Jabalpur Engineering College, Jabalpur

Semester V Credit Based Grading System (CBGS) w.e.f. July 2017

Scheme of Examination

Bachelor of Engineering B.E. (CIVIL ENGINEERING)

Subject wise distribution of marks and corresponding credits

Scheme of Examination w.e.f. July-2017 Academic Session-2017-18

S. No.	Subject Code	Subject Name & Title	Maximum Marks Allotted						Hours / week.			Total Credits	Total Marks
			Theory			Practical		Total Marks					
			End Sem	Mid Sem. MST	Quiz, Assign ment	End Sem.	Lab Work		L	T	P		
1	**CE5001**	Structural Analysis-I	70	20	10	-	-	100	3	1	-	4	
2	**CE5002**	Geotechnical Engg.-II	70	20	10	30	20	150	3	1	2	6	
3	**CE5003**	Fluid Mechanics-II	70	20	10	30	20	150	3	1	2	6	
4	**CE5004**	Structural Design-I (RCC)	70	20	10	30	20	150	3	1	2	6	
5	**CE5005**	Elective-I	70	20	10	-	-	100	3	1	-	4	
6	**CE5006**	Structural Analysis Lab	-	-	-	30	20	50	-	-	2	2	
7	**CE5007**	Management Skill Development (Internal Assessment)	-	-	-	-	50	50	-	-	2	2	
8	**CE5008**	Evaluation of Industrial Training (Internal Assessment)	-	-	-	-	50	50	-	-	2	2	
Total			**350**	**100**	**50**	**120**	**180**	**800**	**15**	**5**	**12**	**32**	**800**

MST: Minimum of two mid semester tests to be conducted.

L: Lecture **T: Tutorial** **P: Practical**

Elective-I	
Subject Code	**Subject Name**
CE5005A	Hydrology
CE5005B	Concrete Technology
CE5005C	Material Science
CE5005D	Numerical Computation & Optimization

B.E.CBGS V SEMESTER
STRUCTI'RAL ANALYSIS – I

Course	Subject Title	Subject C ode	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Structural Analysis – I	CE5001	Min. "D"	Min. "D"	5.0

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: Rotling 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.

Books Reference:

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

B.E.CBGS V SEMESTER
GEOTECHNICAL ENGINEERING – II

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Geotechnical Engineering – II	CE5002	Min. "D"	Min. "D"	5.0

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 loadtest. 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 program me 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.

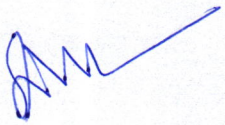
Books Reference :

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 Intemational Pub Delhi
5. Foundation Engg.By GAleonards Mc Graw Hill Book Co. Inc.DT.

GEOTECHNICAL ENGINEERING – II

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.



B.E.CBGS V SEMESTER
FLUID MECHANICS –II

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Fluid Mechanics -II	CE5003	Min. "D"	Min. "D"	5.0

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 ofpipes. 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, t)?es 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 ofjet, torque, power and efficiency for ideal case, characteristic curves, reaction turbines, construction & settings, draft tube theory, runaway speed, simple theory ofdesign 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, Coeflicient of discharge, slip single acting and double acting pump, Man metric head, Acceleration head. Forces on immersed bodies : Types ofdrag, drag on a sphere, flat plate, cylinder and an aerofoil development of lift, lifting vanes, magnus effect.

Books Reference :

1. Fluid Mechanics by Modi & Seth Standard Book House Delhi
2. Fluid Mechanics by A.K.Jain -Khanna Publishers, Delhi

FLUID MECHANICS –II

List of Experiment:

1. To plot main characteristics of turbo impulse turbine "Plot Curves"
   (a) Speed Vs Discharge
   (b) Speed Vs Torque
   (c) Speed Vs Power
   (d) Speed Vs Efficiency

2. To plot the operating characteristics of turbo impulse turbine of constant head and roted speed, plot for the curves:
   (a) Discharge Vs Power
   (b) Discharge Vs Efficiency
   (c) Efficiency Vs Load

3. To plot main characteristics of reaction turbine at content head & guide vane opening plot characteristics.
   (a) Speed Vs Discharge
   (b) Speed Vs Torque
   (c) Speed Vs Power
   (d) Speed Vs Efficiency

4. To plot operating characteristics of a reaction turbine at constant head and rated speed to obtain following curves.
   (a) P Vs Discharge
   (b) η Vs Discharge
   (c) η Vs P (Per cont. load)
5. To plot constant efficiency curve for impulse turbine for four different heads.
6. To plot constant efficiency curve for reaction turbine for four different heads.

