

**Choice Based Credit Course Structure  
Under Graduate Degree Program  
in Civil Engineering (B. Tech. - Civil)  
w.e.f. Academic Year 2011-12  
Semester I to VIII**



**Department of Civil Engineering**

**Dr. Babasaheb Ambedkar Technological University  
Lonere, Dist. Raigad, Maharashtra, INDIA, Pin 402 103**

## Semester- I

Sr. No.	Subject Code	Course	Contact Hours		Credits
			L	P	
01	BH101	Basic Course in Communicative English	3	0	6
02	BH102	Engineering Mathematics – I	4	0	8
03	BH103	Engineering Physics – I	3	2	8
04	BH104	Engineering Chemistry - I	3	2	8
05	ID105	Energy and Environmental Engineering	2	0	4
06	ME106/ ME206	Basic Mechanical Engineering	2	0	4
07	ME107/ ME207	Engineering Graphics	1	4	6
08	CL108	Introduction to Civil Engineering	3	0	6
09	XC109	NCC/NSS/Sports	0	0	0
<b>Total</b>			<b>21</b>	<b>08</b>	<b>50</b>

## Semester – II

Sr. No.	Subject Code	Course	Contact Hours		Credits
			L	P	
01	BH201	Basic Course in Human Rights	2	0	4
02	BH202	Engineering Mathematics – II	4	0	8
03	BH203	Engineering Physics – II	3	2	8
04	BH204	Engineering Chemistry - II	3	2	8
05	EM205/ EM105	Engineering Mechanics	3	0	6
06	ID206	Basic Electrical and Electronics Engineering	2	0	4
07	WS207/ WS107	Workshop Practice	0	4	4
08	CL208	Civil Engineering: Programming and Softwares	3	0	6
09	XC209	NCC/NSS/Sports	0	0	0
<b>Total</b>			<b>20</b>	<b>08</b>	<b>48</b>

**Note:**

Elective Subject Codes marked as ‘#’ indicate Open Electives. Students willing to register for such courses shall contact Course Coordinator for information on prerequisites.

**Semester- III**

Sr. No.	Subject Code	Subject	Contact Hours		Credits
			L	P	
<b>Theory</b>					
01	BH 301	Mathematics – III	4	-	8
02	CV302	Solid Mechanics	4	-	8
03	CV303	Hydraulic Engineering I	4	-	8
04	CV304	Surveying I	4	-	8
05	CV305	Building Construction	2	-	6
06	CV306	Engineering Geology	4	-	8
<b>Practical / Drawing and/or Design</b>					
06	CV307	Building Construction - Drawings Lab	-	04	4
07	CV308	Seminar on Topic of Self Study	-	-	2
Sub-Total			22	04	52
<b>Total</b>			26		52

**Semester- IV**

Sr. No.	Subject Code	Subject	Contact Hours		Credits
			L	P	
<b>Theory</b>					
01	CV401	Hydraulic Engineering II	4	-	8
02	CV402	Structural Mechanics	4	-	8
03	CV403	Surveying – II	4	-	8
04	CV404	Water Resources Engineering I	4	-	8
<b>Practical / Drawing and/or Design</b>					
05	CV 405	Hydraulic Engineering Lab	-	2	2
06	CV 406	Solid Mechanics Lab	-	2	2
07	CV 407	Surveying Lab I	-	3	4
<b>Elective I</b>					
08	CV 408 <sup>#</sup>	Engineering Management	3	-	6
09	CV 409 <sup>#</sup>	Systems Engineering			
Sub-Total			19	07	46
<b>Total</b>			26		46

### Semester- V

Sr. No	Subject Code	Subject	Contact Hours		Credits	
			L	P		
<b>Theory</b>						
01	CV 501	Design of Steel Structures	4	-	8	
02	CV 502	Geotechnical Engineering	4	-	8	
03	CV 503	Environmental Engineering I	4	-	8	
04	CV 504	Water Resources Engineering – II	4	-	8	
<b>Practical / Drawing and/or Design</b>						
05	CV 505	Geotechnical Engineering Lab	-	2	2	
06	CV 506	Environmental Engineering Lab	-	2	2	
07	CV 507	Surveying Lab II		3	4	
08	CV 501# CV 508# CV 509# CV 510	<b>Elective II</b>		4	-	8
		Design of Steel Structures (Other Department Students)				
		Building Materials				
		Rock Mechanics				
		Modern Surveying Techniques				
Sub-Total			<b>20</b>	<b>07</b>	<b>48</b>	
<b>Total</b>			<b>27</b>		<b>48</b>	

### Semester- VI

Sr. No.	Subject Code	Subject Title	Contact Hours		Credits	
			L	P		
01	CV 601	Design of Concrete Structures I	4	-	8	
02	CV 602	Transportation Engineering I	4	-	8	
03	CV 603	Foundation Engineering	4	-	8	
04	CV 604	Concrete Technology	4	-	8	
<b>Practical / Drawing and/or Design</b>						
05	CV 605	Concrete Technology Lab	-	2	2	
06	CV 606	Structural Design and Drawing of Steel Structures	-	4	4	
07	CV 607	Building Planning, Design and Drawing Lab	-	4	4	
08	CV 608	Industrial Training <sup>§</sup>	-	-	-	
09	CV 609 CV 610 CV 611 CV 612	<b>Elective III</b>		4	-	8
		Advanced Solid Mechanics				
		Composite Materials				
		Elements of Remote Sensing				
		Building Planning and Design				
Sub-Total			<b>20</b>	<b>10</b>	<b>50</b>	
<b>Total</b>			<b>30</b>		<b>50</b>	

§: Students should register for the CV 608 in Semester VI and appear at examination in Semester VII. Result shall appear in Grade Report of Semester VII

### Semester – VII

Sr. No.	Subject Code	Subject Title	Contact Hours		Credits
			L	P	
01	CV 701	Design of Concrete Structures II	4	-	8
02	CV 702	Transportation Engineering II	4	-	8
03	CV 703	Professional Practices	4	-	8
04	CV 704	Plastic Analysis and Design	4	-	8
<b>Practical / Drawing and/or Design</b>					
05	CV 705	Professional Practices Lab	-	2	2
06	CV 706	Seminar or Community Project	-	2	2
07	CV 707	Project Stage-I	-	2	4
08	CV 708	Industrial Training <sup>\$</sup>	-	-	2
09	CV 709	<b>Elective IV</b>	3	-	6
Sub-Total			<b>18</b>	<b>6</b>	<b>48</b>
<b>Total</b>			<b>24</b>		<b>48</b>

### Semester – VIII

Sr. No.	Subject Code	Subject Title	Contact Hours		Credits
			L	P	
01	CV 801	Introduction to Earthquake Engineering	4	-	8
02	CV 802	Project Management	4	-	8
03	CV 803	Construction Techniques	4	-	8
<b>Practical / Drawing and/or Design</b>					
04	CV 804	Earthquake Engineering Lab	-	2	2
05	CV 805	Structural Design and Drawing of RC Structures	-	3	4
06	CV 806	Self Study Report based on Topic Related to Foundation Engineering and field visits.	-	2	2
07	CV 807	Project Stage-II	-	4	8
08	CV 808	<b>Elective V</b>	4	-	8
Sub-Total			<b>20</b>	<b>11</b>	<b>48</b>
<b>Total</b>			<b>31</b>		<b>48</b>

## LIST OF ELECTIVE SUBJECTS

<b>Elective IV (Semester VII)</b>		<b>Elective V (Semester VIII)</b>	
1	Waste Water Treatment	1	Town and Urban Planning
2	Advanced Structural Mechanics	2	Finite Element Method
3	Machine Foundations	3	Advanced Structural Design
4	Power Plant Engineering	4	Theory of Plates and Shells
5	Computer Aided Design of Civil Engineering Systems	5	Computational Fluid Dynamics
6	Environmental Quality and Pollution Monitoring Techniques	6	Water Resources Planning and Management
7	Geographical Information Systems	7	Industrial Waste Treatment
8	Ground Improvement Techniques	8	Structural Audit of Buildings
9	Design of Hydraulic Structures	9	Advanced Engineering Geology
10	Construction Economics & Finance	10	Infrastructure Planning and Management
		11	Environmental Management & Impact Assessment

# B. Tech. (Civil) Semester – I

## BH101: Basic Course in Communicative English

**Unit 1:** Communication: An introduction - Its role and importance in the corporate world – Tools of communication – Barriers – Levels of communication.

**Unit 2:** Listening: Importance to listening in the corporate world - Listening process and practice – Exposure to recorded and structured talks, class room lectures – Problems in comprehension and retention – Note-taking practice – Listening tests.

**Unit 3:** Reading-1: Introduction of different kinds of materials: technical and non-technical – Different reading strategies: skimming, scanning, inferring, predicting and responding to content.

**Unit 4:** Reading-2: Guessing from context – Note making – Vocabulary extension.

**Unit 5:** Speaking: Barriers to speaking – Building confidence and fluency – dialogue practice - Extempore speech practice – Speech assessment.

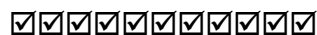
**Unit 6:** Writing: Effective writing practice – Effective sentences: role of acceptability, appropriateness, brevity and clarity in writing – Cohesive writing practice – Paragraph writing – Discourse writing.

### Text Books

- Meenakshi Raman and Sangeetha Sharma, “Technical Communication”, Oxford University Press, New Delhi. 2008

### Reference Books

- M. Ashraf Rizvi, “Effective Technical Communication”, Tata McGraw-Hill, New Delhi, 2005
- Golding S.R, “Common Errors in English Language”, Macmillan, 1978
- Christopher Turk, “Effective Speaking”, E & FN SPON, London, 1985



## BH102: Engineering Mathematics – I

**Unit 1:** Linear Algebra – Matrices: Matrix operations, cofactors, normal form of a matrix, rank, Consistency, Eigen and eigen values, Cayley –Hamilton theorem

**Unit 2:** Differential Calculus: Successive differentiation, Leibnitz’s theorem, Taylor’s theorem, Maclaurin’s Theorem

**Unit 3:** Vector Calculus: Differentiation of vectors, Curves in space, Velocity and acceleration, Tangential and normal acceleration

**Unit 4:** Applications of Vector and Scalar point functions: Vector operator del, Del applied to the Scalar point function – Gradient, Del applied to the Vector point functions– Divergence and Curl, Del applied twice to point function, Line Integral, Surface integral, Volume integral, Divergence theorem, Green’s theorem, Stoke’s theorem.

**Unit 5:** Integral Calculus: Double integral, Triple integral, Application to the area, volume, surface area, Moment of Inertia, Center of gravity

**Unit 6:** Infinite Series: Positive term series – Integral test, Comparison test, D’Alembert ratio test, Cauchy’s root test, Raabe’s test, Log Test, Alternating Series – Leibnitz rule, absolute and conditional convergence, power series

**Text Books**

- Grewal B. S., “Higher Engineering Mathematics”, Khanna Publication, New Delhi.
- Kreyszig E., “Advanced Engineering Mathematics”, Wiley Eastern Publication.



