JABALPUR ENGINEERING COLLEGE, JABALPUR (MP)
(An Autonomous Institute of Govt. of M.P.)

Affiliated to Rajiv Gandhi Technological University, Bhopal (MP)
Scheme of Study and Examination (w.e.f. July 2010)

B.E. Third Year   **Branch : CIVIL ENGINEERING**   **Sem : Fifth**

Course Code	Subject	L	T	P	TA	CT	TOTAL	ESE	SUB TOTAL	Credits
		Periods			SESSIONAL EXAM				EVALUATION SCHEME	
CE-18	Geotechnical Engineering - II	3	1	-	10	20	30	70	100	4
CE-20	Water Resources Engineering - I	3	1	-	10	20	30	70	100	4
CE-22	Fluid Mechanics - II	3	1	-	10	20	30	70	100	4
CE-25	Structural Analysis - I	3	1	-	10	20	30	70	100	4
CE-26	Structural Design - I (RCC)	3	1	-	10	20	30	70	100	4
(PRACTICAL/DRAWING/DESIGN)										
CE-19L	Geotechnical. Engineering Lab - II	-	-	2	20	-	20	30	50	2
CE-21L	Hydrology Lab	-	-	2	20	-	20	30	50	2
CE-23L	Fluid Mechanics Lab - II	-	-	2	20	-	20	30	50	2
CE-27L	Structural Design (RCC) Lab - I	-	-	2	20	-	20	30	50	2
CE-24L	Industrial Training - I	-	-	2	50	-	50	-	50	2
CE-10L	Concrete Lab	-	-	2	50	-	50	-	50	2
	Total	**15**	**5**	**12**	**230**	**100**	**330**	**470**	**800**	**32**

T.A. Teachers Assessment, CT- Class Test, ESE - End Semester Examination, Total Marks 800 Total Periods : 32, Total Credits : 32

COURSE CONTENT & GRADE   (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	**P**	
BE/PTDC	**GEOTECHNICAL ENGINEERING - II**	CE-18	Min "D"	Min "D"	5.0

GEOTECHNICAL ENGINEERING – II

Unit – I : Shallow Foundations : Type of foundations shallow and deep Bearing capacity of foundation on cohesion less and cohesive soils. General and local shear failures. Factors effecting B.C. Theories of bearing capacity, Prandtl. Tezaghi Balla, Skempton Meyerhof and Hansan, I.S. code on B.C. Determination of bearing capacity limits of total and differential settlements. Plate load test.

Unit – II : Deep Foundation : Pile foundation, Types of piles, estimation of individual and group capacity of piles in cohesion less and cohesive soils. Static and dynamic formulae. Pile load test. Settlement of pile group Negative skin friction. Under-reamed piles and their design piles under tension, inclined and lateral load caissons. Well foundation Equilibrium of wells Analysis for stability t. Remedial measures.

Unit – III : Soil Improvement Techniques : Compaction Field and laboratory methods. Proctor compaction tests, Factors affecting compaction. Properties of soil affected by compaction. Various equipment for field compaction and their suitability. Field compaction control. Lift thickness.

Soil stabilization : Mechanical, Lime, Cement, Bitumen, Chemical, Thermal, Electrical-stabilization and stabilization by grouting. Geo-synthetics, types, functions, materials and uses.

Unit – IV : Soil Exploration and Foundations on Expansive and Collapsible soils : Methods of soil exploration. Planning of exploration programme for buildings, highways and earth dams. Disturbed and undisturbed samples and samplers for collecting them.

Characteristics of expansive and collapsible soils, their treatment, Construction techniques on expansive and collapsible soils. CNS layer.

Unit – V : Sheet piles/Bulkheads and Machine foundation : Classification of sheet piles/bulkheads. Cantilever and anchored sheet piles, Cofferdams, materials, types and applications.

Modes of vibration. Mass-spring analogy, Natural frequency. Effect of vibration on soils. Vibration isolation. Criteria for design Design of block foundation for impact type of machine.

Reference Books :
1. Soil Mechanics & Foundation Engg. By Dr. K.R. Arora – Std Pub. Delhi
2. Soil Mechanics & Foundation Engg. By B.C. Punmia – Laxmi Pub. Delhi
3. Modern Geotechnical Engg. By Dr. Alam Singh-IBT Publishers Delhi
4. Geotechnical Engg. By C. Venkatramaiah- New Age International Pub Delhi
5. Foundation Engg. By GALeonards Mc Graw Hill Book Co. Inc.

