JABALPUR ENGINEERING COLLEGE, JABALPUR
(Rajiv Gandhi Proudyogiki Vishwavidyalaya, Bhopal)

Choice Based Credit System (CBCS)

Scheme of Examination w.e.f.

Bachelor of Engineering (Civil Engineering)

Semester - IV

S. No.	Subject Category	Subject Code	Subject Name	Maximum Marks Alloted									Hours/Week			Total Credits
				Theory						Practical						
				TSE End Sem	CT Minor-I	CT Minor -II	Quiz	Assignments	TA Tutorials/Problem Solving	PSE End Sem	PLW Lab Work	PTA Viva Voice/Assignment	L	T	P	
1	DC	CE 242	Fluid Mechanics-I	60	10	10	5	5	10 (10)	10	20	20	2	1	2	4
2	EAS	CE-241	Material Science	60	10	10	5	5	10	-	-	-	3	1	-	4
3	DC	CE-243	Geotech - I	60	10	10	5	5	10	10	20	20	2	1	2	4
4	DC	CE-244	Transporation Engg.-I	60	10	10	5	5	10	-	-	-	3	1	0	4
5	DC	CE-245	Advance Surveying	60	10	10	5	5	10	10	20	20	2	1	2	4
6	DE	CE-246	Concrete Technology	60	10	10	5	5	10	-	-	-	3	1		4
7	EAS	CE-247	Programming Tools	-	-	-	-	-	-	10	20	20	-	-	4	2
8	HU	HU-248	NSS/NCC	-	-	-	-	-	-	-	-	-	-	-	-	Qualifier
			Total	360	60	60	30	30	60	40	80	80	15	6	10	26

L: Lecture T:Tutorial P: Practical

08/9/16

CE-241

Est. on 14 Feb 2017

BE-IV Sem. (Civil Egg.)

Materials science

Unit 1

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, Nano Materials, Selection of Materials

Unit 2

Atomic Structure and Bonding:

Structure of Atoms, Atomic 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 Materials, Failure of Materials –Fracture, Fatigue and Creep, Corrosion and Wear

Unit 3 (stones) (Rocks)

Building Materials

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

Unit 4

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 5

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, Thermosets, Elastomers, General Properties of Polymers, Common Polymers and their Properties, Modified Polymers, Uses of Polymers. , Fibre reinforced plastics, ready to use building materials, etc.

Recommended books:

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 Graw hills
7. S K Duggal, Building Materials, New Age International.
8. S.C. Rangwala, Engineering Materials, Charotar.
9. Purushattam Raj, Building materials and Techniques, Pearson
10. Gambhir & Jamwal, Building Materials, Mc Graw Hill.

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Choice Based Credit System (CBCS)
B.E. IV Semester

Branch	Subject Title	Subject Code	Hours/week			Total Credits
			L	T	P	
Civil Engg.	FLUID MECHANICS-I	CE-242	2	1	2	4

FLUID MECHANICS-I

Unit-I: Review of Fluid Properties: Engineering units of measurement, mass, density, specific weight, volume and gravity, surface tension, capillarity, viscosity, bulk modulus of elasticity, pressure and vapor pressure. Fluid Static's : Pressure at a point, pressure variation in static fluid, Absolute and gauge pressure, manometers, Forces on plane and curved surfaces (Problems on gravity dams and tainter gates); buoyant force, Stability of floating and submerged bodies, Relative equilibrium.

Unit-II : Kinematics of Flow : Types of flow-ideal & real , steady & unsteady, uniform & non-uniform, one, two and three dimensional flow, path lines, streak-lines, streamlines and stream tubes; continuity equation for one and three dimensional flow, rotational & irrotational flow, circulation, stagnation point, separation of flow, sources & sinks, velocity potential, stream function, flow nets their utility & method of drawing flow nets.

Unit-III : Dynamics of Flow: Euler's equation of motion along a streamline and derivation of Bernoulli's equation, application of Bernoulli's equation, energy correction factor, linear momentum equation for steady flow, momentum correction factor. The moment of momentum equation, forces on fixed and moving vanes and other applications.

Flow Measurements: Velocity measurement (Pitot tube, Prandtl tube, current meters etc.), flow measurement (orifices, nozzles, mouth pieces, orifice meter, nozzle meter, venture-meter, weirs and notches).