**BH103: Engineering Physics I**

**Unit 1:** Wave and Oscillations: Free oscillation, damped oscillation and forced oscillation and resonance. Examples, Longitudinal and transverse wave, wave equation.

**Unit 2:** Acoustics: Ultrasonic waves Piezoelectric effect, Magnetostriction effect and production of ultrasonic waves, Applications of Ultrasonic waves.

**Unit 3:** Optics: Interference in thin films, wedge shaped film and Newton’s ring application of interference of light, Polarization of light, Methods for production of polarized light, Hygen’s theory of double refraction, Laurent’s half shade polarimeter, faraday effect, Kerr effect.

**Unit 4:** Laser and Fiber optics: Principle of Laser, Spontaneous and stimulated emission – Einstein’s co-efficient, Types of Laser and its applications , Total internal reflection, materials and types of optical fibers, numerical aperture, fiber optics communication principle and application.

**Unit 5:** Electron Optics: Motion of charged particles in electric field and magnetic field, Measurement of e/m by Thomson’s Method, Millikan’s Oil Drop method. Positive Rays, Bainbridge mass spectrograph.

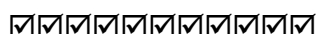
**Unit 6:** Nuclear Physics and Quantum Mechanics: Nuclear reaction, q-value of Nuclear reaction, G.M.Counter. Duality of Matter, de-Broglie’s wave, Electron Diffraction, Davisson and Germer’s  $\bar{e}$  diffraction experiment, Heisenberg’s Uncertainty Principle, Schrodinger’s time dependent and time independent wave equation, Physical significance of wave function.

**Text Books**

- M.N.Avadhanulu and P.G.Kshrisagar, “A Text of Engineering Physics”
- R.K.Gaur and S.L.Gupta, “Engineering Physics”

**Reference Books**

- D.Halliday, R.Resnick and J.Walker, “Fundamental of Physics”, Sixth Edition
- F.S.Crawford Jr., *Waves* – “Berkeley Physics Courses”, Volume 3
- A.Ghatak, “Optics” , Third Edition.



**BH104: Engineering Chemistry – I**

**Unit 1:** Fuels and Lubricants: Fuels: Introduction, classification of fuel, essential properties of fuel, characteristics of good fuel, solid fuelswood and coal, various types of coal, analysis of coal – Proximate and Ultimate analysis, liquid fuel- refining of petroleum.



Lubricants: Introduction, types of lubrication, classification of lubricants, properties of lubricants.

**Unit 2:** Physical Properties in liquid state: Additive and Constitutive properties, Surface tension and its determination, Viscosity and its determination, Refractive index and their determination, Optical activity, Specific rotation, Polarimeter.

**Unit 3:** Chemical Bonding: Types of chemical bonds, Ionic bonding and its characteristics, factors affecting the formation of ionic bond, Born-Haber cycle for determination of lattice energy, the concept of Molecular Orbital theory, characteristics of bonding and antibonding molecular orbitals, formation of MO, bond order and stability of molecule, energy level sequence, MO diagram of H<sub>2</sub>, O<sub>2</sub>, etc. Hydrogen bonding.

**Unit 4:** Corrosion: Introduction, fundamental reason, electrochemical corrosion, direct chemical corrosion, factors affecting the rate of corrosion, types of corrosion- pitting corrosion, microbiological corrosion, stress corrosion, methods to minimize the corrosion – proper design, cathodic and anodic protection, metallic coating, organic coating.

**Unit 5:** Fundamentals of Organic Chemistry-1: Introduction, E1 and E2 reactions, Birch reduction, Oppenauer oxidation, Study of Aromatic compounds: Naphthalene, Anthracene.

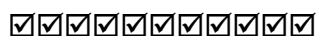
**Unit 6:** Fundamentals of Organic Chemistry-2: Study of Heterocyclic compound: Pyridine and Quinolene. Manufacture of alcohol by fermentation process.

#### **Text Books**

- Bhal and Bhal, “Advanced Organic Chemistry”, S. Chand and Company, New Delhi, 1995.
- Jain P. C. and Jain Monica, “Engineering Chemistry”, Dhanpat Rai and Sons, Delhi, 1992.

#### **Reference Books**

- Finar I. L., “Organic Chemistry” (Vol. I and II), Longman Gr. Ltd. and English Language Book Society, London.
- Barrow G.M., “Physical Chemistry”, McGraw-Hill Publication, New Delhi.



## **ID106: Energy and Environmental Engineering**

**Unit 1:** Power Generation-1: Conventional Vs Non convectional power generation, Renewable and alternative energy trends in power generation in future.

**Unit 2:** Power Generation-2: Solar, Wind, Bioenergy, Ocean Thermal energy conversion (OTEC), Tidal, Fuel cell, Magneto Hydro Dynamics (MHD).

**Unit 3:** Power Generation-2: Thermo electric and thermionic generators – Principle and Application - Energy conservation and management- Industry, domestic, case studies.

**Unit 4:** Pollution-Air: Air pollution- sources- effects- control- air quality standards, air pollution act- measurement,

**Unit 5:** Pollution-Water: Water pollution- effects- selection of process- Disposal of solid wastes.

**Unit 6:** Pollution-General: Green house effect- Acid rain- Noise pollution – Thermal pollution- Pollution aspects of various power plants.

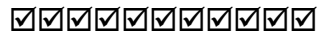
#### **Text Books**

- Rai. G. D., “Non Conventional Energy Sources”, Khanna Publishers, Delhi, 2006.

- Gilbert M. Masters, “Introduction to Environmental Engineering and Science”, 2nd Edition, Prentice Hall, 2003.

### Reference Books

- Rao S., Parulekar B.B., “Energy Technology-Non conventional, Renewable and Conventional”, Khanna Publishers, Delhi, 2005.
- Glynn Henry J., Gary W. Heinke, “Environmental Science and Engineering”, Pearson Education, Inc, 2004.



## ME106/ME206: Basic Mechanical Engineering

**Unit 1:** Introduction to Mechanical Engineering: Thermal Engineering, Design Engineering, Manufacturing Engineering.

**Unit 2:** Introduction to Laws of Thermodynamics with simple examples pertaining to respective branches, IC Engines: Classification, Applications, 2 Stroke and 4 Stroke systems in IC Engines.

**Unit 3:** Automobiles: Transmission systems, Suspension system, Power Plant: Types of Power plant; Gas power plant, Thermal power plant, Nuclear power plant

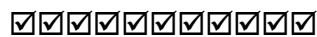
**Unit 4:** Design Basics, Mechanisms, Factor of safety, materials and metallurgical considerations

**Unit 5:** Engineering materials, machine elements, Transmission, Fasteners, support systems

**Unit 6:** Manufacturing: Classification, introduction to Lathe machine, Drilling machine, Milling machine, metal joining, Metal forming, casting (A visit to Workshop for demonstration)

### Reference Books

- Lecture notes prepared by Department of Mechanical Engineering.



## ME107/ME207: Engineering Graphics

**Unit 1:** Drawing standard: Drawing standard SP46: Dimensioning, Lettering, type of lines, scaling conventions.

**Unit 2:** Geometrical constructions: Dividing a given straight line into any number of equal parts, bisecting a given angle, drawing a regular polygon given one side, special methods of constructing a pentagon and a hexagon

**Unit 3:** Orthographic /Isometric projection: Introduction to orthographic projection, drawing orthographic views of objects from their isometric views - Orthographic projections of Points lying in four quarters, Orthographic projection of lines parallel and inclined to one or both planes. Orthographic projection of planes inclined to one or both planes. Isometric Projection and view of planes and simple solids.

**Unit 4:** Solids and sectioning: Types of solids, Projections of solids with axis perpendicular to HP, solids with axis perpendicular to VP, solids with axis inclined to one plane. Projection of spheres touching each other Sectioning of solids: section planes perpendicular to one plane and parallel or inclined to other plane.

**Unit 5:** Studies of surfaces: Intersection of surfaces: intersection of cylinder and cylinder, intersection of cylinder and cone, intersection of prisms.

Development of surfaces: Development of cylindrical and conical surfaces Development of prisms.

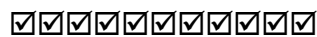
**Unit 5:** Computer Aids: Introduction to computer aided drafting: introduction to computer aided drafting package to make drawings

**Text Books**

- N.D. Bhatt, “Engineering Drawing”, Charotar publishing House, 46th Edition, 2003.
- K.V. Natarajan, “A text book of Engineering Graphic”, Dhanalakshmi Publishers, Chennai, 2006.

**Reference Book**

- K.Venugopal and V.Prabhu Raja, “Engineering Graphics”, New Age International (P) Ltd, 2008.



**CL108: Introduction to Civil Engineering**

**Unit 1:** Introduction to Civil Engineering: Role of Civil engineers in society, outstanding accomplishments of the profession, future trends,

**Unit 2:** Projects in Civil Engineering: Types of projects, stages of projects, Specifications and Scope.

**Units 3:** Structures: State of the art lectures on structures, Transportation, Water Resources, Environment, geotechnical, and GIS /GPS / RS, Introduction to geology.

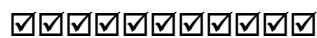
**Unit 4:** Construction Materials: Properties and uses of construction materials such as stones, bricks, cement, concrete and steel.

**Unit 5:** Buildings: Site selection for buildings – components of building foundation – shallow and deep foundations

**Unit 6:** Brick and stone masonry – plastering – lintels, beams and columns – roofs.

**Reference Books**

- Sushil Kumar, “Building Construction”, Standard Publishers, 2001
- Rangwals, S.C, “Building Materials”, Charotar Publishing house, 1996.



## **B. Tech. (Civil) Semester – II**

### **BH201: Basic Course in Human Rights**

**Unit 1:** The Basic Concepts: Individual, group, civil society, state, equality, justice.  
Human Values: Humanity, virtues, compassion.

**Unit 2:** Human rights and Human Duties: Origin, civil and political rights, Contribution of American bill of rights, French revolution. Declaration of independence, Rights of citizen, Rights of working and exploited people, Fundamental rights and economic programme, India's charter of freedom.

**Unit 3:** Society, religion, culture, and their inter-relationship. Impact of social structure on human behavior, Roll of socialization in human values, science and technology, modernization, globalization, and dehumanization.

**Unit 4:** Social Structure and Social Problems: Social and communal conflicts and social harmony, rural poverty, unemployment, bonded labour. Migrant workers and human rights violations, human rights of mentally and physically challenged.

**Unit 5:** State, Individual liberty, Freedom and democracy. The changing of state with special reference to developing countries. Concept of development under development and social action, need for collective action in developing societies and methods of social action.  
NGOs and human rights in India: Land, Water, Forest issues.

**Unit 6:** Human rights in Indian constitution and law:

- i) The constitution of India: Preamble
- ii) Fundamental rights
- iii) Directive principles of state policy
- iv) Fundamental duties
- v) Some other provisions

Universal declaration of human rights and provisions of India. Constitution and law. National human rights commission and state human rights commission.

