Bachelor of Technology (Civil Engineering) Kurukshetra University, Kurukshetra

SCHEME OF STUDIES/EXAMINATIONS (w.e.f. 2015-16 onwards)
Semester – VII

S. No.	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Duration of Exam (Hrs.)
			L	T	P	Hours/ Week	Theory	Sessional	Practical	Total	
1	CE-401 N	Designof Concrete Structures-II	4	1	0	5	75	25	0	100	4
2	CE-403 N	Irrigation Engineering-II	3	1	0	4	75	25	0	100	3
3	CE-405 N	Transportation Engineering-II	3	1	0	4	75	25	0	100	3
4	CE-407 N	Sewerage &Sewage Treatment	3	0	0	3	75	25	0	100	3
5		DEC –I*	3	1	0	4	75	25	0	100	3
6	CE-409N	Concrete Structures-II (Drg.)	0	0	3	3	0	40	60	100	3
7	CE-411N	Irrigation Engg. Design &Drawing	0	0	2	2	0	40	60	100	3
8		DEC-II*	3	1	0	3	75	25	0	100	3
9	CE-429N	Project-I**	0	0	6	6	0	40	60	100	3
10	CE-435N	Field Training-2 (Viva-Voce)***	0	0	0	0		40	60	100	3
		Total	**19**	**05**	**11**	**35**	**450**	**270**	**280**	**1000**	

* The students should select two Departmental Elective Courses (DEC) from the following list.

Course No.	DEC-I	Course No.	DEC-II
CE-413N	Hydro Electric Power Development	CE-421N	Elements of Earthquake Engineering
CE-415N	River Mechanics & Flood Control	CE-437N	Energy Resource And Technology
CE-417N	IT & CAD Applications in Civil Engineering	CE-439N	Estimation & Accounts
CE-419N	Rock Mechanics	CE-441N	Energy Efficient Building

**The project should be initiated by the students in the beginning of VII[h] semester and will be evaluated at the end of the semester on the basis of a presentation and report.

***The performance of the student will be evaluated after the presentation delivered and the report submitted by the student related to field training-2 undertaken after VIth semester.

Bachelor of Technology (Civil Engineering) Kurukshetra University, Kurukshetra
SCHEME OF STUDIES/EXAMINATIONS (w.e.f. 2015-16 onwards)
Semester – VIII

S. No.	Course No.	Course Title	Teaching Schedule				Allotment of Marks				Duration of Exam (Hrs.)
			L	T	P	Hours/ Week	Theory	Sessional	Practical	Total	
1	CE-402N	Bridge Engineering	4	2	0	6	75	25	0	100	3
2	CE-404N	Railway & Airport Engineering	3	2	0	5	75	25	0	100	3
3	CE-406N	Industrial Waste Water Treatment	3	2	0	5	75	25	0	100	3
4		DEC-III*	3	1	0	4	75	25	0	100	3
5		DEC-IV*	3	1	0	4	75	25	0	100	3
6	CE-426N	Transportation Engineering-II (P)	0	0	2	2	0	40	60	100	3
7	CE-428N	Environment Engineering-II (P)	0	0	2	2	0	100	100	200	3
8	CE-430N	Project-II**	0	0	6	6	0	40	60	100	3
9	CE-434N	Seminar	0	1	0	1	0	50	0	50	3
10	CE-436N	Comprehenssive Viva-Voice	0	0	0	0	0	0	75	75	3
11	CE-438N	General Fitness & Professional Aptitude	0	0	0	0	0	0	75	75	3
		Total	**16**	**9**	**10**	**35**	**375**	**295**	**330**	**1000**	

*The student should select two Departmental Elective Courses (DEC) from the following list.

Course No.	DEC-III	Course No.	DEC-IV
CE-414N	Geosynthetics Engineering	CE-418N	Ground Water Hydrology
CE-440N	Non Conventional Energy Resources	CE-420N	Design of Hydraulic Structures
CE-442N	Pre Stressed Concrete Structure	CE-422N	Environmental Impact Assessment
CE-444N	Instrumentation & Sensor Technologies	CE-424N	Remote Sensing & GIS

***The project should be initiated by the students in the beginning of VIIIth semester and will be evaluated at the end of the semester on the basis of a presentation and report. **Note:** Project-II should not be related to Project-I unless it involves large amount of work, time and effort.*

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: DESIGN OF CONCRETE STRUCTUTRES-II					
L	T	P/D	Total	Subject Code: CE-401N	Max. Marks: 100
4	1	0	5		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 4 hrs.
Course Objective	Students will acquire the knowledge about the design of concrete structures like Beam,Slabs, Stair case, Water Tanks and Building frames.				
UNIT	Course Outcomes				
I	Students will be able to study behavior in the Beam and Prestressed concrete –moments,shear and design of beam.				
II	Students will be able to design different types of Slabs,Stair case and Foundations.				
III	Students will be able to design of Water tanks, Silos and Bunkers.				
IV	Students will be able to analyze the frames structures				

UNIT-I

Continuous Beams:
Basic assumptions, Moment of inertia, settlements, Modification of moments, maximum moments and shear, beams curved in plan-analysis for torsion, redistribution of moments for single and multi-span beams, design examples.

Prestressed Concrete:
Basic principles, classification of prestressed members, various prestressing systgems, losses in prestress, initial and final stress conditions, analysis and design of sections for flexure and shear, load balancing concept, I:S:Specifications .
End blocks-Analysis of stresses, Magnel's method, Guyon's method, Bursting and spalling stresses, design examples.

UNIT-II

Flat slabs and staircases:
Advantages of flat slabs, general design considerations, approximate direct design method, design of flat slabs, openings in flat slab, design of various types of staircases, design examples.

Foundations:
Combined footings, raft foundation, design of pile cap and piles, under-reamed piles, design examples.

UNIT-III

Water Tanks, Silos and Bunkers:
Estimation of Wind and earthquake forces, design requirements, rectangular and cylindrical underground and overhead tanks, Intze tanks, design considerations, design examples.
Silos and Bunkers-Various theories, Bunkers with sloping bottoms and with high side walls, battery of bunkers, design examples.

UNIT-IV

Building Frames:
Introduction, Member stiffnesses, Loads, Analysis for vertical and lateral loads, Torsion in buildings, Ductility of beams, design and detailing for ductility, design examples.

