plate meter **Discharge measurement for tanks:** Orifice-types, flow through circular sharp crested orifice, hydraulic coefficient

Laminar flow: Relation between shear stress and pressure gradient, Steady laminar flow through circular pipes, Hagen-Poiseuille law (no derivation), Laminar flow between parallel plates

Flow around immersed objects: Practical problems involving flow around immersed objects, Drag and lift-definition & expression, Types of drag, Pressure drag on flat plate, Stream line & bluff bodies.

Text Books:

1. Hydraulics & Fluid Mechanics, Modi and S.M. Seth, 14th edition, Standard Book House, New Delhi, 2009
2. Fluid Mechanics, Hydraulics and Hydraulic Machines, Dr. A.K. Arora, 9th edition Standard Publishers Distributors, New Delhi, 2009.

Reference Books:
1. 1000 Solved Problems in Fluid Mechanics, K. Subramanya, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008
2. Fluid Mechanics through Problems, R.J. Gadre, New Age International Publishers, New Delhi, 2011.
3. Fluid Mechanics & its Applications, Vijay Gupta & Santosh K. Gupta, 2nd edition, New Age International Publishers, New Delhi, 2011
4. Fluid Mechanics & Machinery, Agrawal S.K., Tata McGraw Hill Publishing Co. Ltd, 1997.

CEU303-STRENGTH OF MATERIALS

Teaching Scheme: 03 L + 01 T   Total = 04   **Credits: 04**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE   **Total Marks: 100**
Duration of ESE: 2hrs.30 min.

Mechanical properties: Concept of direct, bearing and shear stresses and strains, stress strain relations, Biaxial and triaxial loading, elastic constants and their relationship, stress-strain diagrams and their characteristics for mild steel, TOR steel and concrete,

Generalized Hook's law, factor of safety.

Uniaxial stresses and strains: Stresses and strains in compound bars in uniaxial tension and compression, temperature stresses in simple restrained bars and compound bars of two metals only.

Shear force & bending moment diagrams: Beams, loading and support conditions, bending moment, shear force and axial load diagrams for all types of loadings for simply supported beams, cantilevers and beams with overhangs, relation between shear forces, bending moment and loading intensity.

Stresses in beams (Bending, Shear):

i) Bending: Theory of simple bending, section modulus, moment of resistance, bending stresses in solid, hollow and built up section.

ii) Shear: Distribution of shear stresses on beam cross sections,

iii) Strain energy under uniaxial tension and compression, impact loads and instantaneous stresses.

Torsion: Theory of torsion & assumptions, derivation of torsion equation, polar modulus, stresses in solid & hollow circular shaft

Principal stresses: Biaxial stress system, principal stresses, principal planes, Mohr's circle of stresses, principal strains.

Thin and Thick cylinders and thin spherical shells subjected to internal pressures.

Combined direct & bending stresses: Combined direct and bending stresses, applications to short columns with eccentric loads.

Slope & deflection of beams: Slope & deflection in statically determinate beams subjected to point loads, uniformly distributed loads, moments by Macaulay's method, Moment Area method and Conjugate Beam method.

Columns: Theory of long columns, Euler, Rankin formula

Introduction to fatigue

Text Books:
1. Engineering Mechanics of Solids, E.P. Popov, 2nd edition, Prentice Hall of India, 1998
2. Mechanics of Materials, Beer, Johnston and DeWolf, 3rd edition, Tata McGraw Hill Publication, New Delhi, 2002.

Reference Books:
1. Mechanics of Materials, Gere and Timoshenko, 2nd edition, CBS publishers, 2002.
2. Mechanical of Solids in Introduction, Laudner T. J. and Archer R. R., McGrawHill International edition, 1994.
3. Theory and Problems of Strength of Materials, William A. Nash, 3rd edition, Schaum's Outline Series, McGraw Hill International editions, 1994.

CEU304 BUILDING CONSTRUCTION & MATERIALS

Teaching scheme: 03 L + 00 T   Total 03   Credit: 03
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE   Total Marks: 100
Duration of ESE: 2hrs. 30 min.

Introduction: Types of building as per National Building Code, Components of buildings and their functions, Types of structures-load bearing, framed and composite structures, their suitability, relative advantages and disadvantages

Foundation: Definition, purpose, Loads acting on foundation, Safe bearing capacity of soil-definition, values from IS code, Types of shallow foundation for buildings-spread footings for walls and columns, combined footing for columns, raft foundation, Setting out for foundation

Floors & Floor finishes: Floors- Definition & purpose, Types of R.C.C. floors-R.C.C. slab floor, R.C.C. slab & beam floor, Ribbed floor, Flat Slab, their suitability and construction procedure, Flooring tiles: Types-plain cement tiles, Mosaic tiles,

chequred tiles, ceramic tiles, glazed tiles, P.V.C. flooring tiles, Types of flooring-suitability and construction procedure.