#### **Reference books**

- Shastri, T. S. N., "India and Human rights: Reflections", Concept Publishing Company India (P Ltd.), 2005
- Nirmal, C.J., "Human Rights in India: Historical, Social and Political Perspectives (Law in India)", Oxford India



### **BH202: Engineering Mathematics - II**

**Unit 1:** Linear Algebra – Matrices: Matrix operations, cofactors, normal form of a matrix, rank, Consistency, Eigen and eigen values, Cayley –Hamilton theorem

**Unit 2:** Differential Calculus: Successive differentiation, Leibnitz's theorem, Taylor's theorem, Maclaurin's Theorem

**Unit 3:** Vector Calculus: Differentiation of vectors, Curves in space, Velocity and acceleration, Tangential and normal acceleration

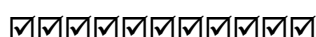
**Unit 4:** Applications of Vector and Scalar point functions: Vector operator del, Del applied to the Scalar point function – Gradient, Del applied to the Vector point functions– Divergence and Curl, Del applied twice to point function, Line Integral, Surface integral, Volume integral, Divergence theorem, Green’s theorem, Stoke’s theorem.

**Unit 5:** Integral Calculus: Double integral, Triple integral, Application to the area, volume, surface area, Moment of Inertia, Center of gravity

**Unit 6:** Infinite Series: Positive term series – Integral test, Comparison test, D’Alembert ratio test, Cauchy’s root test, Raabe’s test, Log Test, Alternating Series – Leibnitz rule, absolute and conditional convergence, power series

**Text Books**

- Grewal B. S., “Higher Engineering Mathematics”, Khanna Publication, New Delhi.
- Kreyszig E., “Advanced Engineering Mathematics”, Wiley Eastern Publication.



**BH203: Engineering Physics - II**

**Unit 1:** Crystallography and X- rays: Crystalline and amorphous solids, crystal structure , Lattice point, space lattice, unit cells,lattice parameter and crystal systems, cubic system, number of atoms per unit cell, co-ordination number, atomic radius, packing density, Lattice constant. Lattice plane and Miller Indices, Interpalnner spacing for cubic system . Production and types of x-rays spectrum, x-ray diffraction, Bragg’s law, Moseley’s law.

**Unit 2:** Conducing Materials: Electrical conduction, free electron theory,FermiDirac statistics, band theory of solids, Resistivity of metals, Superconductivity and types- Meissner effect, High temperature superconductor, applications.

**Unit 3:** Semiconductor: Intrinsic and extrinsic semiconductor, conductivity of semiconductor and its temperature dependence, Fermi level, Hall effect, semiconductor devices (P-N junction diode, Transistor)

**Unit 4:** Dielectric Materials: Dielectric constant, polarization , types of polarization Internal field and claussius-Mosotti equation,types of dielectric materials , temperature and frequency effect, application.

**Unit 5:** Magnetic Materials and Advanced Materials: Magnetic dipole moment, magnetic flux density, mafnetic field strength magnetization, magnetic permeability , types of magnetic materials, domain theory, hystresis loop, hard and soft materials, Nano materials, physical properties, a ferrites and garnets and application,

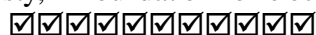
**Unit 6:** Electrodynamics: Coulomb’s law for distribution of charges, polarization and Gauss’s law, Maxwell’s equation, electromagnetic wave equation, propagation of electromagnetic waves in free – space

**Text Books**

- M.N.Avadhanulu and P.G.Kshrisagar, “A text of Engineering Physics”–
- V.Raghavan, “Materials Science and Engineering”

**Reference Books**

- E.M.Purcell, “Electricity and Magnetism”-Berkeley Physics Course Volume 2
- J.R.Reitz, F.J.Milford and R.W.Christy, “Foundation of electromagnetic theory” , third edition



## BH204: Engineering Chemistry - II

**Unit 1:** Water: Introduction, Hard and soft water, softening of water-zeolite process, ion-exchange process, hot lime-soda process, purification of water- methods to remove suspended impurities, methods to remove germs and bacteria.

**Unit 2:** Metallurgy: Introduction, occurrence of metals, Types of ores, conc. of ores- crushing and sizing, froath flotation, magnetic separation, tabling process etc. calcination, roasting, reduction by pyrolysis. Chemical reductions, Refining of metals.

**Unit 3:** Phase Rule: Phase Rule, statement & derivation, explanation of the terms- Phase, components, degrees of freedom, one component system-water & sulphur, two components alloy system.

**Unit 4:** High Polymers: Introductions, Types of polymerization-addition, condensation & co-polymerisation, molecular weight determination by viscosity method & osmotic pressure method, plastic and its classification.

**Unit 5:** Electrochemistry –I: Introduction, conductivity-specific conductance, equivalent conductance, measurement of conductance, cell constant, factors affecting the conductance of electrolytic solution, conductometric titrations, Debye- Huckel theory of strong electrolyte, Transport number & determination of transport number by moving boundary method.

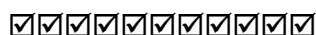
**Unit 6:** Electrochemistry –II: Introduction, Theory of acid-base indicator, glass electrode, Quinhydrone electrode, measurement of pH, potentiometric titration.

### Text Books

- P.C.Jain & M.Jain, “Engineering chemistry”, Dhanpat Rai Publishing company (P) Ltd.,New Delhi,2007.
- Bhal &Tuli, Textbook of Physical chemistry,(1995), S.Chand & company,New Delhi.

### Reference Books:

- S.Glasstone, Physical Chemistry, McGraw-Hill Publication, New Delhi.
- Barrow G.M., Physical Chemistry, McGraw-Hill Publication, New Delhi.
- S.S.Dara, Engineering chemistry, S. Chand & company, New Delhi.



## EM105/EM205: Engineering Mechanics

**Unit 1:** Concurrent forces in a plane: Principles of Statics-Composition of forces-Equilibrium of concurrent forces in a plane-Method of projections- Equilibrium of three forces in a plane Method of Moments – Friction

**Unit 2:** Forces in plane: Parallel forces in a plane: Two parallel forces- General case of parallel forces in a plane-Center of parallel forces and center of gravity-Centroids of composite plane figures and curves – Distributed forces in a plane

General case of forces in a plane: Composition of forces in a plane-Equilibrium of forces in a plane

**Unit 3:** Forces in space: Force systems in space: Concurrent forces in space- method of projections, methods of moments-couples in space-parallel forces in space-center of parallel forces and center of gravity- general case of forces in space.

**Unit 4:** Rectilinear Translation: Kinematics of rectilinear motion-Principles of dynamics Differential equation of rectilinear motion-Motion of particle acted upon by a constant force

D'Alembert's principle-Momentum and impulse-Work and energy- Ideal systems: conservation of energy- Impact

**Unit 5:** Curvilinear translation: kinematics of curvilinear motion- Differential equations of curvilinear motion-Motion of a projectile- D'Alembert's principle in curvilinear motion.

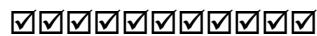
**Unit 6:** Rigid Body motion: Rotation of a rigid body about a fixed axis and plane motion of a rigid body.

### Text Books

- Rajasekaran.S. and Sankara Subramanian.G., "Engineering Mechanics – Statics and Dynamics", Vikas Publishing Comp, 2005
- S. Timoshenko and D.H. Young, "Engineering Mechanics", McGraw Hill, 1995.

### Reference Books

- Irving H.Shames, "Engineering Mechanics – Statics and Dynamics", Pearson Educations, Forth edition, 2003.
- Beer and Johnston, "Vector Mechanics for Engineers", *Vol.1 "Statics" and Vol.2 "Dynamics"*, McGraw Hill International Edition, 1995.
- Suhas Nitsure, "Engineering Mechanics", Technical Publications, Pune, 2007.



## **ID206: Basics of Electrical and Electronics Engineering**

**Unit 1:** DC Circuits – Direct currents and voltages, power, Kirchhoffs Laws, batteries, DC machines- Construction, principle of operation and applications.

**Unit 2:** AC Circuits an transformers - Alternating current and voltage, circuit elements R,L &C, Phasor Diagram, impedance, real and reactive power in single phase circuits, Single phase transformer – construction, principle of operation, Introduction to three phase systems.

**Unit 3:** AC machines – Synchronous and Induction machines - Construction, Principle of operation, and applications, introduction to brushless DC motor.

**Unit 4:** Basic Electronics – semiconductor devices – p-n junction diode, BJT, operational amplifiers -Principle of operation and applications, introduction to number systems and logic gates.

**Unit 5:** Signal measurement and processing – peak, RMS and average values, Data acquisition system- ADC, DAC – principles of operation.

### Reference Books

- Hughes revised by McKenzie smith with John Hilcy and keith Brown, "Electrical and Electronics technology", 8<sup>th</sup> Edition, Pearson, 2006.
- R.J.Smith, R.C.Dorf, Circuits devices and systems, 5<sup>th</sup> edition, John wiley and sons, 2001
- Malvino, A.P, Leach D.P and Gowtham Sha, "Digital Principles and Applications", 6th Edition, Tata McGraw hill, 2007
- Vincent Del Toro, Electrical Engineering Fundamental, Prentice Hall India, 20

## CL208: Civil Engineering: Programming & Software

**Unit-1:** Introduction: Use of computers in Civil Engineering – numeric computation and visual representation, Analytical Modelling of Physical Phenomena, Overview of commercial software for Civil Engineering applications, Overview of Programming languages and coding within dedicated commercial software.

**Unit-2:** Development of Algorithms and Flow Charts: Basic concepts of developing algorithms for encoding, Introduction to pseudo-coding with Branching and Looping, Development of algorithms and flowcharts for simple matrix operations and numerical evaluation of roots of a polynomial and numerical integration

**Unit-3:** Use of Formulae in Excel: Introduction to simple operations in Excel using scalars and matrices. Use of formulae in Excel involving a single sheet, multiple sheets and multiple files (workbooks)

**Unit-4:** Use of Macros in Excel: Introduction to macros, recording and using macros for repetitive tasks. Introduction to VBA through the recorded macros

**Unit-5:** Introduction to MATLAB: Introduction to MATLAB Programming involving scalar and vector computation and graphical representation.

**Unit-6:** Applications of Commercial Software's: Solution of simple truss and/or beam problems, Applications for text editing: MS Office or Open Office Features.