Yield Line Theory:
Basic assumptions, Methods of analysis, yield line patterns and failure mechanisms, analysis of one way and two way rectangular and non-rectangular slabs, effect of top corner steel in square slabs, design examples.

Note for Paper-setter:
EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

Books:
1. Plain and Reinforced Concrete, Vol.2, Jai Krishna & O.P.Jain, Nem Chand & Bros.,Roorkee.
2. Pre-Stressed Concrete, N.Krishna Raju, TMH Pub.,N,.Delhi.
3. Design of Prestressed Concrete Structures, T.Y.Lin, John Wiley & Sons., N.Delhi.
4. Reinforced Concrete-Limit StaTge Design, A.K.Jain, Nem Chand & Bros., Roorkee.
5. IS 1343-1980,IS Code of Practice for Prestressed Concrete.
6. IS 3370-1976(Part I to IV), Indian Standard Code of Practice for Liquid Retaining Structures.
7. IS 456-2000, Indian Standard of Practice for Plain and Reinforced Concrete, IS 1893, 4326 & 13920 Indian Standard Code of Practice for Earthquake Resistant Design of Structures.

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: IRRIGATION ENGINEERING-II					
L	T	P/D	Total	**Subject Code: CE-403N**	Max. Marks: 100
3	1	0	4		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective	To Impart knowledge irrigation water requirement and ability to understand the hydraulic structures.				
UNIT	**Course Outcomes**				
I	Students will be able to understand the design properties of differerent types of Falls and Canals				
II	Students will be able to study the Cross drainage work and canal headworks				
III	Students will be able to study about different types of dams and their design				
IV	Students will be able to study about Spillways and Energy Dissipaters				

UNIT-I

Regulation works:
Canal falls-necessity and location, development of falls, design of cistern element, roughening devices, design of Sarda type fall, and design of straight Glacis fall. Off-take alignment, cross-regulator and distributory, head regulators, devices to control silt entry into the off-taking channel and silt ejector, canal escapes, types of escapes.

UNIT-II

Cross drainage works:
Classification and their selection, hydraulic design aspects of aqueducts, syphon aqueducts, super passage, canal syphon and level crossing, design of transitions.

Diversion canal headworks:
Various components and their functions, layout plan, selection of site for diversion headworks, Bligh's creep theory, Khosla's method of independent variables, use of Khosla's curves, various corrections, silt excluders.

UNIT-III

Storage Headworks:
Types of dams, selection of a site, gravity dam-two dimensional design, forces acting, stability criterion, elementary profile of a dam, cutoffs and drainage galleries, arch dams-constant angle and constant radius arch dam, simple design and sketchs, most economical angle, Earth dam, design principles, seepage through earth dams, seepage line, control of seepage, design of filters.

UNIT-IV

Spillways and Energy Dissipaters:
Essential requirements of spillway and spillway's capacity, types of spillways and their suitability, Ogee spillways, chute, side channel, shaft and syphon spillways, energy dissipation below spillways, stilling basins, USBR and I.S. Stilling Basins.

Note for Paper-setter:
EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

Books:
1. Irrigation, Water Resources and Water Power Engineering by P.N.Modi.
2. Fundamentals on Irrigation Engineering by Bharat Singh.
3. Irrigation Engineering and Hydraulic Structures by S.K.Garg.
4. Theory and Design of Irrigation Structures Vol.I & II by R.S.Varshney, Gupta & Gupta.

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: TRANSPORTATION ENGINEERING -II					
L	*T*	*P/D*	*Total*	*Subject Code: CE-405N*	*Max. Marks: 100*
3	*1*	*0*	*4*		*Theory: 75 marks*
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective	*The study of safe and optimum geometric design of highways and fundamental parameters of highway materials.*				
UNIT	**Course Outcomes**				
I	*Students will able to study about different types of pavement and their design*				
II	*Students Will study about highways construction using bituminous and non bituminous pavement*				
III	*Students Will study about highway maintenance and hill road design*				
IV	*Students Will study about highway economics and tunnels*				

UNIT-I

Design of Flexible Pavements:
Types of pavements. Flexible and rigid pavements. Components of a pavement and their functions. Factors affecting design of pavements. Design of thickness of a flexible pavement by Group Index method, CBR method (including latest IRC guidelines), riaxial method and Burmister's method.
T
Design Of Rigid Pavements:
Westergaard's theory, critical locations of loading, load and temperature stresses. Critical combination of stresses. IRC guidelines for determination of thickness of a rigid pavement. Joints: requirements, types, patterns. Spacing of expansion and contraction joints. Functions of dowel and tie bars.

UNIT-II

Highway Construction : Non-Bituminous Pavements:
Brief introduction to earthwork machinery: shovel, hoe, clamshell, dragline, bulldozers. Principles of field compaction of subgrade. Compacting equipments. Granular roads. Construction steps of WBM. WMM. Construction of cement concrete pavements. Slip-form pavers. Basic concepts of the following: soil stabilized roads, use of geo-synthetics, reinforced cement concrete pavements, prestress concrete pavements, roller compacted oncrete pavements and fibre reinforced concrete pavements.

Construction of Bituminous Pavements:
Various types of bituminous constructions. Prime coat, tack coat, seal coat and surface dressing. Construction of BUSG, Premix carpet, BM, DBM and AC. Brief coverage of machinery for costruction of bituminous roads: bitumen boiler, sprayer, pressure distributer, hot-mix plant, cold-mix plant, tipper trucks, mechanical paver or finisher, rollers. Mastic asphalt. Introduction to various IRC and MOST specifications.

UNIT-III

Highway Maintenance:
Pavement failures. Maintenance operations. Maintenance of WBM, bituminous surfaces and cement concrete pavements. Pavement evaluation. Benkleman beam. Introduction to arious types of overlays.

Highway Drainage and Hill Roads:
Surface drainage: types, brief design. Types of sub-surface drainage. Special characteristics of hill roads: geometrics, hair pin bends, construction of hill roads, drainage of hill roads, maintenance problems of hill roads

UNIT-IV

Highway Economics and Finance:

Need of economic evaluation. Highway user benefits and costs. Methods of economic evaluation: benefit cost ratio method, net present value method, internal rate of return method, comparison. Highway finance.

Tunnels:

Sections of tunnels: advantages, limitations and suitability of each section. Shaft. Pilot tunnel. Driving tunnel in rocks: sequence of construction operations, full face method, heading and bench method, drift method. Driving tunnels in soft ground: sequence of onstruction operations, needle beam method, shield tunneling, compressed air tunneling.