Doors & Windows:

Wood & Wood based Products**:** Characteristics of good timber, Chief varieties of timber and their uses in construction, Market forms of timber and their uses in construction, Industrial timber products-veneer, Ply wood, particle board, fiber board, batten board, block board, pre-laminated boards, laminates.

Aluminum products: market forms, powder coating & anodizing of aluminum sections.

Doors**-**Purpose, Criteria for location, Sizes, Types of door frames, Methods of fixing door frames, Types of door shutters- fully paneled, flush, louvered, glazed, sliding, revolving, rolling shutter, collapsible door, grilled door, suitability of different types of doors. Types of aluminum doors

Windows-Purpose, Criteria for location, Sizes, Types of wooden windows-casement, louvered, glazed, metal windows, Aluminum windows, Corner & bay windows, Ventilators-purpose and types, Grills for windows

Fixtures and fastenings of doors and windows**:** Hinges-types and uses, Bolts-types and uses, Handles and locks

Lintels and Arches: Lintels-purpose, types and their suitability, details of R.C.C. lintel, Arches- purpose, types and their suitability

Stairs: Function, Technical terms, Criteria for location, Requirements of good stair, Types of stairs and their suitability, Design of stair, Lifts types and their suitability, Ramps, Escalators

Roofs: Flat & pitched roofs-suitability, Types of steel roof trusses and their suitability, Placing and fixing trusses, Types of roofing sheets, Fixing of roofing sheets to trusses

Use of Coal ash: Coal ash production, types, properties, use in concrete, cement, bricks, embankments etc.

Masonry construction:

Brick Masonry: Qualities of good bricks, Field and laboratory tests on bricks, Classification of bricks, Mortars**:** Types of mortars and their suitability, Proportion of mortars used for different works Technical terms in brick masonry, Principles to be observed during construction, Header bond, Stretcher bond, English Bond, Flemish bond (1 & 11/2 brick thick walls), Construction procedure, defects in brick masonry, Strength of brick masonry

Reinforced Brick masonry: Applications, Advantages, Materials required, Construction procedure

Concrete block masonry: Types-solid and hollow, common dimensions, Construction procedure

Plastering and pointing: Purpose, Types and their suitability, Procedure of plastering and pointing, Defects in plastering work

Coloring & painting:

Paints Enamels and varnishes: Types Procedure of painting old and new masonry surfaces, metal surfaces and wooden surfaces

Damp proofing: Causes and effects, Methods of damp proofing, materials required, Water proofing compounds- suitability and uses, Details of cavity wall construction

Joints in structure: Construction joints-necessity, provision of construction joint in slab, beam and columns, Expansion joints –necessity, location, materials used, details of expansion joints at foundation and roof level for a load bearing and framed structure.

Formwork & scaffolding: Form work-types and suitability, Period for removal of formwork, Scaffolding**:** Necessity, Types, Details of erections

Text Books:
1. Building Construction, Sushil Kumar, 19th edition, Standard Publishers Distributors, New Delhi, 2008
2. Building Materials, P.C. Verghese, 1st edition, Prentice-Hall of India, New Delhi, 2009.

Reference Books:
1. National Building Code of India 2005, B.I.S., 2nd revision, Techniz Books International, New Delhi, 2005.
2. NFPA 5000: Building Construction & Safety Code, NFPA, Techniz Books International, New Delhi, 2009
3. Building Materials & Components for Developing Countries, C.B.R.I., Tata Mc-Graw Hill Publishing Co. New Delhi, 1990.
4. Building Construction, Gurucharan Singh, 11th Edition, Standard Book House, New Delhi, 2010.

SHU305 GENERAL PROFICIENCY – II

Teaching Scheme: 01L + 02 P   **Total : 03**   **Credit   : 02**
Evaluation Scheme: 25 ICA + 25 ESE   **Total Marks: 50**
Duration of ESE: 3Hrs.

Presentation Skill:
Communication boosters – aura words, pronunciation, body language – voice, posture and gesture, eye contact, dress codes.
Function of culture code in presentation – planning, preparing and delivering a presentation, etiquettes, clarity and aliveness of delivery.
General communication skill for presentation – content matching and language matching for specific audience, tone, hummer poise- listener/speaker sensitivity.
Specific communication skill for presentation – icebreaker, small talk dialogue, debate, turn taking, effective and defensive handling of question.
Models of presentation – Public speaking, academic and professional presentation, group discussion, personal interview, technical report writing (IEEE standards).