### Assignments

- a) Development of formulae for numerical evaluation of roots of a polynomial and numerical integration.
- b) Developing macros for simple numerical techniques and civil engineering computations.
- c) Graphical representation of data using Spreadsheet Charts and/or MATLAB programs
- d) Document creation using text editors such as MS Word or Open Office

### Text Books

- Microsoft Office Excel 2007, Complete, Illustrated Series
- Balaguruswami E., "Numerical Methods", Tata McGraw Edition
- Datta and Kanti Bhushan, "Matrix And Linear Algebra: Aided with Matlab" Prentice Hall India
- Xavier C., "Fortran and Numerical Methods", New Age International (P) Limited Publishers, N. Delhi
- Kanetkar Yashwant, "Let Us C", , BPB Publication
- Rudra Pratap, "Getting Started with MATLAB 5, A Quick Introduction for Scientists and Engineers", Oxford University Press, USA

### Reference Book

- Gottfried Byron S., "Programming with C", Schum's Outline Series, Tata McGraw Hill Company
- Ganju, T. N., "Matrix Structural Analysis Using Spreadsheets", TATA McGraw Hill Publishing Company Limited, N. Delhi
- McGuire, W., Gallagher, R. H., and Ziemian, R.D., "Matrix Structural Analysis", Edition, Wiley, New York,
- Program help documentation of commercial softwares





## B. Tech. (Civil) Semester – III

### BH 301: Mathematics – III

**Unit 1:** Infinite Series: Series of Number, Improper Integrals, Cauchy Criterion, Test of Convergence, Absolute and Conditional Convergence, Series of Functions, Uniform Convergence, Power Series, Radius of Convergence..

**Unit 2:** Fourier Series: Fourier Series, Half-Range Expansions, Approximation by Trigonometric Polynomials, Fourier Integrals.

**Unit 3:** Partial Differential Equations: First and Second Order Linear Partial Differential Equations with Variable Coefficients, Wave Equation and Heat Equation in One and Two Dimensions, Laplace Equation in Two and Three Dimensions (Cartesian Co-Ordinates Only), Transforms Techniques in Ordinary Differential Equations and Partial Differential Equations.

**Unit 4:** Power Series Methods for Solution of Ordinary Differential Equations: Legendre Equations and Legendre Polynomials, Bessel Functions of First and Second Kind, Orthogonality, Sturm-Liouville Problems.

**Unit 5:** Laplace Transform: Laplace Transforms of Various Functions.

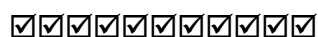
**Unit 6:** Inverse Transforms, Shifting on the S and T Axes, Convolutions, Partial Fractions.

#### Text Books

- Wartikar J.N. and Wartikar P.N., “Engineering Mathematics Vol. I and Vol.II”, Pune Vidyarthi Griha Prakashan, Pune,1992
- Grewal B.S., “Higher Engineering Mathematics”, Khanna Publication, New Delhi, 2003

#### Reference Books

- Kreyszig E., “Advanced Engineering Mathematics”, Wiley Eastern, Sixth Edition, 1986
- Peter V, O’Neil, “Advanced Engineering Mathematics”, Thomson Publication, 2002



### CV 302: Solid Mechanics

**Unit 1:** Simple Stress: Analysis of internal forces, simple stress, shearing stress, bearing stress, thin walled pressure vessels.

Simple Strains: Stress strain diagram, Hooke's law: axial and shearing deformations, Poisson's ratio: biaxial and triaxial deformations, statically indeterminate members, thermal stresses.

**Unit 2:** Torsion - Introduction and assumptions, derivation of torsion formulae, torsion of circular shafts, stresses and deformation in determinate solid/hollow homogeneous/composite shafts.

**Unit 3:** Combined Stresses: Combined axial and flexural loads, Kern of a section; load applied off the axes of symmetry, variation of stress with inclination of element, relationship between modulus of rigidity and modulus of elasticity, variation of stress at a point: Analytical derivation, Mohr's circle, absolute maximum shearing stress, Application of Mohr's circle to combined loadings (Principal Stresses), State of Simple Shear, Transformations of strain components, strain rosette.

**Unit 4:** Axial Force, Shear Force and Moment in Beams : concept of unbalanced forces at a transverse section, axial forces, shear forces and moment – interaction of these, relations among load shear and moment, introduction to moving loads.

Stresses in Beams: Derivation of flexural formula, economic sections, floor framing, unsymmetrical beams, Analysis of flexure action derivation of formula for horizontal shearing stress, design for flexure and shear.

**Unit 5:** Beam Deflections: Calculations of deflection for determinate beams by double integration, Theorem of area moment method, moment diagram by parts, conjugate beam method, Deflection by method of superposition, introduction to energy methods

**Unit 6:** Columns and Struts: Concept of short and long columns, formulae by Euler and Rankine, Limitation of Euler's Formula, equivalent length, eccentrically loaded short compression members.

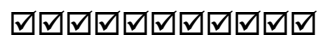
**Unit 7:** Theories of Failure: Concept of failure in strength and failure in deformation, Statement and application of Maximum Principal Stress Theory, Maximum Principal Strain Theory, Maximum Strain Energy Theory, Maximum Shear Stress Theory, Maximum Shear Strain Theory

### Text Books

- F.L. Singer and Pytle, "Strength of Materials", Harper Collins Publishers.
- S.B. Junnarkar, "Mechanics of Structures", Charotor Publishers, Anand.

### Reference Books

- E.P. Popov, "Introduction to Mechanics of Solids", Prentice-Hall, Second Edition 2005.
- S.H. Crandall, N.C. Dahl, and T.J. Lardner, "An Introduction to the Mechanics of Solids", Tata McGraw Hill, 1978.



## CV 303: Hydraulic Engineering - I

**Unit 1:** Fundamental Concepts: Definition of fluids, Fluid properties-density, specific weight, specific volume, specific gravity, viscosity, compressibility, surface tension, capillarity, vapor pressure, Types of fluids - Newtonian and non-Newtonian fluid, Continuum, Measurement of Fluid Pressure.

**Unit 2:** Fluid Statics: Forces on fluid elements, Fundamental equation, Manometers, Hydrostatic thrust on submerged surfaces, Buoyancy, Stability of unconstrained bodies, Fluids in rigid body motion.

**Unit 3:** Fluid Kinematics: Types of flow, Momentum equation, Euler's equation, Bernoulli's equation, Velocity potential and stream function

**Unit 4:** Laminar flow: Fully developed laminar flow between infinite parallel plates; Both plates stationary, upper plate moving with constant speed, fully developed laminar flow in pipe.

Turbulent flow: Shear stress distribution and turbulent velocity profiles in fully developed pipe flow, Velocity distribution and Shear stresses in turbulent flow, Prandtl mixing length theory, Nikuradse's Experiment, Calculation of head loss, Introduction to Moody's Chart, Nomograms and other pipe diagrams.

**Unit 5:** Dimensional analysis and similitude: Nature of dimensional analysis, Buckingham pi theorem, Dimensionless groups and their physical significance, flow similarity and model studies.

**Unit 6:** Flow measurement: Direct methods, Restriction flow meters, Linear flow meters, Traversing methods, Measurements in open channel flow.

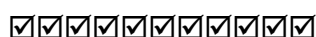
Flow through pipes: Pipe discharging from a reservoir, pipe connecting two reservoirs in series and parallel, Siphon, Transmission of power through nozzle, Water hammer in pipes- Rigid and Elastic Water Column Theory. Surge Tanks - Function, location and Uses.

### **Text Books**

- Robert W. Fox and Alan T. Mc-Donald, "Introduction to Fluid Mechanics", John Wiley and Sons, Fifth Edition
- Modi and Seth, "Fluid Mechanics and Hydraulic Machinery", Standard Book House, Tenth Edition , 1991
- Kumar K. L., "Fluid Mechanics"
- Bansal R. K., "Fluid Mechanics"

### **Reference Books**

- V.L. Streeter, K.W. Bedford and E.B.Wylie, "Fluid Dynamics", New York, McGraw-Hill, Ninth Edition, 1998
- S.K. Som and G. Biswas, "Introduction to Fluid Mechanics and Fluid Machines", Tata McGraw-Hill, Second Edition, 2003



## **CV 304: Surveying - I**

**Unit 1:** Chain Surveying: Definition - Principles - Classification - Fields and office work - Scales - Conventional signs – Survey instruments, their care and adjustment - Ranging and chaining - Reciprocal ranging - Setting perpendiculars - well-conditioned triangles - Traversing - Plotting - Enlarging and Reducing figures.

**Unit 2:** Compass Surveying: Prismatic compass - Surveyor's compass - Bearing - Systems and conversions - Local attraction – Magnetic declination - Dip - Traversing - adjustment of errors

**Unit 3:** Plane Table Surveying: Plane table instruments and accessories – Merits and demerits - Methods - Radiation - Intersection - Resection - Traversing

**Unit 4:** Leveling and Applications: Level line - Horizontal line - Levels and Staves - Spirit level - Sensitiveness - Bench marks - Temporary and permanent adjustments - Fly and Check leveling - Booking - reduction - Curvature and Refraction – reciprocal leveling - Longitudinal and cross sections - Plotting - Contouring - Methods - Characteristics and uses of contours - Plotting - Earth work volume - Capacity of reservoirs. Planimeter-Types, Theory, concept of zero circle, Study of Digital Planimeter, Computation of Areas and Volumes

**Unit 5:** Theodolite Surveying: Theodolite - Vernier and microptic - Description and uses - temporary and permanent adjustments of vernier transit - Horizontal angles - Vertical angles - Heights and Distances - Traversing - Closing error and distribution - Gales's tables - Omitted measurements

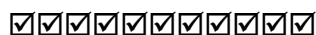
**Unit 6:** Engineering Surveys: Reconnaissance, Preliminary and location surveys for engineering projects - Layout - Setting out works – Route Surveys for highways, railways and waterways – Introduction to curve ranging, Mine Surveying - Instruments - Tunnels - Correlation of underground and surface surveys - Shafts

### **Text Books**

- Kanetkar T.P. Kulkarni S. V., "Surveying and Leveling", Vols. I, II and III, Vidyarthi Gruh Prakashan, Pune
- Punmia B.C., "Surveying", Vols. I, II and III, Laxmi Publications

### **Reference Books**

- Anderson J. M. and Mikhail E. M., "Introduction to Surveying", McGraw Hill Book Company
- Clark D., "Plane and Geodetic Surveying", Vol. I and II, C.B.S. Publishers and Distributors, New Delhi, Sixth Ed.
- Bannister A. and Raymond S., "Surveying", ELBS, Sixth Edition, 1992
- Heribert Kahmen and Wolfgang Faig, "Surveying", Walter de Gruyter, 1995



## **CV 305: Building Construction**

**Unit 1:** Introduction: Basic requirements of a building as a whole: strength and stability, Dimensional stability, comfort and convenience, Building components in substructure and superstructure, basic requirements of constituents such as Foundations, Plinth, Walls, Columns, Beams, Roofs, Steps and Stairs, Floors, Doors, Windows, Sills, Lintels, Weather Sheds, and Utility Fixtures.

**Unit 2:** Foundations: Excavations, Sub soil Drainage, Bearing capacity of soils, Foundation Types

**Unit 3:** Masonry Construction: Stone masonry – Random Rubble, Un-coursed Rubble, Coursed Rubble & Ashlar Brickwork & Brick Bonds - English, Flemish, Principles to be observed during construction Composite masonry, various partition walls, Brick, Aluminum & Timber, Solid concrete blocks, hollow concrete blocks and light weight blocks (Siporex), soil stabilized blocks, Fly Ash Blocks, Cement Concrete Walls

**Unit 4:** Arches: Arches and their stability consideration, technical terms in arches, types of arches, methods of construction, Lintel: Necessity, Materials: wood, stone, brick, steel, R.C.C. and reinforced brick lintels, Beams: Types according to material, layout such as primary and secondary, Continuous Beams, Formwork for RCC Elements: Function, Requirements

**Unit 5:** Means of Lateral Communication

Doors and Windows: Doors – Classification, Types: Paneled Door, Flush Door, Aluminum Doors, Steel Doors, Glazed Doors, fixtures and fastening.