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

Books :
1. *Highway Engg by S.K.Khanna & C.E.G. Justo, Nem Chand Bros., Roorkee.*
2. *Principles and Practice of Highway Engg. by L.R.Kadiyali, Khanna Publishers, Delhi.*
3. *Principles of Pavement Design by Yoder,E.J & Witczak,M.W., John Wiley and Sons, USA.*
4. *Tunnel Engineering by S.C.Saxena, Dhanpat Rai Publications, N.Delhi.*
5. *A text book of Tunnel, Bridges and Railway Engg. by S.P.Bindra, Dhanpat Rai Delhi.*

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: SEWERAGE AND SEWAGE TREATMENT					
L	T	P/D	Total	Subject Code: CE-407N	Max. Marks: 100
3	0	0	3		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective		The aim of study is the Collection, Treatment and Disposal of Sewage			
UNIT		Course Outcomes			
I		Students will study the importance of sanitation and sewer design			
II		Students will study the physical, chemical and bacteriological properties of Sewage			
III		Students will study the methods of treatment of Sewage			
IV		Students will study the methods of safe Sewage disposal			

UNIT-I

Collection of sewage:
Importance of sanitation, Systems of sewerage – separate, combined and partially separate. Quantity of sanitary sewage and variations. Shapes of sewer – circular and egg shaped. Design of sewers, self-cleansing velocity and slopes, Construction and testing of sewer lines. Sewer materials. joints and appurtenances.

UNIT-II

Sewage Characterization:
Quality parameters- BOD, COD, Solids, D.O., Oil & Grease. Indian Standards for disposal of effluents into inland surface sources and on land.

UNIT-III

Sewage Treatment:
Objectives, sequence and efficiencies of conventional treatment units. Preliminary treatment, screening and grit removal units. Theory and design aspects of primary treatment, secondary treatment- activated sludge process & its modifications, Tricking filter, sludge digestion and drying beds.
Stabilization pond, aerated lagoon, UASB process , septic tank and Imhoff tank.

UNIT-IV

Disposal of Sewage:
Disposal of sewage by dilution – self-purification of streams. Sewage disposal by irrigation (sewage treatment).

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

Books:
1. Waste Water Engineering: Metcalf and Eddy.
2. Sewage and Sewage Treatment: S.K. Garg.
3. Sewage and Sewage Treatment: S.R. Krishansagar.
4. Waste Water Engineering: B.C. Punmia.
5. Manual on Sewerage and Sewage Treatment: Ministry of Urban Dev., New Delhi.

B. Tech. VII Semester (Civil)
CE-409N CONCRETE STRUCTURES-II (DRG.)

L T P/D: 0 0 3
Total Marks: 100   Sessional: 40 marks
Viva-voce: 60 marks   Duration: 3 hrs.

Preparing drawing sheets showing reinforcement details in case of:

1. Flat slabs

2. Underground and Overhead Water Tanks.

3. Combined Footings, Pile Foundations, Raft foundation.

4. T-Beam Bridge.

5. Silo/Bunker.

L T P/D: 0 0 2
Total Marks: 100   Sessional: 40 marks
Viva-voce: 60 marks   Duration: 3 hrs.
Complete design and drawing of the following:

1. Design of weirs and barrages on permeable foundation for surface and sub surface flow conditions.
2. Design of Guide Banks.

3. Flood Routing using step by step method.

4. Design of Syphon Aqueduct.

5. Design of Sarda type fall & sloping glacis fall.

6. Seepage line in a homogeneous earth dams on impermeable foundation with horizontal drainage.

7. Design of Ogee Spillway and stilling basin.

Note: Emphasis would be given to the computer aided designs of some of above structures.

DEC-I

B. Tech. VII Semester (Civil Engineering)					
SUBJECT: CE-413N HYDRO ELECTRIC POWER DEVELOPMENT					
L	T	P/D	Total	Subject Code: CE-413N	Max. Marks: 100
3	1	0	4		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective	The aim of study is the Sources of power, Elements of Hydro power, Intake structures, Penstocks.				
UNIT	Course Outcomes				
I	Students will study the estimation of water power, necessity and importance				
II	Students will study the Elements of Hydro power, classification of hydro-power plants				
III	Students will study about Intake structures, trash racks.				
IV	Students will study the methods Penstocks, surge tank, surges in canals.				

UNIT-I

Introduction:

Sources of power, estimation of water power, necessity and importance of harnessing small hydro power, flow duration and power duration curves, load curve, load factors, capacity factors, utilization factors, firm and secondary power.

Types of Hydro Power Plants:

Elements of Hydro power, classification of hydro-power plants, run-of-river plants, storage plants diversion canal development, pumped storage plants, tidal power plants, base load and peak load plants in a power grid.

UNIT-II

Intakes:

Intake structures, functions and their types, components of intakes-forebay, trash racks, gates and valves, force required to operate gates.

Conveyance System:

Penstocks, design criterion, economical diameter anchor blocks, cradles and footings, water hammer, instantaneous closure of power canal, surge tank, surges in canals.

UNIT-III

Turbines:

Types of turbines, specific speed and classification of turbines, synchronous speed, scroll casing, flumes and draft tubes, dimensions of scroll sassing and draft tubes, setting of turbines

UNIT-IV

Power House: General layout and arrangements of hydro-power number and size of units, sub-structure, spacing of super-structure, underground power stations, tidal power.

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unitBooks:
1. Water Power Engineering, Dandekar, M.M. Sharma, K.N.
2. Hydro-Electric Engineering Practice Vol. I, II & III Brown
3. Water Power Engineering, Borrows, H.K.
4. Water Power Development, Vol. I & II, Mosonyi, E.
5. Water Power Engineering, M.M. Deshmukh.

CE-415N RIVER MECHANICS & FLOOD CONTROL

L T P/D   Total Max.Marks: 100
3 1 – 4   Theory: 75 marks
                                              Sessionals: 25 marks
                                              Duration: 3 hrs.

UNIT-I
Introduction:
Indian rivers, flood, flood problems, river morphology behavior of river flow, role of sediments in rivers, changes in regimes, river gauging, causes of flood and losses, alleviation of flooding.