Managerial skill:
Time management - advantages, time wasters – procrastination, time management tips and strategies.

Stress management- stress and its disadvantages, stress coping ability and stress inoculation training, management of various types of fear, depression and anger.

Conflict management -types of conflict, conflict stimulation and conflict resolution technique for conflict for effective conflict management, effective ways of dealing with people, significance of body language in communication and assertiveness training.
Interpersonal skills -concept of team, advantages of teamwork, promotion of team spirit, team building techniques, nurturing leadership qualities, negotiation skills.

Topics for assignments/practicals:
Minimum eight assignments/practicals based on above topics. The representative list is given below
1. Collection of new words concerning various technical and professional subjects
2. Listening of audiocassette or lecture or watching videocassette (based on the topics of managerial skill) followed by speech/seminar by students.
3. Listening of audiocassette or lecture or watching videocassette (based on the topics of managerial skill) followed by group discussion of students.
4. Collecting the information related to the topics of managerial skill using Internet, books, Magazines etc. and its power point presentation or seminar/lecture.
5. Power point presentation on topic related to any subject of programme.
6. Preparing a technical paper in IEEE format.
7. Management games.
8. Personal interview.
9. Extempore elocution, debate.

Text Books:
1. Professional Communication Skills, Alok Jain, Pravin S. ,R. Bhatia, A. M. Sheikh, 3rd edition, S. Chand and Company, New Delhi, 2005
2**.** Personality Development, E. B. Hurlock, 5th edition, Tata MacGraw Hill, New Delhi,   2006

Reference Books:
1. Power of Positive Thinking, D. J. Mile, 1st edition, 28th reprint , Rohan Book Company, Delhi, 2004
2. All About Self motivation, Pravesh Kumar, 3rd edition, Goodwill Publishing House, New Delhi, 2005
3. Body Language: How to Read Others Thoughts by their Gestures, Pease, Allan, 3rd edition, Sudha Publications, New Delhi, 1998.
4. Multiple Intelligences: The Theory in Practice: A Reader, Gardner, Howard,1^{s} edition, Basic   Books. New York, 1993.
5. Six Thinking Hats, De Bono, Edward, 2nd edition, Penguin Books, New York, 2000

Note :
ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.
ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

CEU305 ENGINEERING GEOLOGY & HYDROLOGY LAB

Teaching scheme: 02P   **Total 02**   **Credit : 1**

Evaluation Scheme: 25 ICA + 25 ESE   **Total Marks: 50**

Duration of ESE: 3Hrs.

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU301) from the list or otherwise.

ENGINEERING GEOLOGY

1. Megascopic study of common rock forming and ore minerals.
2. Megascopic study of the common igneous, sedimentary and metamorphic rocks.
3. Geological map reading and construction of selections from simple geological Maps with engineering problems (about 8 maps)
4. Field visit to rock / soil strata exposure, fault zone, fractures, drilling rigs or machine work.

HYDROLOGY

1. Determining the inflow at the reservoir using hydrograph.
2. Field visit shall be arrange at dam site to understand the functions and performance for the following aspects,
   a. Rain gauge stations
   b. Humidity measurements
   c. Temperature measurements

Note :

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

CEU306 FLUID MECHANICS LAB

Teaching scheme: 02 P   **Total 02**   **Credit: 01**

Evaluation Scheme: 25 ICA + 25 ESE   **Total Marks: 50**

Duration of ESE: 3Hrs.

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU302) from the list or otherwise. Minimum eight experiments should be performed.

List of Practicals:

1. Identification of laminar and turbulent flow by conducting Reynolds experiment.

2. Identification of type of equilibrium of given floating body analytically and experimentally.

3. Drawing EGL & HGL for given flow through pipes using experimental setup.

4. Calibration of Venturimeter / Orifice plate meter.

5. Determination of hydraulic coefficients of orifice.

6. Determination of friction factor/coefficient of friction for pipes of different diameter/materials.

7. Determination of minor losses in pipes fittings (Elbow / bends / valves / reducers / taper).

8. Determination of Total pressure on plane and curves surfaces of water tanks, earthen and gravity dams, spillways, spillway gates, sluice gates, sluice valves from the given data.

9. Drawing the HGL & EGL for flow through compound pipeline on graph paper from given data.

10. Measurement of flow, pressure, velocity of fluid using digital instruments.

Note :
ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

CEU307 STRENGTH OF MATERIALS LAB

Teaching Scheme: 02 P   **Total = 02**   **Credit: 1**
Evaluation Scheme: Internal = 25 ICA + 25 ESE   **Total Marks: 50**
Duration of ESE: 3Hrs.