Windows - Classification, T.W. Glazed Windows, Aluminum Glazed Windows, Steel Windows, fixtures and fastening, Laying out of Passages

**Unit 6:** Means of Vertical Communication

Stairs: Terminology, Requirements of a Good Stair, Various Types, Uses and Limitations.

Ramps: Requirements and types, Planning Aspects for Physically Handicapped Persons.

Elevators: Types and their Use.

**Unit 7:** Flooring: Types, Factors for Selections of Floorings, Flooring in Ground and Upper floors, Various types of Tiled Flooring, Concrete Flooring (Tremix Flooring)

**Unit 8:** Roofs and Roof Coverings: Terms used. Roof and their selection, pitched roofs and their types, Timber Trusses (King Post and Queen Post), Steel Trusses types and their suitability, roof coverings and their selection.

**Unit 9:** Prefabrication: Principles - Advantages and Disadvantages, Types of Prefabricates, Standardization, Basic, Nominal and Actual Dimensions, Tolerances, Joints Production, Transportation and Erection

### **Text Books**

- Punmia B.C., Jain A. K., "Building Construction", Laxmi Publications Pvt. Ltd., New Delhi,
- Arora S. P. and Bindra S. P., "A Text Book of Building Construction", Dhanpat Rai Publications
- Sushil Kumar, "Building Construction" Standard Publishers

## Reference Books

- NBC 2005, National Building Code of India, Parts III,IV,VII and IX, B.I.S. New Delhi
- Chudley.R., "Construction Technology", Vol.1, 2, 3 and 4 ELBS Publisher
- SP 7- National Building Code Group 1 to 5, B.I.S. New Delhi
- I.S. 962 - 1989 Code for Practice for Architectural and Building Drawings, B.I.S. New Delhi
- Sikka V. B., "A Course in Civil Engineering Drawing", S. K. Kataria and Sons



## CV 306: Engineering Geology

**Unit 1:** Introduction and Physical Geology: Definition, Scope and subdivisions, applications of Geology in Civil Engineering, Major features of the Earth's structure, Geological work of river: features of erosion, deposition and transportation, Civil Engineering Significance, Geological work of wind: Processes and features of erosion, deposition and transportation, Civil Engineering Significance.

Volcano: Central and Fissure types, Products of volcano.

Mountain: Types, examples

**Unit 2:** Mineralogy and Petrology:

Mineralogy: Physical properties of mineral, Classification of minerals.

Petrology: Definition, rock cycle.

Igneous rocks: Origin, Textures and Structures, Classification, Concordant and Discordant Intrusions, Civil Engineering significance

Secondary rocks: Formation, Classification

Residual deposits: Soil, Laterite and Bauxite and their importance

Sedimentary deposits: Formation, Textures, Classification and Structures, Civil Engineering significance, Chemical and organic deposits.

Metamorphic rocks: Agents and Types of Metamorphism, Stress and antistress minerals, Structures, Products of metamorphism

**Unit 3:** Structural Geology: Outcrop, Strike and Dip, Unconformity-Types, Outliers and Inliers, Overlap

Fold and Fault: Parameters, Classification, Causes, Civil Engineering significance

Joint: Types, Civil Engineering considerations

**Unit 4:** Building Stones: Properties of rocks, Requirement of good building stone, Building stones of India

Groundwater: Sources of groundwater, water table, Zones of groundwater, Porosity and permeability

**Unit 5:** Geology of Dams and Reservoirs, Tunnels and Bridges: Preliminary geological survey, Influence of geological conditions on location, alignment, Design and Type of a dam, geological considerations in site selection for dams, Site improvement techniques, dams on carbonate rocks, sedimentary rocks, folded strata and deccan traps, favorable and unfavorable geological conditions for reservoir site

Tunnels and Bridges: Influence of geological conditions on tunneling, difficulties during tunneling, tunnel lining, tunneling in folded strata, sedimentary rocks and deccan traps, dependence of types of bridges on geological conditions.

**Unit 6:** Preliminary Geological Investigations: Steps in geological investigations, engineering consideration of structural features Exploratory drilling: Observations, Preservation of cores, Core logging, Core recovery Graphical representation of core log, Limitation of exploratory drilling method

### **Text Books**

- Prabin Singh, “Engineering and General Geology”, S. K. Katariya and sons, Delhi
- P. K. Mukerjee, “A Text Book of Geology”, The World Press Pvt. Ltd., Calcutta
- K.V.G.K. Gokhale and D. M. Rao , “Experiments in Engineering Geology”, TMN, New-Delhi
- R. B. Gupte, “A Text Book of Engineering Geology”, Pune Vidyarthi Griha Prakashan, Pune

### **Reference Books**

- G. W. Tyrrell, “Principles of Petrology”, B. I. Publication Pvt. Ltd., New Delhi
- A. Holmes, “Principles of Physical Geology”, ELBS Chapman & Hall, London
- M. P. Billings, “Structural Geology”, Prentice Hall of India Private Ltd., New Delhi
- R. F. Legget, “Geology Hand book in Civil Engineering”, Mc-GrawHill, New York
- D. P. Krynine & W. R. Judd, “Principles of Engineering Geology and Geotechnics”, CBS Publishers & Distributors, New Delhi
- L. W. Farmer, “Engineering Properties of Rocks”, Chapman & Hall, London
- Dr. D. V. Reddy, “Engineering Geology for Civil Engineering”, Oxfard & IBH Publishing Co. Pvt. Ltd., New Delhi.
- B. S. SathyaNarayanswami, “Engineering Geology”, Dhanpat Rai & Co.(P) Ltd, Delhi
- Tood D. K., “Groundwater Hydrology”, John Wiley & Son, New York
- Engineering Geology Laboratory Manual
- H. H. Read, “Rulley’s Elements of Mineralogy”, CBS Publishers & Distributors, Delhi.



## **CV 307: Building Construction - Drawings Lab**

- 1) Sketch Book shall consist of free hand proportional sketches for the items to be drawn on drawing sheets as mentioned below.
- 2) Drawing to scale on a half imperial drawing sheet covering following aspects
  - a) Lettering, Symbols, Types of lines and dimensioning as per IS 962
  - b) Foundations: - Isolated, Combined Footings, Under Reamed Piles, Rafts
  - c) Types of Stone Masonry: Elevation and Sectional Drawings
  - d) Types of Brick masonry: Elevation and Sectional Drawings
  - e) Types of Doors: Elevation and Sectional Drawings
  - f) Types of Windows: Elevation and Sectional Drawings
  - g) Types of Stairs: Plan and Sectional Drawings
  - h) Timber Trusses: King Post and Queen Post
  - i) Typical plan for a single room and sectional views



## B. Tech. (Civil) Semester – IV

### CV401: Hydraulic Engineering II

**Unit 1:** Uniform Flow in Open Channel: Introduction, Difference between pipe flow and open channel flow. Types of open channels, Types of flows in open channel, Geometric elements, Velocity distribution, Measurement of velocity-(Pitot tube, current meter) Weir & Spillway : Sharp, broad & round crested weirs, calibration of weir, time of emptying tank with weir, Profile of Ogee spillway, Flow below gates.

**Unit 2:** Steady & Uniform Flow: Chezy's & Manning's formula, Roughness coefficient, Uniform Flow computations, Hydraulically efficient section ( Rectangular, Triangular, Trapezoidal )

**Unit 3:** Depth Energy Relationship in Open Channel Flow: Specific energy: definition & diagram, Critical, Sub-critical, Super-critical flow, Specific force, Specific discharge- (definition & diagram),

**Unit 4:** Varied Flow: Gradually (G.V.F.): Definition, Classification of channel Slopes, Dynamic equation of G.V.F. (Assumption and derivation), Classification of G.V.F. profiles-examples, Direct step method of Computation of G.V.F. profiles

Rapidly varied flow (R.V.F.): Definition, examples, Hydraulic jump- Phenomenon, relation of conjugate depths, Parameters, Uses, Types of Hydraulic jump.

**Unit 5:** Impact of Jet: Impulse momentum principle, Impact of jet on Vanes-flat, curved (stationary and moving), Inlet & outlet velocity triangles, Series of flat, curved vanes mounted on wheel.

**Unit 6:** Hydraulic Machines: Turbines: Importance of hydro-power, Classification of turbines, description, Typical dimensions and working principle of Pelton, Francis & Kaplan turbine (Detailed design need not to be dealt with), Unit quantities, Specific speed, Performance Characteristics, Selection of type of turbine, description & function of Draft tube, Thoma's cavitation number.

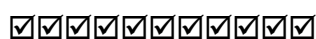
Pumps: Classification, Component parts, Working of centrifugal pump, Performance Characteristics, Selection of pump, Common pump troubles & remedies, Introduction to different types of pumps such as reciprocating, multi-stage, Jet, Air lift, Submersible pump.

#### Text Books

- Modi, Seth, "Fluid Mechanics – Hydraulic & Hydraulic Mechanics" Standard Book House,
- Bansal R.K., "Fluid Mechanics", Luxmi Publications
- R. J. Garde, "Fluid Mechanics through Problems", New Age Publications
- Jain A. K., "Fluid Mechanics", Khanna Publications, Delhi
- Kumar K. L., "Fluid Mechanics", Eurasia Publication House, Delhi
- Rangaraju, "Open Channel flow", Tata McGraw-Hill Pub. Co., Delhi
- Subramanyam K., "Fluid Mechanics through Problems" Tata McGraw-Hill Pub. Co., Delhi
- Subramanyam K., "Flow in Open Channel", Tata McGraw-Hill Pub. Co., Delhi

#### Reference Books

- Streeter, "Fluid Mechanics" McGraw-Hill International Book Co., Auckland
- Shames, "Mechanics of Fluids", Mc Graw Hill
- Chaw V. T., "Flow in Open Channel", McGraw-Hill International Book Co., Auckland
- Hughes & Brighton, "Fluid Mechanics", Tata Mc Graw Hill.



## CV402: Structural Mechanics

**Unit 1:** Introduction: Different Structural Systems, Concept of Analysis, Basic Assumptions, Indeterminacy, Choice of Unknowns, Castigliano's Theorems.

Energy Principles: Strain energy and strain energy density - Strain energy in traction, shear, flexure and torsion - Castigliano's and Engesser's energy theorems - Principle of virtual work - application of energy theorems for computing deflections in beams and trusses - Maxwell's reciprocal theorem - Williot Mohr diagrams.