7. Investigate varieties of η & specific speed of reaction turbine with guide vane opening keeping the rated speed constant.

8. Obtain operating characteristics of centrifugal pump at constant (rated) speed not curves.
   (a) Speed Vs Discharge
   (b) Power Vs Q
   (c) η Vs Discharge

9. To obtain main characteristics of centre fugal pump at plot curves.
   (a) Speed Vs Head
   (b) Speed Vs Discharge
   (c) Speed Vs Power

10. Plot drive constant η curves for centrifugal pump.
    (a) Q Vs η
    (b) Q Vs H
    (c) Constant η curve.

11. Study the performance & Operation of Hydraulic ram.

12. Study the performance characteristics of reciprocating pump.

13. Study the open channel flume & to plot water surface profile.

B.E.CBGS V SEMESTER
STRUCTTIRAL DESIGN - I (RCC)

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Structural Design – I (RCC)	CE5004	Min. "D"	Min. "D"	5.0

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, Slab less 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)

Books Reference :

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.

STRUCTTIRAL DESIGN - I (RCC)

List of Experiment:

1. Detailed of Drawing of Beams.
2. Detailed of Drawing of Slabs.
3. Detailed of Drawing of Colums.
4. Detailed of Drawing of Footings.
5. Detailed of Drawing of Stairs.

B.E.CBGS V SEMESTER
(ELECTIVE- I) HYDROLOGY

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	(Elective- I) Hydrology	CE5005A	Min. "D"	Min. "D"	5.0

Unit-I:

Introduction, hydrological cycle, Water-Budget equation, Precipitation- Forms, Types, Measurement of Precipitation, Types of Gauges, Rain gauge Network, Preparation of Data, Presentation of Rainfall Data, Mean Precipitation Over an Area, Depth-Area-Duration Relationships,

Unit-II:

Frequency of Point Rainfall, Maximum Intensity/Depth-Duration-Frequency Relationship, Probable Maximum Precipitation, Evaporation, Evapotranpiration, Infiltration ϕ-index, w-index, Stream flow Measurement- Measurement of Stage, Velocity, Discharge.

Unit-III:

Hydrographs- Introduction, Factors Affecting Runoff Hydrograph, Components of Hydrograph, Effective Rainfall, Unit Hydrograph, Application of Unit Hydrograph, Derivation of Unit Hydrograph, Unit Hydrographs of Different Durations, S curve.

Unit-IV:

Synthetic Unit Hydrograph, Instantaneous Unit Hydrograph, Floods, Flood Frequency Studies, Gumbel's Method, Risk, Reliability, Safety Factor, Flood Routing, Attenuation, Hydrologic Channel Routing, Muskingum Method.

Unit-V:

Groundwater-Forms of Subsurface Water, Saturated Formation, Types of Aquifers, Aquifer Properties, Stratification, Equation of Motion, Wells, Steady Flow in a Well, Open Wells, Well Loss, Recuperation Test.

Books Reference:

1. Subramanya K Engineering Hydrology; McGraw Hill Education (India) Pvt. Ltd.
2. Shagufta, Hydrology and Water Resources Engineering
3. Mysooru R. Yadupathi Putty, Principles of Hydrology

B.E.CBGS V SEMESTER
(ELECTIVE- I) CONCRETE TECHNOLOGY

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	(Elective- I) Concrete Technology	CE5005B	Min. "D"	Min. "D"	5.0

Course objectives:

To understand the properties of ingredients of concrete
To study the behavior of concrete at its fresh and hardened state
To study about the concrete design mix
To know about the procedures in concreting
To understand special concrete and their use

Course Content

Unit-I:

Introduction - Concrete as construction materials, Concrete making materials: Cement- Types and testing, Aggregates- various properties and testing, Water- quality for mixing and curing and use of sea water, Admixtures- functions and classification.