COURSE CONTENT & GRADE   (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE/PTDC	WATER RESOURCES ENGINEERING – I	CE-20	Min "D"	Min "D"	5.0

WATER RESOURCES ENGINEERING – I

Unit-I

Hydrology : Hydrological cycle, precipitation and its measurement, recording and non recording rain gauges, estimating missing rainfall data, rain gauge net works, mean depth of precipitation over a drainage area, mass rainfall curves, intensity-duration curves, depth-area duration curves, Infiltration and infiltration indices, evaporation stream gauging, run off and its estimation, hydrograph analysis, unit hydrograph and its derivation from isolated and complex storms, S-curve hydrograph, synthetic unit hydrograph.

Unit-II

Floods and Ground water: Types of floods and their estimation by different methods, probability and frequency analysis, flood routing through reservoirs and channels, flood control measures, economics of flood control, confined and unconfined aquifers, aquifer properties, hydraulics of wells under steady flow conditions, infiltration galleries. Ground water recharge necessity and methods of improving ground water storage. Water logging-causes, effects and its prevention. Salt efflorescence-causes and effects. reclamation of water logged and salt affected lands.

Unit-III

Water resources planning and management : Planning of water resources projects, data requirements, economic analysis of water resources projects appraisal of multipurpose projects, optimal operation of projects introduction to linear programming and its application to water resources projects. Role of water in the environment, rain water harvesting, impact assessment of water resources development and managerial measures.

Unit – IV

Irrigation water requirement and soil-water-crop relationship: Irrigation, definition, necessity, advantages and disadvantages, types and methods. Irrigation development. Soils - types and their occurrence, suitability for irrigation purposes, wilting coefficient and field capacity, optimum water supply, consumptive use and its determination. Irrigation method. Surface and subsurface, sprinkler and drip irrigation. Duty of water, factors affecting duty and methods to improve duty, suitability of water for irrigation, crops and crop seasons, principal crops and their water requirement, crop ratio and crop rotation, intensity of irrigation.

Unit – V

Canal irrigation: Types of canals, alignment, design of unlined and lined canals, Kennedy's and Lacey's silt theories, typical canal sections, canal losses, linings-objectives, materials used, economics. Canal falls & cross drainage works, - description and design, head and cross regulators. Escapes and outlets, canal transitions.

Well irrigation: Types of wells, well construction, yield tests, specific capacity level and specific yield, hydraulic design of open wells and tube wells, methods of raising well water, characteristics of pumps and their selection, interference of wells, well losses, advantages and disadvantages of well irrigation.

Suggested Books :-

1. Engineering Hydrology - J.NEMEC - Prentice Hall
2. Hydrology for Engineers Linsley, Kohler, Paulnus - Tata Mc.Graw Hill.
3. Engineering Hydrology by K. Subhramanya - Tata Mc Graw Hills Publ. Co.
4. Hydrology & Flood Control by Santosh Kumar - Khanna Publishers
5. Engineering Hydrology by H.M. Raghunath

COURSE CONTENT & GRADE   (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE/PTDC	**FLUID MECHANICS - II**	CE-22	Min "D"	Min "D"	5.0

FLUID MECHANICS – II

Unit – I : Turbulent Flow : Laminar and turbulent boundary layers and laminar sub layer, hydro dynamically smooth and rough boundaries, velocity distribution in turbulent flow, resistance of smooth and artificially roughened pipes commercial pipes, aging of pipes.

Pipe flow problems : Losses due to sudden expansion and contraction, losses in pipe fittings and valves, concepts of equivalent length, hydraulic and energy gradient lines, siphon, pipes in series, pipes in parallel, branching of pipes.

Pipe Network : Water Hammer (only quick closure case) transmission of power. *Hardy Cross Method

Unit – II : Uniform flow in open channels : Channel geometry and elements of channel section, velocity distribution, energy in open channel flow, specific energy, types of flow, critical flow and its computations, uniform flow and its computations, Chezy's and Manning's formulae, determination of normal depth and velocity. Normal and critical slopes, Economical sections,

Unit – III : Non uniform flow in open channels : Basic assumptions and dynamic equations of gradually varied flow, characteristics analysis and computations of flow profiles, Saint Venant equation for gradually varied unsteady flow.

Rapidly varied flow – hydraulic jump in rectangular channels and its basic characteristics, surges in open channels & channel flow routing, venturi flume.