**Unit 2:** Method of Consistent Deformation:

Indeterminate Beams: Analysis of indeterminate beams: Propped Cantilever and Fixed Beams - Fixed end moments and Reactions for standard cases of loading – slopes and deflections in fixed beams - Continuous beams - Theorem of three moments - Analysis of continuous beams - S.F. and B.M. diagrams for continuous beams, Settlement Effects.

Frames up to Three Degree of Indeterminacy: Analysis of Pin Jointed Trusses, Externally and Internally Redundant Trusses, Effects of Settlement and pre-strains.

**Unit 3:** Slope deflection method: analysis of continuous beams, analysis of rigid frames, frames with sloping legs, gabled frames, frames without sway and with sway, settlement effects.

Moment distribution method: Analysis of beams and frames.

Kani's method: Analysis of beams and simple frames.

**Unit 4:** Cables, Suspension Bridges and Arches: Analysis of forces in cables, suspension bridges with three hinged and two hinged stiffening girders, theory of arches, Eddy's theorem, Circular, parabolic and geometric arches, concept of radial shear force and axial thrust, analysis of three hinged and two hinged arches, Effect of yielding of supports, rib shortening and temperature changes, tied arches. ILD for 3 hinged arches and suspension bridges.

**Unit 5:** Moving Loads and Influence Lines: Introduction to moving loads, concept of equivalent UDL, absolute maximum bending moment and shear force, concept of influence lines, influence lines for reaction, shear force, bending and deflection of determinate beams, Influence line diagram (ILD) for forces in determinate frames and trusses, analysis for different types of moving loads, single concentrated load, several concentrated loads, uniformly distributed load shorter and longer than span, Application of Muller Breslau Principle for determinate structures.

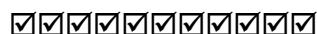
**Unit 6:** Thin Cylinders: Thin cylinders subjected to internal fluid pressure, wire wound thin cylinders. Thin cylindrical shells, circumferential and hoop stresses, longitudinal stresses, Maximum shear stress.

### Text Books

- Reddy C. S., "Basic Structural Analysis", Tata McGraw Hill.
- Vazirani and Ratwani, "Theory of Structures", Standard Publishers
- Khurmi R.S., "Theory of Structures",
- Punmia B.C., "Structural Analysis", Luxmi Publications.
- Wang C.K., "Statically Indeterminate Structures", Mc Graw Hill

### Reference Books

- Norris C. H. and Wilbur J. B., "Elementary Structural Analysis", Mc Graw Hill
- Timoshenko and Young, "Theory of structures", Mc Graw Hill
- Kinney J. S., "Indeterminate Structural Analysis", Oxford and IBH.
- Hibbler R. C., "Structural Analysis", Pearson Publications.
- Schodek, "Structures", Pearson Education.





## CV403: Surveying – II

**Unit 1:** Tacheometry: Significance & Systems, Principle, constants. Basic Formulae and Field Work Stadia method, Auto reduction Tachometer, Tangential system.

EDM: Importance, Principles of Electronic Distance measuring instruments, Classification of EDM's based on carrier waves used. Study and use of Total Station

**Unit 2:** Triangulation: Principle & Classification, system, Selection of station, Base line Measurement, correction and use of subtense bar, signals, satellite station, reduction to center, spherical excess, angular observations, trilateration.

Triangulation Adjustments: Theory of errors, laws of weights, concept of most probable value

**Unit 3:** Field Astronomy: Terms, co-ordinate systems, determination of latitude and true bearing by observation on the sun and pole star

**Unit 4:** Curves: Horizontal and vertical curves - Simple Curves - setting with chain and tapes, tangential angles by theodolite, double theodolite - Compound and reverse curves - Transition curves - Functions and requirements - Setting out by offsets and angles - Vertical curves – Sight distance requirements

**Unit 5:** Photogrammetry: Terms, Types, vertical photographs, scale, ground coordinates, relief displacement, Flight planning Photomaps and Mosaics, Stereoscopy and photo interpretation.

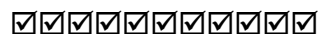
**Unit 6:** Remote sensing: Introduction, Classification and principles, electromagnetic energy and its interaction with matter, Idealized systems, sensors, platforms, and application in civil engineering. G.P.S & G.I.S. as surveying techniques – Overview, uses and applications

### Text Books

- Bannister A. and Raymond S., J.N. Wartikar and P.N. Wartikar, "Surveying", ELBS, Sixth Edition, 1992
- Heribert Kahmen and Wolfgang Faig, "Surveying ", Walter de Gruyter, 1995.
- Kanetkar T.P., "Surveying and Leveling", Vols. I, II and III, Vidyanarhi Gruh Prakashan, Pune.
- Punmia B.C., "Surveying", Vols. I, II and III, Laxmi Publications

### Reference Books

- James M. Anderson and Edward M. Mikhail, "Introduction to Surveying", McGraw Hill
- Clark D., "Plane and Geodetic Surveying", Vol. I and II, C.B.S. Publishers and Distributors, New Delhi, Sixth Edition.
- Agor, "Advanced Surveying", Khanna Publications, Delhi.
- Arora K. L., "Surveying", Vol.1 & 2
- Basak, "Surveying and Levelling"
- S. K. Duggal, "Surveying", Vol 1 & 2, Tata Mcgraw Hill Publications, New Delhi.
- S. Gopi, R. Satikumar and N. Madhu, "Advanced Surveying", Pearson Education
- Chandra A. M., "Higher Surveying", New Age International Publication.



## CV404: Water Resources Engineering – I

**Unit 1:** Introduction, Definition, Scope, Necessity, Advantages, Types of Irrigation Systems, Development of irrigation in India,

**Unit 2:** Water Requirement of Crops, Soil moisture, Consumptive Use, Irrigation frequency, Irrigation Methods, Crops Season, Crop Pattern in relation weather, Important crops

**Unit 3:** Canal Irrigation, Classification, Parts of a canal system, Route Surveys, Commanded areas, Assessment of water requirement, Channel losses, Kennedy's Theory, Lacey's Theory, Longitudinal section, Schedule of area statistics and channel dimension cross-section of irrigation channel, Water-Logging, Effects, Causes and Anti-water logging measure, Sections of lined channel. Drainage of Water logged land,

**Unit 4:** Irrigation Outlets, Definition, Requirements, Classification, Selection, Regulation and Control of Canal System: Regulation, Measurement of discharge, Assessment of canal Revenue, Efficient Management of irrigation water

**Unit 5:** Hydrology, Definition, Hydrologic cycle, Application to Engineering Problem, Measurement of rainfall, Peak flow, Flood Frequency, Catchment Area Formulae, Flood hydrograph, Rainfall Analysis, Infiltration, Run off, Unit Hydrograph and its determination, Estimation of Runoff

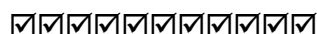
**Unit 6:** Wells and Tube Wells, Introduction, Specific yield, Deep and shallow wells, Comparative advantage of well and canal irrigation, Duty of well water, Types of Tube wells, Boring methods.

### **Text Books**

- Varshney R. S., Gupta & Gupta, "Theory and Design of Irrigation Structures", Vol. I & II.
- Punamia B. C. Pandey B. B. and Lal, "Irrigation and Water Power Engineering", Standard Publishers, New Delhi
- Garg S. K., "Irrigation Engineering" Khanna Publications, New Delhi
- Priyani, "Irrigation and Water Power", Charotar Publishing House, Anand
- Bharat Singh, "Irrigation", NEW CHAND & Brothers, Roorkee
- Subramanya K., "Engineering Hydrology", Tata Mc-Graw Hill Company Limited, N. Delhi

### **References**

- U. S. B. R., "Design of Small Dam", OXFORD & IBH, Publishing Company
- Justinn, "Engineering for Dam" Vol. I, II, III, Creager and Hinds
- Leliavsky "Design of Hydraulic Structures" Vol. I & II,
- C B I & P "River Behaviour, Management and Training"
- Circular of Government of Maharashtra, 18 February 1995, "Design of Canals"



## **CV405: Hydraulic Engineering Laboratory**

Practical Work consists of at least four performances from (A), and three each from (B) and (c), lists below and detailed reporting in form of journal.

Practical examination shall be based on above.

### **Group (A):**

- a) Measurement of discharge - Calibration of measuring tank, measurement of pressure (Piezometer, manometers, Pressure gauges) Use of hook or point gauge.
- b) At least three experiments from the following.
  - 1) Verification of Bernoulli's Theorem
  - 2) Determination of metacentric height.
  - 3) Calibration of an orifice / mouthpiece / venturimeter / orificemeter
  - 4) Study of factors affecting coefficient of friction for pipe flow (at least for two different materials and two different diameters)
  - 5) Determination of loss of head due to Pipe Fittings

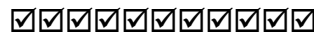
**Group (B)**

- 1) Calibration of V notch / Rectangular notch.
- 2) Calibration of Ogee Weir.
- 3) Study of hydraulic jump
  - a) Verification of sequent depths,
  - b) Determination of loss in jump.
  - c) Study of parameters with respect to Froud Number: i)  $Y_2/Y_1$ ; ii) Length; iii) Energy loss
- 4) Study of flow below gates – Discharge v/s head relation, Equation of flow, Determination of contraction in fluid in downstream of gate.
- 5) Velocity distribution in open channel in transverse direction of flow.

**Group (C)**

- 1) Impact of jet.
- 2) Study of Turbines (Demonstration).
- 3) Tests on Centrifugal Pump.
- 4) Study of Charts for Selection of Pumps

Use of computer programs such as MS Excel is desirable for post-processing of results.

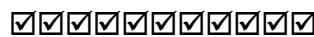


**CV406: Solid Mechanics Lab**

Practical Work consists of performance of at least seven experiments from the list below Detailed report shall constitute the term-work.

**List of Experiments:**

- 1. Tension test on ferrous and non-ferrous alloys (mild steel / cast iron /aluminum etc.)
  - 2. Compression test on mild steel, aluminum, concrete, and wood
  - 3. Shear test on mild steel and aluminum (single and double shear tests)
  - 4. Torsion test on mild steel and cast iron solid bars and pipes
  - 5. Flexure test on timber and cast iron beams
  - 6. Deflection test on mild steel and wooden beam specimens
  - 7. Graphical solution method for principal stress problems
  - 8. Impact test on mild steel, brass, Aluminum, and cast iron specimens
  - 9. Experimental on thermal stresses
  - 10. Strain measurement involving strain gauges / rosettes
- Assignment involving computer programming for simple problems of stress, strain computations.



**CV407: Surveying Lab – I**

Practical Work consists of at least ten performances among the list below and detailed reporting in form of field book, journal and drawing sheets. Practical examination shall be based on above practical course.

- 1) Use of Dumpy Level, Auto Level and Tilting Level.
- 2) Reciprocal Levelling.
- 3) Sensitivity of Bubble Tube using Dumpy Level.
- 4) Illustration of Permanent adjustment of Dumpy Level.
- 5) Evaluation of constant of Planimeter.