It is a representative list of practical. The instructor may choose experiments as per his/her requirements (so as to cover entire contents of the course CEU303) from the list or otherwise. Minimum eight experiments should be performed from part A, while part B is compulsory.

List of Practicals:
Part A:

1. To perform tension test on mild steel and compare the results obtained with standard IS values and comment

2. To perform tension test on TOR steel also perform bend test. Compare the results obtained with standard IS values and comment. Refer I.S. 1608.

3. To perform compression test on metals. Observe the nature of failure and determine the compressive stress. Refer I.S.1708 for test procedure.

4. To perform compression test on Wood (parallel and perpendicular to grains). Observe the nature of failure and determine the compressive stress. Refer I.S.1708 for test procedure. Comment on results.

5. To perform shear test on metals. Study single & double shear action. Interpret failure pattern and calculate shear strength in single & double shear. Refer I.S 5242-9779.

6. To perform impact test on metals. Determine the shock absorbing capacity of the material using Izod impact test apparatus. Compare the impact resisting qualities of different metals. Refer IS: 1598 and IS: 1757 – 1973.

7. To perform hardness test on different metals and compare hardness number for different metals. Refer IS 1500.

8. To perform torsion test on metals. Interpret the graph of torque and angle of twist and determine shear strength and modulus of rigidity of the specimen. Refer I.S. 1717.

9. To find deflection of beams, bending stresses and their relation for simply supported beam. Also find Young's modulus.

10. Determine modulus of rupture of wooden beam. Observe the parameters that affect modulus of rupture.

11. Observe types of columns, their deflection behaviors. Understand buckling of columns and factors affecting strength of columns. Find buckling load of given set of columns with different end conditions.

12. Observe deflection and working of different types of springs. Determine modulus of rigidity of spring material and stiffness of spring.

Part B: At least four problems from four different topics to be solved using either programming or spreadsheet or solvers or any software.

Note:
ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.
ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

CEU308 BUILDING CONSTRUCTION & MATERIALS LAB
Teaching scheme: 02 P   Total 02   Credit: 01
Evaluation Scheme: 25 ICA + 25 ESE   Total Marks: 50
Duration of ESE: 3Hrs.

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU304) from the list or otherwise.

List of Practicals:
1 Drawing free-hand sketches in the Sketch book of following building components

    i.   Different types of foundations

    ii.   Different types of R.C.C. Floors

    iii.   Line diagrams of different types of steel roof trusses

    iv.   Different types of stairs (plan and elevations)

v. Types of bonds in brick masonry –plan and elevation of stretcher & header bond, 1 brick thick wall in English and Flemish bond, brick columns

vi. Expansion joints at foundation and roof level in load bearing and framed structure

vii. Any one type of scaffolding (elevation and section)

viii. Form work for R.C.C. floor

ix. Section of typical load bearing and framed structure

2. Drawing of following building components on half imperial drawing sheet

i) Details of fully paneled/flush door and glazed window, indicating dimensions

ii) Design of dog-legged stair from given data and its drawing (plan and section)

iii) Details of steel roof truss along with roof covering and fixing at support

iv) Preparation of setting-out plan for foundation from given line plan of a two-room building

3 Setting out in field for foundation of building from the plan in sheet no. 4

4. Setting out in field layout of compound wall for plot having curved corner.

Note :
ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.
ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

CEU401 ENGINEERING ECONOMICS AND HUMANITIES

Teaching Scheme : 03 L + 00 T   Total 03   Credit : 03
Evaluation Scheme: 15 CT1 + 15 CT2 +10 TA+ 60 ESE   Total Marks: 100
Duration of ESE: 2hrs.30 min

ECONOMICS :
Introduction: Nature and Scope of Economics; Special significance of economics to engineers

Banking: Function of Central, Commercial Banks and Reserve Bank of India.
Taxation: Principal of taxation, Direct and Indirect taxes, concept of auditing
Market: Forms, perfect and imperfect competition, pricing under perfect and imperfect competition, prices discrimination under monopoly
Economics of Development: Meaning, Characteristics of under development, obstacles to economic growth and vicious circle of poverty, Theory of national income, concept of Gross Domestic Product and artificial intelligence in economics.

Economic planning: Meaning, objective and salient features of current five years plan of India Economics of comparison of different alternative projects.

HUMANITIES:

Salient features of Indian Constitution, Fundamental rights and Duties, Directive Principles of State Policy. Latest amendments in Indian constitution such as Right to information act, Right to Education- its definition, applicability and benefits.

Environmental laws, Indian Patent Laws, Labour Laws: definition, significance and application.

Impact of Science and Technology on Culture and Civilization; Social responsibility of business.