Hydrologic Statistics:
Probabilistic treatment of hydrologic data, frequency & probability functions, statistical parameters, fitting a probability distribution, probability distribution fort hydrauli

UNIT-II
Flood Mitigation by River Protection:
Basis of river engineering, flow types, resistance flow, energy slope, backwater effect, three dimensional flow, circular and helicoidal flow, river improvement works, river survey, protection by embankment, discharge capacity, design of dyke, stability analysis of dykes, bank protection, bank recession, types of bank protection works, channel improvement, cutoffs diversion, bypass channel, cutoff channel, floored ways, flood plain zeroing, spreading grounds.

UNIT-III
Flood Mitigation by Reservoirs:
Design factors, storage capacity determinations, sequent peak algorithm method, live storage, ripple mass curve flood routing, flood storage, dead storage, reservoir classification, reservoir sedimentation, distribution of sediment load measurement, Mood's method, life of reservoir, reservoir operation based on annual storage and regulation, single and multi purpose reservoirs, gate operation schedule, maximum and minimum flow operation, multi purpose reservoir operation, reservoir economics-cost benefit ratios, optimization of benefits.

UNIT-IV
Flood Forecasting & Warning:
Basic data, communication network, forecasting techniques and procedures, forecast of rainfall, runoff from rainfall, forecasting stages, peak travel time, forecast reporting, flood warning, Engineering methods for flood fighting.
Engineering Economics of Flood Control:
Estimation of flood damages, estimation of benefits of flood contr4ol, cost benefit analysis of flood control project.

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit
Books:
1. Flood Control & Drainage Engg. By S.N. Ghosh
2. Hydrology & Flood control Engg. By S.K.Garg

DEC-II
CE-421N ELEMENTS OF EARTHQUAKE ENGINEERING

L T P/D
3 1 – 4

Total Max.Marks: 100
Theory: 75 marks
Sessionals: 25 marks
Duration: 3 hrs.

UNIT-I
Seismology: Introduction, plate tectonics, earthquake distribution & mechanism, seismicity, seismic wave, earthquake magnitude & intensity, seismic zoning & seismometry.

Single degree of freedom systems: Various types of dynamic loads, vibration of single degree of freedom system, free or forced vibrations, types of damping, critical damping, transmissibility, vibration measuring instruments, response spectrum.

UNIT-II
Multi-degree of Freedom (MDOF) systems: Equation of motion, normal modes & natural frequencies, semi-definite systems, dynamic vibration absorbers, vibration dampers, principle of orthogonally, Stodolas method, Holzer's method, matrix method, modal analysis & its limitations, Mode superposition method.

UNIT-III
Seismic Analysis and Design: General principles, assumptions, Seismic coefficient method, response spectrum method, strength and deflection, design criterion for structures, significance of ductility, codal provisions, and design examples.

UNIT-IV
Seismic performance, Repair and strengthening: Methods for assessing seismic performance, influence of design ductility and masonry infills, criterion for repair and strengthening techniques and their applications, addition of new structural elements.

Vibrational control: General features of structural control, base isolation, active and paasive control system, earthquake resistance design as per IS: 1893, IS: 4326 and: 13920.

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

Books:
2. Elements Of Earthquake of Engineering, Jai Krishna, A. R. Chandershekaran & Brajesh Chandra, South Asian Pub New Delhi.
3. Dynamics of Structures, Clough & Penzion, McGraw Hill.
4. Earthquake Engineering, Y-X Hu, S-C. Liu and W. Dong, E and FN Sons., Madras.
5. Earthquake Resistant Concrete Structures, George G. Penelis and J. Kapoors, E and FN Sons., Madras.
6. Structural Dynamic, Mario Paz, CBB Pub. N.Delhi.

CE-437N ENERGY RESOURCES & TECHNOLOGY

L T P/D   Total Max.Marks: 100
3 1 – 4   Theory: 75 marks
                                                  Sessionals: 25 marks
                                                   Duration: 3 hrs.

UNIT-I
ENERGY SOURCES & AVAILABILITY:
World energy situation. Indian energy scenario. Comparative study of thermal, hydro, nuclear and gas power plants. Impact of thermal, gas, hydro and nuclear power stations on environment, air and water pollution, green house effect (global warning) geothermal, hydrogen energy, fuel cells,

UNIT-II
SOLAR ENERGY:
Solar constant, solar radiation geometry, local solar time, day length, solar radiation measurement, radiation on inclined surface, solar radiation data & solar charts., solar water heating, solar dryers, solar stills, solar cooling and refrigeration. Conversion of heat into mechanical energy. Active and passive heating of buildings. Solar cells.

UNIT-III
BIOMASS ENERGY:
 Introduction to biomass, biofuels & their heat content, biomass conversion
technologies. Aerobic & anaerobic digester, Factors affection biogestion, biogas plants - types & description. Utilisation of biogas - Gasifiers, Alternative liquid fuels –ethanol and methanol. Ethanol production.

UNIT-IV
HYDRO POWER ENERGY
Sources of power, estimation of water power, necessity and importance of harnessing small hydro power, flow duration and power duration curves, load curve, load factors, capacity factors, utilization factors, firm and secondary power. Elements of Hydro power, classification of hydro-power plants, run-of-river plants, storage plants diversion canal development, pumped storage plants.

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit

TEXT BOOKS:
1. Electric Power Generation, B.R.Gupta
2. Power Generation, Operation and Control, Wood and Wollenberg, John Wiley & Sons,1984.
3. Power Plant Engg: G.D. Rai

REFERENCE BOOKS:
1. Renewable Energy Resources: John Twidell and Tony Weir
2. Renewable Energy Resources Conventional & Non- Conventional: M.V.R Koteswara

				B. Tech. VII Semester (Civil Engineering)		
				CE-439N Estimation and Accounts		
L	T	P/D	Total	**Subject Code: CE-439N**	Max. Marks: 100	
3	1	0	4		Theory: 75 marks	
					Sessional: 25 Marks	
					Duration: 3 hrs.	
Course Objective	The aim of study is to get knowledge about estimation of different civil works.					
UNIT	**Course Outcomes**					
I	Students will study the different methods of estimation					
II	Students will study about different types of specification used in civil works					
III	Students will study about rate analysis of different items					
IV	Students will study the terms used in civil works and public works accounts					

UNIT-I

Estimate:
Principles of estimation, units, items of work, different kinds of estimates, different methods of estimation, estimation of materials in single room building, two roomed building with different sections of walls, foundation, floors and roofs, R.B. and R.VC.C. works, Plastering, White-washing, Distempering and painting, doors and windows, lump sum items, Estimates of canals, roads etc.