- 6) Use of Digital Planimeter for measurement of areas.
- 7) Study of Theodolite.
- 8) Measurement of Horizontal Angle by Various Methods
- 9) Measurement of Magnetic Bearing and Vertical Angle by Theodolite
- 10) Study and use of Minor Instruments
- 11) Methods of Plane Table Survey
- 12) Two Point and Three Point Problems



## Elective I

### CV408: Engineering Management

**Unit 1:** Evolution of Management Thought: Scientific, Human Behaviour, System approach Introduction to elements of systems – input, output, process restriction, feedback, Contingency Approach, Contributions by Taylor, Frank and Lillion, Gilbreth, Henry Fayol, Elton Mayo, McGregor (Theory X and Theory Y), H.L.Gantt, Maslow.

**Unit 2:** Functions of Management: Planning – Nature and Purpose of Planning, Strategies and Policies, Management by Objectives, Formal and informal organization, Centralization, Decentralization, Line, Line and Staff, Functional organization, Principles of site layout. Leading and directing, controlling and coordination (Brief introduction only) Communication process, Motivation

**Unit 3:** Importance of Decision Making, steps in decision making, analysis of decision, decision under certainty, uncertainty and decision under risk, criterion of optimism and regret, sensitivity of criteria and decision under conflict, expected monetary value, decision tree, Theory of games (dominance pure and mixed strategy).

**Unit 4:** Operations Research: Linear Programming, Simple L-P model, Simplex method - Duality, Sensitivity analysis. Application of Linear Programming in Transportation and Assignment models

**Unit 5:** Simulation Studies: Monte-Carlo simulation, Queuing or Waiting Line Theory (simple problems), Dynamic programming, Introduction to Emerging Optimization Techniques

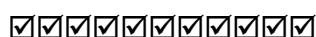
**Unit 6:** Material Management: Purchasing principles, stores, coding system function, Responsibilities, record and accounting. Inventory control – An introduction, inventory cost, EOQ analysis, ABC analysis, safety stocks.

#### Text Books

- Deshpande S. H., “Operation Research”
- Deshpande A. S., “A Text book of Management”
- Gopal Krishnan, “Material Management”, Sdushman
- Taha, “Operation Research”
- Banga and Sharma, “Engineering Management”

#### References

- Stoner, “Engineering Management”
- Davar, “Principles of Management”
- Koontz, Dounell and Weigrick, “Essentials of Management”
- Kast and Rosinweig, “Management and Organization”, Tata McGraw Hill Publication.
- Wagner, “Operation Research”, Wikey Easter Ltd., New Delhi
- Zhamb L.C., “Quantitative Techniques in Management”, Vol. I,
- Miller and Stars, “Executive Decisions & Operation Research”, Prentice Hall of India



# B. Tech. (Civil) Semester – V

## CV501: Design of Steel Structures

**Unit 1:** Introduction, Advantages & Disadvantages of steel structures, permissible stresses, factor of safety, Methods of design, Types of connections, various types of standard rolled sections, Types of loads and load combinations.

**Unit 2:** Design of Welded & Bolted Connections, Types of welds, failure of welded joints, Throat thickness, permissible stresses, analysis of axially & eccentrically loaded connections (subjected to bending & torsion), Type of bolts, bolt, nut & washer assembly, stresses in bolts and design.

**Unit 3:** Axially Loaded Members: Tension Members: Common sections, net effective area, Load carrying capacity, connection using weld / bolts. Design of tension splice  
Compression Members: Common sections used, effective length and slenderness ratio, permissible stresses, Load carrying capacity, connection using weld / bolt

**Unit 4:** Beams: Laterally supported & unsupported beams, design of simple beam, built up beams using flange plates. Curtailment of flange plates, web buckling & web crippling.

Secondary and main beam arrangement, beam to beam connections

Gantry Girder: Forces acting on a gantry girder, commonly used sections, design of gantry girder as laterally unsupported beam, connection details

Roof Trusses: Components of an industrial shed, Types of trusses, load calculations and combinations, design of purlins, design of truss members, Design of hinge & roller supports

**Unit 5:** Columns: Simple and built up section, lacing, battening, column subjected to axial force and bending moment, column splices.

Column Bases: Slab base, Gusseted base and moment resisting bases, Design of anchor bolts

**Unit 6:** Introduction to Plastic Analysis: Plastic moment, moment curvature relationship, plastic hinges, theorems of plastic analysis, mechanisms, application of virtual work method to beams.

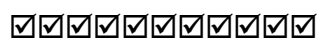
**Note:** Use of IS 800, IS 875, IS: Handbook No.1 for Steel Section and Steel Table is permitted for theory examination.

### Text Books

- S. K. Duggal, “Design of Steel Structures”, Tata Mc Graw Hill Pub. Co. Ltd., New Delhi
- Ram Chandra, “Design of Steel Structures”, Vol. I & Vol. II, Standard Book House, New Delhi
- Dayaratnam P., “Design of Steel Structures”, Wheeler Publishing, New Delhi

### Reference Books

- Arya A. S. and Ajamani J.L., “Design of Steel Structures”, Nemchand and Brothers, Roorkee
- Vazirani & Ratwani, “Design of Steel Structures”, Standard Book House, New Delhi
- Publications of Bureau of Indian Standards, New Delhi, relevant to the syllabus
- Gaylord E.H. and Gaylord C.N., “Design of Steel Structures” Mc Graw Hill, New York
- Lothers J.E., “Design in Structural Steel” Vol.-I, Prentice Hall New Jersey
- Salmon and Johnson, “Steel Structures: Design and Behaviour”, Harper and Row, New York  
Steel Designers Manual



## CV502: Geotechnical Engineering

**Unit 1:** Introduction: Definition of soil and soil engineering, Application areas of soil mechanics, Three Phase soil system, Soil moisture, Index properties of soil: Different unit weights of soil, and their determination, unit weight of solids, unit weights of soil mass viz. saturated unit weight, submerged unit weight, dry unit weight, method for determination of field density viz. sand replacement and core cutter, Specific Gravity determination methods void ratio and porosity, degree of saturation, Inter relation between weight volume state, density index.

**Unit 2: Soil Consistency:** Atterberg's limits and their significance, Soil Classification: Soil classification based on particle size and constituency, I.S. classification system of soils. Soil structure and fabric, Effective Stress Concept: Terzaghi's effective stress concept, equilibrium water content, frost action

**Unit 3: Flow of Water through Soil: Permeability:** Head, gradient and potential, Darcy's law, Factors affecting permeability, Field and laboratory methods of determining permeability, Seepage pressure, quick sand condition, Derivation of Laplace equation, Flow net, it's characteristics, it's application, construction of flow net, piping phenomenon

**Unit 4: Shear Strength:** Concept of shear, Coulomb's theory and failure envelope, Principle stress, stress analysis (Total stress approach and effective stress approach), representation of stresses on Mohr's circle for different types of soil such as cohesive and cohesionless, saturated and partly saturated soil etc, Application of shear stress parameters in the field, Different types of shear tests: Unconsolidated undrained, Consolidated undrained and consolidated drained choice of the type of test, box shear test, triaxial compression test with pore pressure and volume change measurement, unconfined compression test, vane shear test.

**Unit 5: Compaction:** Theory of compaction, factors influencing compaction, compacted density, Laboratory Standard and modified compaction test. Method and measurement of field compaction, Field compaction control

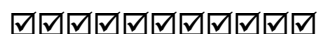
**Unit 6: Compressibility and Consolidation:** Compressibility: Definition, compressibility of laterally confined soil, compression of sand and clay, e-p and e-log p curve, compression index. Consolidation: Terzaghi's theory of one dimensional consolidation, consolidation test, determination of coefficient of consolidation, degree of consolidation, relevance of one dimensional consolidation to field condition, time factor

### Text Books

- Kasamalkar B. J., "Geotechnical Engineering", Pune Vidyarthi Griha Prakashan Pune
- Murthy V.N.S., "Soil Mechanics & Foundation Engineering", U.B.S. Pub. and Distri. N. Delhi
- Punmia B.S., "Soil Mechanics & Foundation Engineering", Laxmi Publications
- Arora K. R., "Soil Mechanics"

### Reference Books

- Alam Singh, "Text book of soil mechanics in theory and practice", Asian Pub. House, Mumbai
- Taylor D.W., "Fundamentals of Soil mechanics",
- Terzaghi and Peak "Soil mechanics" John Willey and Sons, New-York
- Scott R. F., "Principal of soil mechanics",
- Lambe T.W, "Soil Testing" by.Willey Eastern Ltd., New Delhi



## CV503: Environmental Engineering-I

**Unit 1:** Environment and its components, Importance of Water, Role of Environmental Engineer, Hydrologic Cycle, Sources of Water, Factors considered in selection of source of water for treatment plant, Alternative Sources: Rain, Surface and Ground Water, Assessment of Yield and Development of Source

**Unit 2:** Water Demand: Design Flow, Design Period, Design Population, Factors affecting Water Consumption, Variation in Demand, Design Capacity for Water Supply Components  
Quality of Water: Physical, Chemical, Biological Characteristics, Indian standards, Quality Tests

**Unit 3:** Conveyance of Raw Water: Canals and Pipelines, Hydraulics of Conduits, Laying and jointing of pipelines, testing of pipe lines, Designing of rising main, Type of Valves, Types of Pumps, Intake structure, Types of Intake Structures.

**Unit 4:** Treatment of Water: Necessity of Water Treatment Processes,  
Types of Treatments: Aeration: Necessity, Methods, Removal of taste and odour, Design of aeration fountain

Sedimentation: Suspended Solids, Settling Velocity, Types of Sedimentation Tanks, Surface Loading, Detention Time, Inlet and Outlet Arrangements

Coagulation: Necessity, Coagulant Dosage, Choice of Coagulants, Optimum pH

Rapid Mixing: Necessity, Gravitational, Mechanical, Pneumatic Devices

Slow Mixing and Flocculation: Design of Flocculation Chamber, Mean Velocity Gradient, Design of Clari-Flocculator, Plate Settler and Tube Settler

Filtration: Theory of Filtration, Filter Materials, Types of Filters, Components, Working and Cleaning of Filters,

Disinfection: Theory of Disinfection, Factors affecting, Efficiency of Disinfection, Types of disinfectants, Break Point Chlorination, Bleaching Powder Estimation

Water Softening Methods: Lime-soda, Ion Exchange Method, Demineralization

**Unit 5: System of Water Supply:** Continuous and Intermittent System, Type of Distribution Systems, Layouts, Methods of Supply: Gravity, Pumping and Combination, Hydraulic Analysis of Distribution System

**Unit 6: Air Pollution:** Definition, Sources of Air Pollution, Types Air Pollutants, Atmospheric Stability, Mixing Heights, Plume Types and Meteorological Parameters, Effects of Air Pollution Control Measures of Air Pollution

### Text Books

- Rao and Rao, "Air Pollution ", Tata Mcgraw Hill Publications, New Delhi
- Garg S. K., "Water Supply Engineering", Khanna Publishers, NewDelhi
- Birdi, "Environmental Engineering"