Human Society: Community Groups, Social Control: Meaning, Types and Agencies. Psychology: Definition, nature, scope, hurdles and application in industries.

Text Books:
1. Human Society, Davis K, Delhi Surjeet Publication, 2007.
2. Elementary Economic Theory, Dewett and Varma J. D, S. Chand & Co, New Delhi, 2011
3. Constitutional Govt. in India, Pylee M. V, S., 4th edition Chand & Co, New Delhi, 1984.

Reference Books:
1. The Constitution of India, Joshi G. N., 6th edition, MacMillan India Ltd, 1975.
2. Economics: An Introduction to its Basic Principles by Mitra, J. K., Word Press Pvt. Ltd.,1976
3. Managerial Economics: Concepts and cases, Mote, V. N, Samual Paul and G. S. Gupta, Tata McGraw Hill Co.Ltd. New Delhi, 1977.
4. Environmental Law, Stuart Bell, and Donald McGillivray. Oxford University Press. Inc. New York Seventh Edition, 2008.
5. Introduction to Indian Constitution, Durga Das Basu, Prentice-Hall of India, 1982.

CEU402 TRANSPORTATION ENGINEERING

Teaching scheme: 03 L + 01 T   Total 04   **Credit: 04**

Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE   Total Marks: 100
Duration of ESE: 2hrs.30 min

INTRODUCTION

Importance of Transportation in Nation Development, Different modes of transportation and their relative advantages & disadvantages.

HIGHWAY ENGINEERING

Characteristics of Road Transport, Classification of Roads

Highway planning & engineering surveys: Necessity, Planning Surveys, Preparation of Plans, Master plan and its phasing, Highway alignment, Engineering surveys, Drawings and reports, Stages in new Highway Project.

Highway geometric design & IRC recommendations: Design controls and criteria, Highway cross sectional elements, Camber**,** Width of pavement or carriageway, Width of roadway or Formation width, Right of way, Sight distance, Superelevation,

Widening of pavement on curves, Gradient, Vertical curves, Typical cross section of Highway in cutting and filling

Highway materials and testing: Stone aggregates properties and different tests, **Bituminous Materials –** Bitumen, Tests on bitumen, cutback bitumen, Bituminous emulsions, Tar, Bituminous paving mixes, Design of bituminous mixes – Marshall method

Design of highway pavement: Object and requirement of pavement, Types of pavements, Pavement components and their functions, Design factors, Design wheel loads, Design of Flexible pavement by CBR method, Design of Rigid pavement, joints in rigid pavement

CONSTRUCTION OF HIGHWAY:

Construction of W.B.M. roads- specifications of materials, construction procedure

Construction of Bituminous pavements - Types of bituminous constructions, construction procedure for Surface Dressing, Penetration Macadam, Bituminous Macadam, Bituminous Concrete

Construction of Cement Concrete pavements - construction of pavement slab, construction of joints

Highway maintenance: Need for Highway maintenance, General causes of pavement failure, Pavement failures, Classification of maintenance works, Maintenance of W.B.M. roads, Bituminous surfaces and cement concrete pavements, Strengthening of existing pavements.

Highway drainage: Importance, Surface drainage, Sub-surface drainage

BRIDGE ENGINEERING

Bridge Components and their functions, Abutments, piers and wing walls, bearing, approaches, foundation, Types and choice, Site selection.

Culverts & causeways- Types and selection

Types of major bridges based on various criteria, Suitability of different types.

Design flood discharge, Linear waterway, Scour depth, Afflux, Depth of foundation, Free board, Economic span, IRC recommendations, Data collection

Erection of bridge superstructure, Launching of Girders

TUNNEL ENGINEERING

Necessity, types, tunnel alignment

Tunneling methods in soft soils and hard rock, size and shape of tunnels, tunnel lining, drainage, ventilation and lighting of tunnel

Text Books:
1. Highway Engineering, Khanna S.K. & Justo C.E.G., Nem Chand & Bros., Roorkee, 11th edition, 2001
2. Elements of Bridges, Tunnels and Railways Engineering, Bindra, S. P., Dhanpat Rai & Sons, Delhi, 2010
3. Principles of Transportation Engineering, Chakroborty P. and Das A., 1st edition, Prentice Hall of India, 2009

Reference Books:
1. Transportation Engineering Vol. I & II, V.N. Vazirani & S.P. Chandola, 7th edition , Khanna Publishers, New Delhi, 2003.
2. Transportation Engineering: An Introduction, Khisty and Lall, 3rd edition, Prentice Hall, 2003.
3. Bridge Engineering, Ponnuswamy, S., 2nd edition, Tata McGraw Hill Publication, New Delhi, 2007.
4. Pavement Design and Materials, Papagiannakis A. T. and Masad E. A., 1st Edition, John Willey, 2008.
5. Principles of Highway Engineering & Traffic Analysis, Mannering F. L., Walter P. K. and Scott John, 3rd edition Willey, 2004.