UNIT-II

Specification of Works:
Necessity of specifications, types of specifications, general specifications, specification for bricks, cement, sand, water, lime, reinforcement; Detailed specifications for Earthwork, Cement, concrete, brick work, floorings, D.P.C., R.C.C., cement plastering, white and colour washing, distempering, painting.

UNIT-III

Rate Analysis:
Purpose, importance and requirements of rate analysis, units of measurement, preparation of rate analysis, procedure of rate analysis for items:- Earthwork, concrete works, R.C.C. works, reinforced brick work, plastering, painting, finishing(white-washing, distempering).

UNIT-IV

Public Works Account:
Introduction, function of P.W. department, contract, guidelines, types of contracts, their advantages and disadvantages, Tender and acceptance of tender, Earnest money, security money, retention money, performance guarantee, secured advance, mobilization advance, measurement book, cash book, preparation, examination and payment of bills, first and final bills, administrative sanction, technical sanction. Maintenance of muster ROLL precaution filling preparation of pay bill, measurement of book for payment of contractors, different types of payment, first & final, running advance and final payment

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

Books
1. Estimating & Costing in Civil Engg..: Theory & Practice by B.N.Dutta, S.Dutta & Co., Lucknow.
2. Civil Estimating and Costing by A.K Upadhyay, S.K Kataria & Sons, Daryaganj, New Delhi
3. Estimating, Costing & Specification in Civil Engg. by M.Chakarborty, Calcutta.
4. Estimating and Costing for Building & Civil Engg.Works by P.L.Bhasin, S.Chand & Co., N.Delhi.
5. Building Construction Estimating by George H.Cooper, McGraw Hill Book Co., New York

CE-441N ENERGY EFFICIENT BUILDINGS

L T P/D   **Total Max.Marks: 100**
3 1 – 4   **Theory: 75 marks**
                                           Sessionals: 25 marks
                                           Duration: 3 hrs.

UNIT I

Introduction: Fundamentals of energy - Energy Production Systems - Heating, Ventilating and air conditioning –Solar Energy and Conservation - Energy Economic Analysis - Energy conservation and audits -Domestic energy consumption - savings -Energy use in buildings - Residential - commercial buildings.

Environmental: Energy and Resource conservation - Design of green buildings - Evaluation tools for building energy - Embodied and operating energy - Peak demand - Comfort and Indoor air quality - Visual and acoustical quality - Land, water and materials - Airborne emissions and waste management.

UNIT II

Design:
 Natural building design consideration - Energy efficient design strategies - Contextual Factors - Longevity and process Assessment -Renewable energy sources and design. **Advanced building Technologies** - Smart buildings - Economies and cost analysis.

Services: Energy in building design - Energy efficient and environment friendly building – Thermal phenomena - thermal comfort - Indoor Air quality - Climate, sun and Solar radiations.

UNIT III

Energy audit:
Types of energy audit - Analysis of results - Energy flow diagram – Energy consumption/ Unit production - Identification of wastage -Priority of conservative measures - Maintenance of management programme.

UNIT IV

Energy Management:
 Energy management of electrical equipment - Improvement of power factor, management of maximum demand - Energy savings in pumps - Fans - Compressed air systems Energy savings in Lighting systems - Air conditioning systems - Applications.

 Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit

Text Books
1. Moore F., Environmental Control System McGraw Hill, Inc., 1994.
2. Brown, G Z, Sun, Wind and Light: Architectural design strategies, John Wiley, 1985.

Reference Books
1. Cook, J, Award - Winning passive Solar Design, McGraw Hill, 1984.

B. Tech. VIII Semester (Civil Engineering)					
SUBJECT: BRIDGE ENGINEERING					
L	T	P/D	Total	**Subject Code: CE-402N**	Max. Marks: 100
4	2	0	6		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective	Students will acquire the knowledge about the design of Railway, R.C.C and Steel Bridge and its foundation				
UNIT	**Course Outcomes**				
I	Students will be able to study Specifications for Roads and Railways Bridges				
II	Students will be able to design consideration for R. C. C. Bridges				
III	Students will be able to design consideration for Steel Bridges				
IV	Students will be able to Hydraulic & Structural design of Bridge				

UNIT-I

Introduction:
Definition, components of bridge, classification of bridges, selection of site , economical span, aesthetics consideration, necessary investigations and essential design data.
Standard Specifications for Roads and Railways Bridges:
General, Indian Road Congress Bridge Code, width of carriage way, clearance, various loads to be considered for the design of roads and railway bridges, detailed explanation of IRC standard live loads.

UNIT-II

Design Consideration for R. C. C. Bridges:
Various types of R.C.C. bridges(brief description of each type) , design of R.C.C. culvert and T-beam bridges.

UNIT-III

Design Consideration for Steel Bridges:
Various types of steel bridges (brief description of each), design of truss and plate girder bridges.

UNIT-IV

Hydraulic & Structural Design:
Piers, abutments, wing-wall and approaches.
Brief Description:
Bearings, joints, articulation and other details.
Bridge Foundation:
Various types, necessary investigations and design criteria of well foundation.

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

Books:
1. Essentials of Bridge Engineering, D.J.Victor, Oxford & IBH Pub.N.Delhi.
2. Design of Bridges, N.Krishna Raju, Oxford & IBH, N.Delhi.
3. Bridge Deck Analysis, R.P.Pama & A.R.Cusens, John Wiley & Sons.
4. Design of Bridge Structures, T.R.Jagadish & M.A.Jairam, Prentice Hall of India, N.Delhi.

B. Tech. VIII Semester (Civil Engineering)					
SUBJECT: Railway & Airport Engineering					
L	T	P/D	Total	Subject Code: CE-404N	Max. Marks: 100
3	2	0	5		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective	Students will acquire the knowledge about the design of Railways and Air port				
UNIT	Course Outcomes				
I	Students will be able to study different types of Rails,Sleepers and Ballast				
II	Students will be able to design different components of Railways				
III	Students will be able to know Geometric design of track				
IV	Students will be able to analyze the frames structures				

UNIT-I
Introduction, Permanent Way And Rails
Rail transportation and its importance in India. Permanent way: requirements and components. Gauges in India and abroad. Selection of gauge. Coning of wheels. Adzing of sleepers. Rails: functions, composition of rail steel, types of rail sections, requirements of an ideal rail section, length of rails. Defects in rails. Creep of rails. Long welded rails and continuously welded rails.