Unit – IV : Fluid Machines : Turbines : Classifications, definitions, similarity laws, specific speed and unit quantities, Pelton turbine-their construction and settings, speed regulation, dimensions of various elements, Action of jet, torque, power and efficiency for ideal case, characteristic curves, reaction turbines, construction & settings, draft tube theory, runaway speed, simple theory of design and characteristic curves, Cavitation.

Unit – V : Fluid Machines : Centrifugal pumps : Various types and their important components, manometric head, total head, net positive suction head specific speed, shut of head, energy losses cavitation, principle of working and characteristic curves.

Reciprocating Pumps : Principle of working, Coefficient of discharge, slip single acting and double acting pump, Manometric head, Acceleration head.

Forces on immersed bodies : Types of drag, drag on a sphere, flat plate, cylinder and an aerofoil development of lift, lifting vanes, magnus effect.

Reference Books :
1. Fluid Mechanics by Modi & Seth Standard Book House Delhi
2. Fluid Mechanics by A.K.Jain –Khanna Publishers, Delhi

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	**P**	
BE/PTDC	**STRUCTURAL ANALYSIS – I**	CE-25	Min "D"	Min "D"	5.0

STRUCTURAL ANALYSIS – I

Unit – I : Static and kinematics indeterminacy ,Virtual work and Energy Principles : Principles of Virtual work applied to deformable bodies, strain energy and complementary energy. Energy theorems, Maxwell's Reciprocal theorem, Analysis of Pin-Jointed frames for static loads.

Unit – II : Indeterminate structures –I :. Analysis of Fixed and continuous beams by theorem of three moments. Effect of sinking and rotation of supports, Moment distribution method (without sway)

Unit – III : Indeterminate Structures – II : Analysis of beams and frames by slope deflection method. Column Analogy method.

Unit – IV : Arches and Suspension Cables : Three hinged arches of different shapes, Eddy's Theorem, Suspension cable, stiffening girders, Two Hinged and Fixed Arches – Rib shortening and temperature effects.

Unit – V : Rolling loads and influence Lines : Maximum SF and BM curves for various types of Rolling loads, focal length EUDL, Influence Lines for Determinate Structures – Beams, Three Hinged Arches.

Reference Books :
1. Wang C.K. Intermediate Structural Analysis, Mc Graw Hill New York.
2. Kinney, Streling J: Indeterminate Structural Analysis Addison wasley
3. Reddy C S Basic Structural Analysis Tata Mc Graw Hill Pub. Co. New Delhi

COURSE CONTENT & GRADE   (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE/PTDC	**STRUCTURAL DESIGN - I (RCC)**	CE-26	Min "D"	Min "D"	5.0

STRUCTURAL DESIGN - I (RCC)

Unit - I.
Basic Principles of Structural Design : Assumptions, Mechanism of load transfer, Various properties of concrete and reinforcing steel, Introduction to working stress method ;   Limit state methods of design, partial safety factors for load and material. Calculation of various loads for structural design . Calculation of moment of resistance of rectangular and flanged sections by WSM and LSM.

Unit - II.
Design of Beams: Singly & doubly reinforced rectangular & Flanged Beams, Lintel, Cantilever, simply supported and continuous beams, Beams with compression reinforcement: Redistribution of moments in continuous beams, Design of beam for shear, bond and torsion.

Unit-III.
Design of Slabs: Slabs spanning in one direction. Cantilever, Simply supported and Continuous slabs, Slabs spanning in two directions, Circular slabs.

Unit -IV.
Columns & Footings: Effective length of columns, Short and long columns- Square, Rectangular and Circular columns, Isolated footings. Columns subjected to axial loads and bending moments (sections with no tension).

Unit -V.
Staircases: Staircases with waist slab having equal and unequal flights with different support conditions, Slabless tread-riser staircase.
Design of flat slabs and waffle slabs.

NOTE : All the designs for strength and serviceability should strictly be as per the latest version
        of IS:456. Use of SP-16 (Design aids)

Suggested Books: -
1. Reinforced Concrete; Pillai & Menon, TMC New Delhi.
2. Plain & Reinforced Concrete Vol. I & II – O.P. Jain & Jay Krishna
3. Limit State Design by P.C.Varghese ; Prentice Hall of India, New Delhi.
4. Design of Reinforced Concrete Elements by Purushothman; Tata McGraw Hill, New Delhi
5. Reinforced Cement Concrete by Gupta & Mallick, Oxford and IBH
6. Reinforced Cement Concrete by P. Dayaratnam, Oxford and IBH
7. Plain & reinforced concrete – Rammuttham
8. Plain & reinforced concrete – B.C. Punnia
9. Structural Design & Drawing by N.K.Raju.