CEU403 SURVEYING

Teaching scheme: 03 L + 01 T   Total 04   **Credit: 04**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE   Total Marks: 100
Duration of ESE: 2hrs.30 min.

Introduction: Surveying- Necessity & purpose, Classification of survey, principles of surveying, Basic measurements in surveying, work of surveyor

Linear Measurements and offsets: Instruments for measurement of distance, linear measurements, errors in measurements, corrections to field measurements, Instruments for marking stations, ranging out, direct and indirect ranging, Chaining on sloping ground, Offsets-Types, Instruments for marking offsets, degree of accuracy of offsets, Instruments for setting right angle, obstacles in chaining & ranging, Cross staff survey

Chain & Compass surveying : Selection of survey stations, Survey lines, Bearing of a line, fore bearing, back bearing & reduced bearing, Prismatic compass – its use & adjustment, local attraction, magnetic declination & its variation, calculation of included angles from bearing.

Chain & compass traversing : Open & closed traverse, reconnaissance, fixing of stations, Booking field notes, Plotting of traverse survey, adjustment of traverse by Bowditch's graphical method.

Plane table surveying : Introduction, use, advantages & disadvantages, accessories required, principle of plane table surveying, orientation of plane table, methods of orientation, methods of plane table surveying, two point & three point problem.

Leveling : Technical terms, principle of leveling, Bench mark & its types, Instruments used for leveling, Auto level, Digital level, Temporary adjustments, leveling staffs and its types, precautions in leveling, booking of field readings in field book, calculation of RL by using height of collimation method & rise & fall method. Arithmetic check, Classification of leveling-reciprocal, leveling difficulties, Errors and mistakes in leveling, correction for curvature & refraction.

Profile Leveling: Fixing alignment, L-section & Cross section, selection of scales & plotting, fixing formation level

Contouring: Definition, characteristics, contour interval, methods of locating contours, interpolation of contours, contour maps & its uses, contour drawing

Planimeter: Digital planimeter-components, setting, selection of scale, computation of area.

Theodolite: Component parts of transit Theodolite, fundamental lines temporary adjustment, measurement of horizontal angles by repetition & reiteration method, measurement of vertical angles, deflection angles, magnetic bearing, lining in by Theodolite, balancing in by Theodolite, prolonging a straight line, laying off horizontal angle, use of Theodolite as a level.

Total station: Introduction, components, adjustments, various uses.

Text Books
1. Surveying Part-I, T.P. Kanetkar and S.V. Kulkarni, 24th edition, Pune Vidyarthi Griha Prakashan, Pune, 2002.
2. Surveying, Punmia B.C. and Jain A.K., 16th edition, Laxmi Publication, Delhi, 2005.

Reference Books
1. Surveying Principles and Applications, Kavanagh, 7th edition, Prentice Hall, 2007.
2. Surveying Fundamentals & Practices, Nathanson, Lanzafama and Kissam, 5th edition, Prentice Hall, 2006.
3. Surveying Vol. I, S.K. Duggal, 2nd edition, Tata McGraw Hill Publishing Company Ltd., New Delhi, 2005.

CEU404 CONCRETE TECHNOLOGY

Teaching Scheme : 03 L + 00 T   Total = 03   **Credits: 03**

Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE   **Total Marks: 100**

Duration of ESE: 2hrs.30 min.

Cement: Various types of cement, Chemical Composition of Portland Cement, Manufacture of Portland Cement, Properties of Cement, Laboratory Tests.

Aggregate: Classification of Aggregate, Physical Properties, Bulking and Moisture Content, Specific Gravity, Bulk Density, Laboratory Tests, replacement of sand by crushed aggregate

Water: Impurities in Water and Their Effects on Properties of Concrete.

Admixtures: Various Types of Admixtures and Their Functions.

Proportioning of Concrete Mixes: Introduction of Mix Design, Basic Consideration in Concrete Mix Design, Factors Influencing the Choice of Mix Proportions, Methods of Concrete Mix Design with special emphasis on IS Code Method And IRC-44 Method.

Production of Concrete: Batching of Materials, Mixing, Transportation and Placing of Concrete, Compaction of Concrete, Curing of Concrete.

Properties of Fresh Concrete: Workability of Concrete, Factor Affecting Workability, Measurement of Workability.