Sleepers, Fastenings And Ballast
Sleepers: functions, requirements of an ideal sleeper. Types of sleepers: wooden, cast iron, steel and concrete sleepers, advantages, disadvantages and suitability of each type. Sleeper density. Fastenings for various types of sleepers: fish plates, spikes, bolts, bearing plates, keys, chairs, jaws, tie bars. Elastic fastenings. Ballast: functions, requirements, types of ballast and their suitability.

UNIT-II
Points And Crossings
Necessity. Turnout: various components, working principle. Switch: components, types. Crossing: components and types. Design elements of a turnout, design of a simple turnout. Layout plan of track junctions: crossovers, diamond crossing, single-ouble slips, throw switch, turn table, triangle.

Signaling, Interlocking And Train Control
Signals: objects, types and classification. Semaphore signal: components, working principle. Requirements / principles of a good interlocking system. Brief introduction to devices used in interlocking. Methods of control of train movements: absolute block system, automatic block system, centralized train control and automatic train control systems.

UNIT-III
Geometric Design Of The Track
Gradients, grade compensation. Super elevation, cant deficiency, negative super elevation. Maximum permissible speed on curves. Tractive resistances, types. Hauling capacity of a locomotive.

Stations, Yards And Track Maintenance
Stations: functions and classification. Junction, non-junction and terminal stations. Yards: functions, types. Marshalling yard: functions, types. Maintenance of railway track: necessity, types of maintenance. Brief introduction to mechanized maintenance, M.S.P and D.T.M.

UNIT-IV
Introduction And Airport Planning

Air transportation, its importance and characteristics, status in India. Layout plan of an airport and its basic elements: terminal area, apron, taxiway, runway, hanger. Aircraft characteristics, their effect on elements of an airport. Site
selection of an airport. lassification of airports.

Runway Layout And Pavement Design
Runway orientation, Wind Rose diagram. Basic runway length. Corrections to basic runway length. Runway patterns. Difference between highway and runway pavement. Types of runway pavements. Design factors for runway pavement. Brief introduction to design of thickness of a runway pavement.

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

Books:
1. A text book of Railway Engineering *by* S.C.Saxena and S.P.Arora, Dhanpat Rai Publicatios, N.Delhi.
2. Railway Track Engg. *by* J.S.Mundray, Tata McGraw-Hill Publishing Co. Ltd. N.Delhi.
3. Airport Planning and Design *by* S.K.Khanna, M.G.Arora, Nem Chand Bros., Roorkee.
4. The Planning and Design of Airports *by* Robort Hornjeff, McGraw Hill Book Co.
5. Air Transportation Planning and Design *by* Virender Kumar & Satish Chandra, Galgotia Publications,   N.Delhi.

B. Tech. VIII Semester (Civil Engineering)					
SUBJECT: Industrial Waste Water Treatment					
L	T	P/D	Total	**Subject Code: CE-406N**	Max. Marks: 100
3	2	0	5		Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective	The aim of study is to understand the effect of Industrial waste water on environment and its treatment				
UNIT	**Course Outcomes**				
I	Students will study the effect of waste water on streams				
II	Students will study the working process of treatment plant				
III	Students will study about the standard for disposal				
IV	Students will study the types of industry responsible for waste generation				

UNIT-I

Effects of industrial wastes on streams, sewerage systems and wastewater treatment plants.

UNIT-II

Minimizing the effects of industrial effluents on waste water treatment plants and receiving streams-conservation of water, process change, reuse of waste water, volume reduction, strength reduction, neutralization, equalization and proportioning.

UNIT-III

Population equivalent. Industrial effluent standards for disposal into inland surface water sources and on land for irrigation.

UNIT-IV

Study of the following Industries from waste generation, quality and its treatment including brief overview of manufacturing process:

Textile, tannery, sugar mill, distillery, dairy, pulp & paper, metal plating, oil refinery, nitrogenous fertilizers, thermal power plants and radio active wastes.

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

Books:
1.   Industrial and Hazardous Waste Treatment by N.L.Nemerow & A.Dasgupta.
2.   Industrial Effluents by N.Manivasakam.
3.   Waste Water Treatment by M.N.Rao & A.K.Dutta.

CE – 426N TRANSPORTATION ENGINEERING – II (P)

L T P/D 0 0 2
Total Marks: 100   Sessional: 40 marks
Viva-voce: 60 marks   Duration: 3 hrs.

LIST OF EXPERIMENTS

1. Flakiness and Elongation Index of aggregates.
2. Specific gravity and water absorption test on aggregates.
3. Specific gravity of bitumen.
4. Proportioning of aggregates.
5. Marshall's stability test.
6. Stripping test on aggregates.
7. Determination of bitumen content.
8. CBR lab test on soil.
9. Traffic volume study using videography technique.
10. Traffic speed study using videography technique.

L T P/D 0 0 2

Total Marks: 100	Sessional: 40 marks
Viva-voce : 60 marks	Duration: 3 hrs.

LIST OF EXPERIMENTS

1. To determine the acidity of a sewage sample.

2. To determine the alkalinity of a sewage sample.

3. To determine total, suspended, dissolved and settable solids in a sewage sample.

4. To determine volatile and fixed solids in a sewage sample.

5. To determine oil and grease in a sewage sample.

6. To determine the chloride concentration in a sewage sample.

7. To determine the sulphate concentration in a sewage sample.

8. To determine the B.O.D. of a given sewage sample.

9. To determine the C.O.D. of a given sewage sample.

10. To determine the T.O.C. of a given sewage sample.

11. To determine the fecal count of a given sewage sample.

12. Microscopic studies of a sewage.

DEC-III

L	T	P/D	Total	**SUBJECT: GYOSYNTHETICS ENGINEERING**	
				B. Tech. VIII Semester (Civil Engineering)	
				SUBJECT: GYOSYNTHETICS ENGINEERING	
3	2	0	5	**Subject Code: CE-414N**	Max. Marks: 100
					Theory: 75 marks
					Sessional: 25 Marks
					Duration: 3 hrs.
Course Objective		The aim of study is to understand the application of Geosynthetic material,types of material			
UNIT		**Course Outcomes**			
I		Students will study the Historical Development, The Nomenclature, Function			
II		Students will study the Manufacutinr Methods			
III		Students will study about Erosion Control with Geogrids			
IV		Students will study about Application of Geosynthetics in Water Resource Project			