Unit-IV : Dimensional Analysis and Dynamic Similitude: Dimensional analysis, dimensional homogeneity, use

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of Buckingham-pi theorem, calculation of dimensionless numbers, similarity laws, specific model investigations
(submerged bodies, partially submerged bodies, weirs, spillways, rotodynamic machines etc.)
Unit-V : Laminar Flow: Introduction to laminar & turbulent flow, Reynolds experiment & Reynolds number,
relation between shear & pressure gradient, laminar flow through circular pipes, laminar flow between parallel
plates, laminar flow through porous media, Stokes law, lubrication principles.

References:

1. Modi & Seth; Fluid Mechanics; Standard Book House, Delhi
2. Som and Biswas; Fluid Mechnics and machinery; TMH
3. Cengal; Fluid Mechanics; TMH
4. White ; Fluid Mechanics ; TMH
5. JNIK DAKE; Essential of Engg Hyd; Afrikan Network & Sc Instt. (ANSTI)
6. Franiss JRD; A Text Book of fluid Mech. for Engg. Student
7. R Mohanty; Fluid Mechanics; PHI
8. Gupta; Fluid Mechanics; Pearson.

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Choice Based Credit System (CBCS)
B.E. III Semester

Branch	Subject Title	Subject Code	Hours/week			Total Credits
			L	T	P	
Civil Engg.	GEOTECHNICAL ENGINEERING – I	CE-243	2	1	2	4

GEOTECHNICAL ENGINEERING – I

Unit – I : Basic Definitions & Index Properties : Definition and scope of soil mechanics, Historical development. Formation of soils. Soil composition. Minerals, Influence of clay minerals on engineering behavior, Soil structure. Three phase system. Index properties and their determination. Consistency limits.
Classification systems based on particle size and consistency limits.

Unit – II : Soil Water and Consolidation : Soil water, Permeability Determination of permeability in laboratory and in field. Seepage and seepage pressure. Flownets, sues of a flownet, Effective, neutral and total stresses.
Compressibility and consolidation, Relationship between pressure and void ratio, Theory of one dimensional consolidation. Consolidation test, Fitting Time curves. Normally and over consolidated clays. Determination of preconsolidation pressure, settlement analysis. Calculation of total settlement.

Unit – III : Stress Distribution in Soils and Shear Strength of Soils : Stress distribution beneath loaded areas by Boussinesq and water guard's analysis. Newmark's influence chart. Contact pressure distribution.
Mohr-Coulomb's theory of shear failure of soils, Mohr's stress circle, Measurement of shear strength, Shear box test, Triaxial compression test, unconfined compression test. Value shear test, Measurement of pore pressure, pore pressure parameters, critical void ratio, Liquefaction.

Unit – IV : Stability of Slopes : Infinite and finite slopes. Types of slope failures, Rotational slips. Stability number. Effect of ground water, selection of shear strength parameters in slope stability analysis. Analytical and graphical methods of stability analysis. Stability of Earth Dams.

Unit – V : Lateral Earth Pressure : Active, passive and earth pressure at rest. Rankine, Coulomb, Terzaghi

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and Culmann's theories. Analytical and graphical methods of determination of earth pressures on cohesion –
less and cohesive soils. Effect of surcharge, water table and wallfriction. Arching in soils. Reinforced earth
retaining walls.

Reference Books :

1. Soil Mech. & Found. Engg. By Dr. K.R. Arora – Std Publishers Delhi.
2. Soil Mech. & Found by Dr. B.C.Punmia – Laxmi Publications, Delhi
3. Modern Geotech Engg. By Dr. I Aram Singh – IBT Publishers Delhi
4. Geotech Engg. By C.Venkatramaiah New Age International Publishers, Delhi
5. Soil Mech & Found. Engg. By S.K. Garg – Khanna Publishers, Delhi
6. Soil Testing for Engg. By T.W. Lambe – John Wiley & Soms. Inc.
7. Relevant I.S. Codes

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Choice Based Credit System (CBCS)
B.E. IV Semester

Branch	Subject Title	Subject Code	Hours/week			Total Credits
			L	T	P	
Civil Engg.	TRANSPOTATION ENGINEERING – I	CE-244	3	1	-	4

TRANSPOTATION ENGINEERING – I

Unit – I : Introduction, Tractive resistances & Permanent way : Principles of Transportation, transportation by Roads, railways, Airways, Waterways, their importance and limitations. Route Surveys and alignment, railway trac development and gauges. Hauling capacity and tractive effort.