Properties of Hardened Concrete: Strength of Concrete, Stress-Strain Characteristics, Shrinkage and Temperature Effect, Creep, Permeability and

Durability of Concrete. Inspection, Testing And Quality Control of Concrete: Inspection, Testing of fresh Concrete, Factors causing Variation in Quality of Concrete, Field Control, Advantages of Quality Control, Testing of Hardened Concrete using NDT Method.

Special Concretes and Concreting Techniques: Light Weight Concrete, Fiber-Reinforced Concrete, Roller Compacted Concrete, High Strength Concrete, Vacuum Concrete, Ferro Cement.

Guniting, Grouting and Shotcreting Concrete.

Text Books:
1. Concrete Technology, Neville A. M. and Brooks J. J., 1st edition, Prentice Hall, 1987
2. Concrete Technology, Gambhir M L, 3rd Edition, Tata McGraw Hill, New Delhi, 2008.

Reference Books:
1. Lea's Chemistry of Cement and Concrete, Lea F M, Edward, Elsevier, 2003.
2. Properties of Concrete, Neville A M, 4th edition, Pearson, 1995.
3. Concrete, Mindess Sidney, Young J. Francis and Darwin David, 2nd edition, Prentice Hall, 2002.
4. Design of Concrete Mixes, Krishna Raju, 4th edition, CBS Publishers, 2000

CEU405 OPEN CHANNEL FLOW & HYDRAULIC MACHINES

Teaching scheme: 03 L + 01 T   **Total 04**   **Credit: 04**
Evaluation Scheme: 15 CT1 + 15 CT2 + 10 TA + 60 ESE   **Total Marks: 100**
Duration of ESE: 2hrs.30 min.

Uniform Flow through channel: Types of channels, Geometrical properties of prismatic channel section, types of flow through channel, Characteristics of uniform flow through prismatic channel, Chezys equation, Mannings equation, Mannings constant for different types of channel surfaces, Economical channel section, Conditions for rectangular & trapezoidal economical channel section, Specific energy of flow, Specific force and specific discharge, specific energy diagram, critical depth, criteria for critical depth, subcritical, critical and supercritical flow, Froud No.

Velocity measurements: Current meter-types and working, Floats-types

Discharge measurement for channels: Notches-Types, Discharge over rectangular notch, triangular notch, trapezoidal notch, Cippolletti notch, End contraction and velocity of approach, Francis formula, Weirs- discharge over broad crested weir, Flumes- Venturiflume -working principle and computation of discharge, River gauging by segment method

Non-uniform flow through channel: Types of non-uniform flow, Gradually varied flow (GVF) and rapidly varied flow (RVF), Equation of GVF and its alternative solutions, Classification of channel bed slopes, Various GVF profiles, their characteristics and field examples, Rapidly varied flow, Hydraulic jump- definition, location, practical examples of its occurrence, Analysis of hydraulic jump in rectangular channel-relation between conjugate depths, energy dissipation,

Classification of jumps, Practical applications of hydraulic jump, Energy dissipation below ogee spillway

Model investigations: Model study-similitude, Types of similarities, Types of forces acting on structures, Force ratios, Non-dimensional numbers and their significance, Reynolds Model law & Frouds Model Law and their applications for model studies of hydraulic structures, Distorted and undistorted models, Scale effect.

Impact of jet - Impact of jet on plane and curved surfaces (stationary and moving), when jet striking normally at center of plate.

Pumps: Definition and types and suitability,
Centrifugal pump: Components and their functions, principle, working, priming, power required, Multistage pumps, pumps in series
Reciprocating pumps: Components and their functions, principle, working, power required

Modern Pumps: Deep submersible pumps- Components and working, Jet pumps, turbine pumps

Hydraulic turbines: Elements of hydroelectric power generation power plant, Hydraulic turbines-definition, Heads and efficiencies, Classification based on various criteria, Choice of turbine, Specific speed and its significance, Pelton wheel turbine and Francis turbine – suitability, components and their functions.

Text Books:
1. Hydraulics & Fluid Mechanics, Modi and S.M. Seth, 14th edition, Standard Book House, New Delhi, 2009
2. Fluid Mechanics, Hydraulics and Hydraulic Machines, Dr. A.K. Arora, Standard Publishers Distributors, New Delhi, 9th edition 2009.

Reference Books:
1. 1000 Solved Problems in Fluid Mechanics, K. Subramanya, Tata McGraw-Hill Publishing Company Limited, New Delhi, 2008
2. Fluid Mechanics through Problems, R.J. Gadre, New Age International Publishers, New Delhi, 2011.
3. Fluid Mechanics & its Applications, Vijay Gupta & Santosh K. Gupta, 2nd edition, New Age International Publishers, New Delhi, 2011
4. Fluid Mechanics & Machinery, Agrawal S.K., Tata McGraw Hill Publishing Co. Ltd, 1997.