Unit-II:

Properties of fresh Concrete- workability- factors affecting and measurement of workability , segregation, bleeding, setting time. Process of manufacturing of concrete, curing of concrete, Strength of Concrete, elasticity, creep, durability, corrosion and shrinkage.

Unit-III:

Concrete Mix Design - factors influencing mix proportion , Mix design by ACI method and I.S. code method, Design of high strength concrete.

Unit-IV:

Testing of hardened concrete- compression test, comparison between cube and cylinder strength, flexure strength, tensile strength of concrete, non-destructive testing methods, test on composition of hardened concrete.

Unit-V:

Special Concrete - lightweight concrete, Fiber reinforced concrete, Polymer-polymer modified concrete. Ferro cement. Mass concrete, Ready mix concrete, Self compacting concrete.

Books References:

1. Shetty, MS., Concrete Technology, Theory & Practice, S.Chand and Co, 2004.
2. Gambhir, ML., Concrete Technology, Tata McGraw Hill, 2004.
3. Revile, Properties of Concrete, Longman Publishers, 2004.
4. Santakumar A.R., Concrete Technology, Oxford University Press, New Delhi, 2007.

Course outcomes:

On completion of the course, the students will be able to:

1. Test All The Concrete Materials As Per IS Code
2. Design The Concrete Mix Using ACI And IS Code Methods
3. Determine The Properties Of Fresh And Hardened Of Concrete
4. Design Special Concretes And Their Specific Applications
5. Ensure quality control while testing/ sampling and acceptance criteria

B.E.CBGS V SEMESTER
(ELECTIVE- I) MATERIAL SCIENCE

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	(Elective- I) Material Science	CE5005C	Min. "D"	Min. "D"	5.0

Unit-I: Introduction to Material Science and Engineering:

Type of Materials- Metallic Materials, Polymeric Materials, Ceramic Materials, Composite Materials, Electronic Materials, Magnetic Materials, Photonic Optical Materials, Construction Materials, Recent advances in Materials Science- Smart Materials, Nino Materials, Selection of Materials.

Unit-II: Atomic Structure and Bonding:

Structure of Atoms, Atonics Numbers and Atomic Masses, Electronic structure of Atoms, Quantum Numbers of Electrons of Atoms, Crystal and Amorphous Structure in Materials —Crystalline and Amorphous Materials. Type of Atomic Bonds- Metallic Bonds, Covalent Bonds, Ionic Bonds, Vander Walls Bond, Primary and Secondary Bonds.

Properties and Failure of Materials:

Mechanical, Thermal and optical properties of Materials, Electrical and Magnetic Properties of V Materials, Failure of Materials :-Fracture, Fatigue and Creep, Corrosion and Wear.

Unit-III: Building Materials:

Natural Materials' and Hybrid materials, Ferrous Metals- pig iron, cast iron , mild steel, HYSD reinforcing rods, and stainless steel Nonferrous Metals -- Aluminum, copper , lead etc, their properties and application .Steel polymers Structural Steel ,Reinforcing Steel – Grades and Types Properties of Reinforcing Steel,

Unit-IV: Bituminous Materials and Mixtures:

Bitumen, Tar, Pitch and Asphalt, Asphalt Cement, Cut back Asphalt, Emulsified and Blown Asphalt, Properties of Asphalts, Consistency, Rate of Curing, Resistance to Action of Water, Ductility and Adhesion etc., Grades of Asphalt, Viscosity and Penetration Grading, Performance based Grading, Cut back Asphalt Grades, Asphalts Concrete, Asphalt Pavement, Applications of Asphalt.

Unit-V: Miscellaneous Building Materials:

Glass: Type of glass, ingredients and manufacturing of glass, properties of glass for building purposes and structural uses, Paints, Varnishes and Distemper, Modern and Advanced Building Materials: Polymers-Thermoplastics ; ,Thermo sets, Least opers, General Properties ..of Polymers, Common Polymers and their Properties, Modified Polymers, Uses of Polymers. , Fiber reinforced plastics, ready to use building materials, etc.