COURSE CONTENT & GRADE   (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	**P**	
BE/PTDC	**GEOTECHNICAL ENGINEERING – II LAB**	CE-19L	Min "D"	Min "D"	5.0

GEOTECHNICAL ENGINEERING – II LAB

List of Experiments :

1. The Unconfined Compression Test
2. Tri-axial Compression Test
3. Vane Shear test
4. CBR Test
5. Plate Load Test
6. Standard Penetration Test
7. Dynamic Cone Penetration Test
8. Free Swelling Index and Differential Free swell Test
9. Swelling Pressure Test
10. Consolidation Test

COURSE CONTENT & GRADE   (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	**P**	
B.E/PTDC	**HYDROLOGY LAB**	CE-21L	Min "D"	Min "D"	5.0

HYDROLOGY LAB

List of Experiments :

1. Rainfall recording using weighing Rain gauge / Tipping bucket Rain gauge.
2. Automated Water level Recording
3. Velocity measurement using digital current meter.
4. Measurement of relative humidity
5. Measurement of wind velocity using Anemometer
6. Evaporation measurement using Pan Evapori meter.
7. Determination of infiltration indices using double ring infiltrometer
8. Measurement of field permeability using insitu Permeameter
9. Study of Thermograph, Hydrograph
10. Study of Automated weather station
11. Study of R.O. System.
12. Study of conductivity meter.

Tutorial Exercises :
1. Computation of Average Rainfall by Thiessen Polygon method
2. Computation of Average Rainfall by Isohytel method.
3. Derivation of unit Hydrograph from flood Hydrograph (stage gauging data)
4. Determination of flood hydrograph using super-imposition method.
5. Determination of flood hydrograph using S –Curve hydrograph method.
6. Determination design discharge using empirical formulae
7. Yield test of well. Determining permeability & transmissibility
8. Study of different aquifers
9. Study of weather station.

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
BE/PTDC	**FLUID MECHANICS - II LAB**	CE-23L	Min "D"	Min "D"	5.0

FLUID MECHANICS - II LAB

List of Experiments :

1. Study the performances characteristics of Pelton Wheel.
2. Study the performances characteristics of Francis Turbine
3. Study the performances characteristics of Kaplan Turbine
4. Calibration of multistage (Two) Pump & study of Characteristics of variable speed pump
5. To Study the performances & details of operation of Hydraulic Ram.
6. Determination of coefficient of discharge for a broad crested wear & to plot water surface profile over the weir.
7. Study the characteristics of Reciprocating pump.
8. Study of Critical, Sub Critical and Super Critical Open Channel flows
9. Study of Hydraulic jump in an Open Channel
10. Study of Open Channel Surges
11. Study of Cavitation phenomenon
12. Study of Boundary Layer over a flat plate in a Wind Tunnel
13. Study of Drag and Lift over an Aerofoil

COURSE CONTENT & GRADE   (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	**P**	
B.E/PTDC	**STRUCTURAL DESIGN (RCC) LAB – I**	CE-27L	Min "D"	Min "D"	5.0

STRUCTURAL DESIGN (RCC) LAB – I

List of Experiments :
1. Design of Singly reinforced cantilever beam.
2. Design of continuous beam.
3. Design of fixed slab spanning in one direction.
4. Design of continuous slab.
5. Design of cantilever slab.
6. Design of short column.
7. Design of long column.
8. Design of isolated square footing
9. Design of combined footing
10. Design of staircases with waist slab
11. Design of slabless tread riser staircase.

COURSE CONTENT & GRADE   (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	P	
B.E	**INDUSTRIAL TRAINING - I**	CE-24L	Min "D"	Min "D"	5.0

INDUSTRIAL TRAINING - I

The student shall go to an Industry at the end of Fourth Semester during summer and shall prepare a report on the Practical Training undergone there. He has to present the report in Fifth semester and assessment will be done by committee of two members (Headed by H.O.D. of the Department).

COURSE CONTENT & GRADE (w.e.f. July 2010)

Course	Subject Title	Subject Code	Grade for End Sem		CGPA at the end of every even semester
			T	**P**	
B.E/PTDC	**CONCRETE LAB**	CE-10L	Min "D"	Min "D"	5.0

CONCRETE LAB

List of Experiments :

Design of High Strength concrete mixes :

1. Design f M 50 concrete mix using fly ash and chemical admixtures.
2. Design of M 50 Concrete mix using fly ash, metakline /Silica fumes and other chemical admixtures.
3. Design of M 50 mix suitable for pumping.