CEU406 TRANSPORTATION ENGINEERING LAB

Teaching scheme: 02 P   **Total 01**   **Credit: 01**
Evaluation Scheme: 25 ICA + 25 ESE   **Total Marks: 50**
Duration of ESE : 3hrs.

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU402) from the list or otherwise. Minimum eight experiments should be performed.

List of Practicals:
1. To determine the suitability of Aggregate for Road construction by conducting the various tests such as
    a. Crushing strength test,
    b. Los Angeles abrasion test / Deval abrasion test,
    c. Aggregate impact test,
    d. Aggregate Shape test - Flakiness index and elongation index determination.
2. To determine the suitability of Bitumen for Road construction by conducting the various tests such as
    a. Aggregate Bitumen adhesion test,
    b. Penetration test,
    c. Ductility test,
    d. Viscosity test,
    e. Softening point test,
    f. Flash and fire point test.
3. Determination of CBR value and design of flexible pavement

Note :

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

CEU407 SURVEYING LAB

Teaching scheme: 04 P   Total 04   **Credit: 02**
Evaluation Scheme: 25 ICA + 25 ESE   **Total Marks: 100**
Duration of ESE : 3hrs.

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU403) from the list or otherwise. Minimum eight experiments should be performed.

List of Practicals:
1. Cross staff survey for measurement of area of field, calculation of area and measurement of area by digital planimeter
2. Chain / Tape & compass traversing for survey of a given area, entries in field book and plotting of features on ground on A1 size sheet
3. Plane table surveying for a given area and plotting of features on ground on A1 size sheet.
4. Profile levelling for minimum 500 m length and Plotting of L-section & cross section of road on A1 size sheet
5. Block contouring for minimum 200x200 m area and Plotting of contour map on A1 size sheet
6. Measuring horizontal angles, vertical angles, deflection angles, magnetic bearing, prolonging straight lines, lying off horizontal angles by Theodolite
7. Measurement of distances, angles, magnetic bearings for a traverse by Total station.

CEU408 CONCRETE TECHNOLOGY LAB

Teaching Scheme: 02 P   Total = 02   **Credit : 1**

Evaluation Scheme: 25 ICA + 25 ESE   **Total Marks: 50**

Duration of ESE : 3hrs.

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU404) from the list or otherwise. Minimum eight experiments should be performed.

List of Practicals:

1. Fineness test on cement and its importance from strength point of view.
2. Soundness test on cement to study the expansion characteristics of cement.
3. Consistency test on cement to know the water requirement for hydration.
4. Setting time test on cement to know the hardening time required for placing the concrete.
5. Compressive strength test on cement to know the grade of cement.
6. Sieve analysis of aggregate (fine and coarse) to find the particle size distribution in a sample of aggregate.
7. Bulking of sand to know the increase in volume due to moisture content.
8. Silt content of sand to find impurities present in sand.
9. Workability of concrete: slump test to determine the ease of placing of concrete mix.
10. Workability of concrete: compaction factor test to determine the ease of plcacing of concrete mix.
11. Workability of concrete: flow table test to study flow characteristics of concrete.
12. Mix design by IS method to find the proportions of ingredients of concrete.
13. Compressive strength of concrete to know the grade of concrete.
14. Use of NDT methods of concrete for strength and durability.

Note :
ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.
ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.

CEU409 OPEN CHANNEL FLOW & HYDRAULIC MACHINES LAB

Teaching scheme: 02 P   **Total 02**   **Credit: 01**

Evaluation Scheme: 25 ICA + 25 ESE   **Total Marks: 50**

Duration of ESE : 3hrs.

It is a representative list of practicals. The instructor may choose experiments as per his requirements (so as to cover entire contents of the course CEU405) from the list or otherwise. Minimum eight experiments should be performed.

List of Practicals:

1. Determination of Chezy's / Manning's constant of uniform flow through prismatic channel

2. Calibration of rectangular/triangular notch

3. Determination of conjugate depths, length of jump, loss of head of hydraulic jump in laboratory tilting flume

4. Calibration of laboratory Venturiflume

5. Determination of hydraulic gradient of non-uniform flow in prismatic channel

6. Determination of Impact of jet on plates and vanes

7. Determination of efficiency of reciprocating pumps

8. Determination of efficiency of Centrifugal pumps

9. Determination of efficiency of Pelton wheel turbine & Francis turbine

Note:

ICA - The Internal Continuous Assessment shall be based on practical record and knowledge / skill acquired. The performance shall be assessed experiment wise using continuous assessment formats A & B.

ESE – The End Semester Exam for Practical shall be based on performance in one of the experiment and may be followed by sample questions.