UNIT I

Basic Description of Geosynthetics:
Historical Development, The Nomenclature, Function, Use around the World, Applications, Development in India.
Raw Materials – Their Durability and Ageing:
Raw Materials, Durability, Degrading Agencies, Polymers, Biological Resistance, Chemical Resistance, Weathering Resistance

UNIT II

Manufacutinr Methods:
Fibres, Yarn, Nonwoven Geotextiles, Woven Geotextiles, D.S.F. Fabrics.
Geogrids- Testing and Evaluation:
Factors influencing Testing, Sampling, Physical Properties, and Mechanical Properties under Uniaxial loading, Creep Testing

UNIT III

Erosion Control with Geogrids:
Wind Erosion, Rain Water Erosion, Erosion Control Measures, Placement of Geogrid
Bearing Capacity Improvement with Geogrids:
Advantages, Mechanism, Modes of Failure, Friction Coefficient, Experimental Studies.

UNIT IV

Application of Geosynthetics in Water Resource Projects: Case Study: Dharoidam, Hiran II Dam, Meda Creek Irrigation Scheme, Lining of Kakarpar Canal

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

Books:
1. Designing with Geosynthetics, (Prentice Hall) by Robert M. Koerner.
2. Engineering with Geosynthetics, (Tata MacGraw Hill) by G.V. Rao & G.V.S. Raju.

L T P/D   **Max.Marks: 100**
3 1 – 4   **Theory marks: 75**
                                                                                          Sessional: 25
                                                                                          Duration: 3 hrs.

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UNIT-I
Introduction Various non-conventional energy resources   Introduction, availability, classification ,relative merits and demerits.
Solar Cells:
Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations.
Solar Thermal Energy:
Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.
UNIT-II
Geothermal Energy:
Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.
Magneto-hydrodynamics (MHD):
Principle of working of MHD Power plant, performance and limitations.
Fuel Cells:
Principle of working of various types of fuel cells and their working, performance and limitations.
UNIT-III
Thermo-electrical and thermionic Conversions:
Principle of working, performance and limitations.
 Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification   of rotors,
Concentrations and augments, wind characteristics. performance and limitations of energy conversion systems.
UNIT-IV
Bio-mass:
Availability of bio-mass and its conversion theory.
Ocean Thermal Energy Conversion (OTEC):
Availability, theory and working principle, performance and limitations.
Wave and Tidal Wave:
Principle of working, performance and limitations.
Waste Recycling Plants.

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit

Text/References Books:
1. Raja etal, "Introduction to Non-Conventional Energy Resources" Scitech Publications.
2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.
3. M.V.R. Koteswara Rao, " Energy Resources: Conventional & Non-Conventional " BSP Publications,2006.
4. D.S. Chauhan,"Non-conventional Energy Resources" New Age International.
5. C.S. Solanki, "Renewal Energy Technologies: A Practical Guide for Beginners" PHI Learning.

CE-442N Prestressed Concrete Structure

L T P/D   **Max.Marks: 100**
3 1 – 4   **Theory marks: 75**
                                                                       Sessional: 25
                                                                       Duration: 3 hrs.

UNIT I

Introduction: Basic concepts of prestressing, terminology, advantages and applications of prestressed concrete.Materials for Prestressed Concrete: High strength Concrete, permissible stresses in concrete, high strength steel, permissible stresses in steel. **Prestressing Systems**: Prestensioning and post tensioning systems, various types of tensioning devices, Lec-Macall systems, Magnel Blaton post tensioning, Freyssinet systems, Gifford Udal system.

UNIT II

Losses of Prestress : Types of losses of prestress, loss due to elastic deformation of concrete, loss due to shrinkage of concrete, loss due to creep of concrete, loss due to relaxation of stress in steel, loss due to friction, loss due to anchorage slip, total loss in pretensioned and post tensioned members. **Analysis of Prestress and Bending stresses**: Basic assumptions, resultant stresses at a section, concept of load balancing, cracking moment.

UNIT III

Deflections: Factors influencing deflections, short term deflections of un-cracked members, deflections of cracked members, prediction of long term deflections.
Shear and Torsional Resistance: Ultimate shear resistance of prestressed concrete members, prestressed concrete members in torsion, design of reinforcements for torsion, shear and bending.

UNIT IV

Design of Flexural Members : Dimensioning of flexural members, design of pre-tensioned and post tensioned beams, design of partially prestressed members, design of one way and two way slabs, continuous beams.Design for axial tension, compression and bending, bond and bearing.

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

Text Books
1. Prestressed Concrete by N. Krishna Raju, TMH Publishing Company, New Delhi,
2. Prestressed Concrete by P. Dayartnam, Oxford and IBH Publication, New Delhi.

Reference books 1.Design of Prestressed Concreet Structures by T Y Lin& Ned H. Burns

L T P/D   **Max.Marks: 100**
3 1 – 4   **Theory marks: 75**
                                                                           Sessional: 25
                                                                           Duration: 3 hrs.

UNIT-I

Fundamentals of Measurement, Sensing and Instrumentation covering definition of measurement and instrumentation, physical variables, common types of sensors; Describe the function of these sensors; Use appropriate terminology to discuss sensor applications; and qualitatively interpret signals from a known sensor type, types of instrumentation, Sensor Specifics, Permanent installations, Temporary installations;

UNIT-II

Sensor Installation and Operation covering to: i) Predict the response of sensors to various inputs; ii) Construct a conceptual instrumentation and monitoring program; iii) Describe the order and methodology for sensor installation; and iv) Differentiate between types of sensors and their modes of operation and measurement and v) Approach to Planning Monitoring Programs, Define target, Sensor selection, Sensor siting, Sensor Installation & Configuration, Advanced topic, Sensor design, Measurement uncertainty

UNIT-III

Data Analysis and Interpretation covering **a)** Fundamental statistical concepts, b) Data reduction and interpretation, c) Piezometer, Inclinometer, Strain gauge, etc. d) Time domain signal processing, e) Discrete signals, Signals and noise and f) a few examples of statistical information to calculate are: Average value (mean), On average, how much each measurement deviates from the mean (standard deviation), Midpoint between the lowest and highest value of the set (median), Most frequently occurring value (mode), Span of values over which your data set occurs (range)