1. Rails : types, welding of rails, wear and tear of rails, rail creep.
2. Sleepers : types and comparison, requirement of a good sleeper, sleeper density.
3. Rail fastenings : types, Fish plates, fish bolts, spikes, bearing plates, chain deys, check and guard rails.
4. Ballast : Requirement of good ballast, various materials used as ballast, quantity of ballast.

Different methods of plate laying, material trains, calculation of materials required, relaying of track

Unit –II : Geometric Design ; Station & Yards; Points and Crossings & Signaling and interlocking : Formati cross sections, Super elevation, Equilibrium, Cant and cant deficiency, various curves, speed on curves. Types locations, general equipments, layouts, marshalling yards. Definition, layout details, design of simple turnouts. Typ of signals in stations and yards, principles of signaling and inter-locking.

Unit – III : Bridge Site Investigation and Planning ; Loading Standards & Component parts : Selection of sit alignment, collection of bridge design data : essential surveys, hydraulic design, scour depth of bridge foundation. Economical span, clearance, afflux, type of road & railway bridges : Design loads and forces, Impact factor, India loading standards for Railways Bridges and Highway Bridges. Bridge super structure and sub-structures, abutment piers, wing walls, return walls, approaches, floors & flooring system, choice of super structure.

Unit – IV : Bridge Foundations, Construction, Testing and Strengthening of Bridges : Different types of foundation : piles and wells, sinking of wells, coffer-dams. Choice of bridges and choice of materials, details of construction underwater and above water, sheet piles coffer dams, Erection of bridges, girders, equipments and pla inspection and data collection, strengthening of bridges, Bridge failure.

Unit – V : Tunnels :

1. Selection of route, Engineering surveys, alignment, shape and size of tunnel, bridge action, pressure relief phenomenon, Tunnel approaches, Shafts, pilot shafts.
2. Construction of tunnels in soft soil, hard soil and rock. Different types of lining, methods of lining. Mucking operation, Drainage and ventilation. Examples of existing important tunnels in India and abroad.

Reference Books :

1. Railway Engineering by S.C. Rangwala – Charotar Pub. House, Anand
2. Railway Engineering by Arora & Saxena – Dhanpat Rai & Sons
3. Principles and Practice of Bridge Engineering by S.P. Bindra-Dhanpat Rai & Sons
4. Railway, Bridges & Tunnels by Dr. S.C. Saxena

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Choice Based Credit System (CBCS)
B.E. ~~III~~ IV Semester

Branch	Subject Title	Subject Code	Hours/week			Total Credits
			L	T	P	
Civil Engg.	~~SURVEYING~~ ADVANCE SURVEYING	CE-245	2	1	2	4

SURVEYING

Unit – I
Reciprocal leveling, profile leveling, cross sectioning, contouring, methods of contouring
trignometrical leveling.
Unit – II
Traversing by theodolite, field work checks, traverse computations, latitude and departures,
adjustments, computations of co-ordinates, plotting and adjusting of traverse, omitted measurements.
Unit – III
Tacheometry : Tacheometric systems and principles, stadia system, uses of anallatic lens,
tangential system, subtense system, instrument constant field work, reduction, direct reading
tacheometers, use of tacheometry for traversing and contouring.
Unit – IV
Curves : Classification and use; element of circular curves, calculations, setting out curves by
offsets and by theodolites, compound curves, reverse curves, transition curves, cubic spiral and
lemniscates, vertical curves setting out.
Unit – V
Control Surveys : Providing frame work of control points, triangulation principle,reconnaissance

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selection and marking of stations.
Hydrographic Surveying : Sounding, methods of observations, computations and plotting.
Field Astronomy : Spherical trigonometry, Astronomical terms, co-ordinate systems circumpolar
stars, astronomical triangle determination of Azimuth & time.
Book References :

1. Surveying & Levelling Vol.I & Vol II T.P. Kanetkar
2. Guggal, Surveying Theory & Practice, Vol.I& II,Tata McGraw Hell Pub co.ltd.
3. Surveying Vol I,II,& III B.C. Punamia
4. Surveying Vol I,II, KR.Arora

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CE-246

CONCRETE TECHNOLOGY

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-1

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-2

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-3

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

Unit-4

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-5

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

References

1. Shetty, M.S., Concrete Technology, Theory & Practice, S.Chand and Co, 2004.

2. Gambhir, M.L., Concrete Technology, Tata McGraw Hill, 2004.

3. Nevile, 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:

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