Books References:

1. V. Raghavan, Materials Science and Engineering, Prentice-Hall of India Private Limited (2003).
2. W.F. Smith, Principles of Materials Science and Engineering, McGraw Hill, New York (1994).
3. W.D.Callister, An Introduction to Materials Science & Engineering, John Wiley & Sons (2007).
4. Civil Engineering Materials by N Jackson and R K Dhir, ELBS.
5. Text book of building construction by S P Bindra and Arora.
6. Sahu G.C, Jena J.; Building materials and Construction, Mc Gravy hills
7. S K Duggal, Building Materials, New Age International.
8. S.C. Ringwala, Engineering Materials, Charotar.
9. Purushattam Raj, Building materials and Techniques, Pearson.
10. Gambhir & Jamwal, Building Materials, Mc Craw I Iill.

B.E.CBGS V SEMESTER
(ELECTIVE- I) NUMERICAL COMPUTATION & OPTIMIZATION

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	(Elective- I) Numerical Computation & Optimization	CE5005D	Min. "D"	Min. "D"	5.0

Unit-I: Introduction to Operations Research:

Linear programming problem, formulation, Solution of Linear programming problem by Graphical, Simplex, Two phase, Big-M, Dual Simplex methods, Duality theory.

Unit-II: Transportation Problems:

Initial basic feasible solution , Optimal solution , degeneracy in Transportation problem .

Assignment Problems: Mathematical formulation of assignment problems, solution of assignment problems.

Unit-III: Numerical Solution of Partial Differential Equations:

Classification , Finite – difference approximations to partial derivatives, solution of elliptic(Laplace and Poisson's) equations ,solution of parabolic and hyperbolic equations .

Unit-IV: Calculus of Variations:

Functional , Euler's equations, variation form, Isoperimetric problems, Functional involving higher order derivatives, Approximate solution of BVP by Rayleigh-Ritz method, Weighted residual method (Gale kin's method), Hamilton's principle, Lagrange's equations.

Unit-V: Reliability Theory:

Basic concepts of reliability, failure law, Evaluation of reliability of a component from test data, system reliability, Components in series and parallel, Redundancy.

Books References:

1. Numerical Methods in Engineering and science by B.S. Grewal, Khanna Publishers.
2. Numerical Methods in Engineering and science by B.S. Grewal, Khanna Publishers.
3. Operation Research, Taha H.A; PHI.
4. Introduction to OR, Hiller and Lieberman; TMH.
5. Calculus of Variation, Mukopdhyay A. K., Krishna Publication, Delhi.
6. Reliability Mathematics, Balagurusamy, E., TMH.

B.E.CBGS V SEMESTER
STRUCTURAL ANALYSIS LAB

Course	Subject Title	Subject Code	Grade for End Sem.		CGPA at the end of every even semester
			T	P	
B.E.	Structural Analysis Lab	CE5006	Min. "D"	Min. "D"	5.0

List of Experiment:

1. To verify "THEOREM OF RECIPROCAL DEFLECTIONS" or "MAXWELL'S RECIPROCAL THEOREM" using SSB & cantilever beam.
2. To verify "Principle of superposition for deflection" using SSB & cantilever beam made with linearly elastic material.
3. To draw "INFLUENCE LINE DIAGRAM FOR BENDING MOMENT" at a section of SSB using bending moment apparatus.
4. To obtain horizontal thrust at support of a "Circular three hinged arch" and to draw ILD for this horizontal thrust, also to compare experimental results with analytical solutions;
5. To obtain horizontal thrust at support of a "SEMICIRCULAR TWO HINGED ARCH" and to draw ILD for this horizontal thrust, also to compare experimental results with analytical solutions.
6. To obtain force in members of a shear leg apparatus and to compare results with those obtained using analytical method.
7. To obtain deflection at free end of a curved member consist of a "quadrant with straight edge" and to compare results with those obtained by using analytical solutions.
8. To obtain elastic deflection at free end of a "SEMICIRCULAR FRAME WITH STRAIGHT EDGE" due to load applied at free end to compare results with those obtained using analytical solutions.
9. To obtain "INFLUENCE LINE DIAGRAM" for intermediate reaction of a continuous beam of two unequal spans using "MULLER-BRESLAU's PRINCIPLE" and comparing the results with those obtained using analytical solution.