UNIT-IV

Frequency Domain Signal Processing and Analysis covering Explain the need for frequency domain analysis and its principles; Draw conclusions about physical processes based on analysis of sensor data; Combine signals in a meaningful way to gain deeper insight into physical phenomena, Basic concepts in frequency domain signal processing and analysis, Fourier Transform, FFT (Fast Fourier Transform), Example problems: Noise reduction with filters, Leakage, Frequency resolution

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

Text/Reference Books:
   1) Alan S Morris (2001), Measurement and Instrumentation Principles, 3rd/e, Butterworth Hienemann
   2) David A. Bell (2007), Electronic Instrumentation and Measurements 2nd/e, Oxford Press
   3) S. Tumanski (2006), Principle of Electrical Measurement, Taylor & Francis
   4) Ilya Gertsbakh (2010), Measurement Theory for Engineers, Springer

CE-418N GROUND WATER HYDROLOGY

L T P/D   **Max.Marks: 100**
3 1 – 4   **Theory marks: 75**
                                                                                               Sessional: 25
                                                                                               Duration: 3 hrs.

UNIT-I

Properties of Aquifers, Formation constants, compressibility of aquifers, Equation of motion for steady and unsteady ground water flow in isotropic homogeneous aquifers, Dupit's assumptions. Unconfined flow with a recharge, tile drain problem. Ground water exploration and methods of investigations.

UNIT-II

Effect of Boundaries, interference of water, leaky aquifers, Thiem's equilibrium formula for unconfined and confined aquifers and determination of hydraulic properties of aquifers. Partial penetration of an aquifer by a well, spherical flow in a well. Non equilibrium formula for aquifer (unsteady radial flows).

UNIT-III

Tubewells, optimum capacity, silting of tubewell, design of Tubewells in different aquifers, tubewell types, parts, bore hole, strains, its types, well pipe, causing pipe, blind pipe. Construction and working of tubewells, site selection, drilling operation, cable tool method, hydraulic method, rivers Rotary Method and drilling fluids, well screen assembly installation, verticality and alignment of tubewells, gravel packing, development of tubewells, sickness, in construction and corrosion and failure of tubewells, Pumping equipment and hydraulic testing of pumps.

UNIT-IV

Artificial Recharge of Ground Water, considerations and methods, recharge techniques induced infiltration, water spreading, flooding, basins, ditching, modification of natural channels, irrigation, recharge pits, shafts and recharge wells.

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

Books:

1 Groundwater Hydrology, D.K. Todd, John Wiley & Songs Inc. New York.
2 Groundwater H.M. Raghunath, Wiley Eastern Ltd., N.Delhi.

CE-420N DESIGN OF HYDRAULIC STRUCTURES

L T P/D   Max.Marks: 100
3 1 – 4   Theory marks: 75
                                                               Sessional: 25
                                                               Duration: 3 hrs.

UNIT-I
Gravity Dams: Dam parameters, Criteria for selection of dam sites, Joints & keys, Cooling arrangement. Water stops at joints, Closing gaps, forces acting on dams, Types of loads, Elementary profile of a gravity dam, Step by step method, Stability analysis methods, Safety criteria, Gravity analysis, Internal stress calculation, Graphical determination of shear stress, Effect of foundation elasticity on stresses, Galleries, Behavior of concrete gravity dam subjected to earthquakes, Thermal stresses.

UNIT-II
Arch Dams: Development of arch dam, Valleys suited for arch dams, Arch dams layout, Types of arch dams, Appurtenant works, Thin cylinder theory and most economical central angle, Design of arch dam, Suitability at abutments, Effects of foundation elasticity on behaviours of arch dam.

Buttress Dams: Types of buttress dam, Selection of type of buttress dam, Most economical profile having no tension, Design principles, Butterss design by Unit column theory, Basic shape of buttress, Design of multiple arch dam, Provision of spillways and outlet works.

UNIT-III
Spillways and Energy Dissipaters: Factors affecting design, Components of spillways, Types of spillways, Design principles. Hydraulic design ogee spillway, Side channel spillway, Chute spillway, Syphon spillway, Shaft-spillway, Energy dissipation below spillways, Bucket type energy dissipaters, Design of various types of stilling basins.

UNIT-IV
Weirs and Barrages: Design of weirs & barrages on permeable foundation, Khosla theory of independent variable. Upstream and downstream protection, Flownets, design of sloping Glacis weir, calculation for hydraulic jump and uplift pressure.

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

Books:
1. Engineering for Dams by Creager, Justin & Hinds, Wiley Eastern Pvt. Ltd. Delhi.
2. Concrete Dams by R.S. Varshney, Oxford & IBH Pub. Co. Delhi,
3. Dams Part – I Gravity Dams by K.B. Khushalani, Oxford & IBH, Delhi
4. Design of Weirs on Permeable foundations, CBIP Pub. No. 20. Delhi
5. Hydraulic Design of Spillways, ASCE Technical Engg. No. 2, Design Guides as Adapted from the US army Corps.

CE-422N ENVIRONMENTAL IMPACT ASSESSMENT

L T P/D   **Max.Marks: 100**
3 1 – 4   **Theory marks: 75**
                                                             Sessional: 25
                                                             Duration: 3 hrs.

UNIT-I
Environment and Human Activity: Resources, pollution, reuse and environmental management.

Management of Aquatic Environment: Water quality controls. Drainage basin activities and water pollution. The impact of human activity on aquatic resources. The control measures, regional planning.

UNIT-II
Air Quality Management: Atmosphere, effect of human activity on air quality, waste disposal alternative. Optimization, planning of waste disposal.

UNIT-III
Waste Management: Waste disposal methods, impact of waste disposal of human activity.

Land Use Management: Impact of land use on human life. Control, of hazards in land use, management of land use.

UNIT-IV
Environmental Assessment: National environmental policy, implication of environment assessment in design process. Preparation of assessment, quantification. General requirements of environmental standards. Techniques of setting standards.

Note for Paper-setter: EIGHT questions are to set selecting at least TWO questions from each unit, covering entire syllabus. Students will be required to attempt FIVE questions selecting at least ONE question from each unit.

Books:
1 Environmental Impact Analysis by R.K. Jail and L.V. Urban.
2 Environmental Impact Assessment by Canter
3 Environmental Impact Assessment by J.Glasson.