### Reference Books

- Peavy and Rowe, "Environmental Engineering", McGraw Hill Publications
- Stern, "Environmental Engineering", Vol. I to IV, McGraw Hill Publications
- Sharma and Kaur, "Environmental Chemistry", Goyal Publisher
- Government Of India Publication, "Water Supply and Treatment Manual"
- Fair and Geyr, "Environmental Engineering", McGraw Hill Publications
- Steel and McGhee, "Environmental Engineering", McGraw Hill Publications
- Viessman and Hammer, "Water Supply & Pollution Control", Harper Collins Collage Publishers



## CV504: Water Resources Engineering - II

**Unit 1:** Planning of Reservoirs: Storage Calculations, Control Levels, Silting of Reservoirs, Losses in Reservoirs, Dams – Necessity, Types, Site Selection Considerations, Selection of Type of Dam,

**Unit 2:** Gravity Dams – Estimation of Loading, Design Criteria, Theoretical and Practical Profile, Stability Calculations, Galleries, Joints, Earth Dams: Components and their Functions, Design Criterion, Application of Slip Circle Method, Seepage Considerations, Inverted Filters, Downstream Drainage, Construction Aspects of Earthen Dam

**Unit 3:** Arch Dams – Types based on geometry, Estimation of Loading

**Unit 4:** Spillway, Necessity and Different Types, Selection Criterion, Elementary Hydraulic Design, Energy Dissipation Measures, Gates For Spillways, Outlets in Dams: Types and Energy Dissipation through Outlet Transition

**Unit 5:** Weirs on Permeable Foundations: Theories of Seepage, Bligh's Creep Theory, Khosla's Theory, Piping and Undercutting, Canals: Types, Alignment, Kennedy's and Lacey's Silt Theories, Canal Losses, Typical Canal Sections, Canal Lining : Necessity and Types, Canal Structures: Cross Drainage Works and Canal Regulatory Works

**Unit 6:** River and River Training Works: Types of Rivers, Meandering Phenomenon, Types of River Training Works, River Navigation, Water Logging and Drainage: Causes, Effects, Preventive and Curative Measures,

### Text Books

- Garg S. K., "Irrigation Engineering", Khanna Publishers, N. Delhi
- Punmia, B. C., "Irrigation and Water Power Engineering", Standard Publishers
- Varshney and Gupta, "Irrigation Engineering Vol. I",

### Reference Books

- Priyani, "Irrigation and Water Power", Charoter Publication House, Anand
- Circular of Government of Maharashtra, 18 February 1995, "Design of Canals"
- Justinn, "Engineering for Dam Vol. I, II, III", Creager and Hinds
- Leliavsky, "Design of Hydraulic Structures Vol. I & II",
- U. S. B. R., "Design of Small Dam", OXFORD & IBH, Publishing Company
- Leliavsky "Design of Hydraulic Structures" Vol. I & II,
- C B I & P "River Behaviour, Management and Training"
- Circular of Government of Maharashtra, 18 February 1995, "Design of Canals"



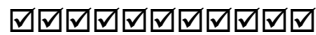
## CV505: Geotechnical Engineering Laboratory

Term work shall consist of detailed report of performance of at least seven experiments from the following mentioned list of experiments.

- 1) Specific gravity determination of coarse and fine grained soil
- 2) Particle size distribution-Mechanical sieve analysis, wet sieve analysis
- 3) Determination of Atterberg's consistency limit
- 4) Permeability- Determination of coefficient of permeability
- 5) Field density determination
- 6) Direct shear box test



- 7) Procter compaction test
- 8) Tri-axial test
- 9) Unconfined compression test
- 10) One dimensional consolidation test



### **CV506: Environmental Engineering Laboratory I**

Practical Work consists of performance of at least six experiments from the List (A) below.

**A) Determination of**

- |                                       |  |
|---------------------------------------|--|
| 1) pH and Alkalinity                  | 2) Hardness                              |
| 3) Chlorides                          | 4) Chlorine demand and residual chlorine |
| 5) Turbidity and optimum dose of alum | 6) MPN                                   |
| 7) Sulphates                          | 8) Fluorides and Iron                    |

**B) Site visit to Water Treatment Plant.**

A report based on the visit to water treatment plant shall be submitted.

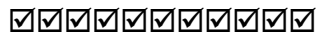


### **CV507: Surveying Lab - II**

Practical Work consists of performing field practical from the list below and detailed reporting in form of journal. Practical examination shall be based on above.

- 1. Tacheometry
  - a) Determination of tachometric constants,      b) Determination of grade of a line.
- 2. Use of subtense bar for distance measurement.
- 3. Setting out of curves
  - a) Simple circular curves,      b) Transition curves
- 4. Study of topo sheets
- 5. Observation of Aerial Photographs under Stereoscope
- 6. Traversing by Total Station.

**Projects:** 1) Road Project 2) Radial Contouring. 1) Block Contouring Project 2) Theodolite Traversing Project to be deleted while editing CB Syllabus



## **Elective II**

### **CV 509: Rock Mechanics**

**Unit 1:** Introduction, Development of Rock Mechanics, Applications of Rock Mechanics

**Unit 2:** Rock sampling, Determination of Density, Porosity, Water Absorption, Uni-axial Compressive Strength, Tensile Strength, Shear Strength, Flexural Strength, Swelling and Slake Durability, Permeability and Point Load Strength, Tri-axial Compressive Test. Factors affecting Strength and Deformation of Rocks, In-situ Determination of Strength, Geophysical Methods

**Unit 3:** Classification, Rock Mass Classification, Rock Quality Designation, Rock Structure Rating, Geo-mechanics and NGI Classification Systems

**Unit 4:** Methods of Improving Rock Properties, Rock Reinforcement & Rock Bolting

**Unit 5:** Stability of Rock Slopes, Modes of Failure, Methods of Analysis, Prevention and Control of Rock Slope Failure, Monitoring and Maintenance

**Unit 6:** Foundations on Rocks, Shallow Foundations, Pile and Well Foundations, Basement Excavation, Foundation Construction, Allowable Bearing Pressure

Tunnels: Rock Stresses and Deformations, Rock Support Interaction, Design of Tunnel Lining

#### **Text Books**

- Vulukuri and Lama, “Hand Book on Mechanical Properties of Rocks”, Vol. I to IV
- Central Board of Irrigation and Power, “Manual on Rock Mechanics”
- Varma B. P., “Rock Mechanics for Engineers”, Khanna Publications
- Stag and Zienkiewec, “Rock Mechanics in Engineering Practice”, John Wiley and Sons, India

#### **Reference Books**

- Goodman R. E., “Introduction to Rock Mechanics”, John Wiley and Sons, India
- Obert and Duvall, “Rock Mechanics and Hydraulic Structures”, John Wiley and Sons, India
- Winterkorn and Fang, “Foundation Engineering Hand Book”
- Relevant Indian Standards



## **B. Tech. (Civil) Semester – VI**

### **CV 601: Design of Concrete Structures - I**

**Unit 1:** Introduction to Design Philosophies, Stress Strain behaviour of Materials, Permissible stresses, Comparison of Different Philosophies of Design, Estimation of Loads

#### **Working Stress Method**

**Unit 2:** Analysis and Design of Singly and Doubly Reinforced Beams

**Unit 3:** Analysis and Design of Axially and Eccentrically Loaded Columns, Isolated Column Footings, One Way and Two Way Rectangular Slabs, Staircases

#### **Limit State Method**

**Unit 4:** Introduction to Limit State Approach, Types and Classification of Limit States, Characteristics Strength and Characteristics Load, Load Factor, Partial Safety Factors.

**Unit 5:** Limit State of Collapse (Flexure): Analysis and Design of Singly and Doubly Reinforced Rectangular Beam Sections, Flanged (L and T) Beams

**Unit 6:** Limit States of Collapse (Shear and Bond): Shear Failure, Types of Shear Reinforcement, Design of Shear Reinforcement, Bond – Types, Factors Affecting, Resistance, Check for Development Length

#### **Text Books**

- IS: 456-2000, Bureau of Indian Standards, New Delhi
- Karve & Shah, “Limit State Theory & Design”, Structures Publications, Pune
- Jain A.K., “Reinforced Concrete Design (Limit State)”, Nemchand Brothers, Roorkee
- Sinha & Roy, “Fundamentals of Reinforced”,
- Sinha S.N., “Reinforced Concrete Design, Vol. I”, Tata Mc-Graw Hill
- Sinha S.N., “Reinforced Concrete Design, Vol. II”, Tata Mc-Graw Hill
- Varghese P.C., “Limit State Design of Reinforced Concrete”, Prentice Hall of India, New Delhi

#### **Reference Books**

- Punmia B.C., “Reinforced Concrete Design, Vol. I”, Laxmi Publications
- Punmia B.C., “Reinforced Concrete Design, Vol. II”, Laxmi Publications
- Relevant Publications by Bureau of Indian Standards, New Delhi



### **CV 602: Transportation Engineering - I**

**Unit 1:** Introduction: Importance of various modes of transportation, Highway Engineering.

**Unit 2:** Developments in Road Construction, Highway Planning, Alignment and Surveys, Geometric Design,

**Unit 3:** Construction of Pavements, Construction and Maintenance of Drainage, Road Arboriculture. Highway Materials: Soil – relevant properties. Aggregates – strength, hardness, toughness, soundness, durability, shape, specific gravity, water absorption. Bituminous materials – Bitumen, Tar, Asphalt – various properties, Marshall stability test.

**Unit 4:** Traffic Engineering: Traffic Characteristics, Speed, Journey Time and Delays, Vehicle Volume Counts, Origin and Destination, Analysis and Interpretation of Survey Data, Traffic Operations, Design and Signals and Rotary intersections, Parking Space Design, Lighting, Planning and Administration,  
Pavement Design: Basic Principles, Methods for different Types of Pavements.  
Road Accidents and Safety: Classification, Causes and Control Measures, Aspects of Safety in Usage of Roads.

**Unit 5: Other modes of Transport**

Introduction to Railways, Airways, Waterways, Pipeline Transportation, Classification, Requirements, Comparative Studies,

**Unit 6: Bridges, Tunnels, Docks and Harbors**

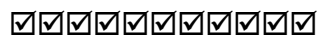
Introduction, Types, Necessity, Economic and Alignment Studies

**Text Books**

- Khanna and Justo, “Highway Engineering”, Nemchand & Bros., Roorkee
- Khanna S.K., “Highway Engineering”,
- Arora N. L., “Transportation Engineering”
- Brindra and Arora, “Highway Engineering”, Standard Publishers

**References**

- Garber, N.J. and Hoel, L.A., “Traffic and Highway Engineering”, West Publishing Company, New York.
- Jones, J.H., “Geometric Design of Modern Highways’, E & FN SPON Ltd., London.
- Khistry, C.J., “Transportation Engineering –An Introduction’, Prentice Hall of India Ltd.,



## CV 603: Foundation Engineering

**Unit 1:** Introduction, General requirements to be satisfied for satisfactory performance of foundations, Soil exploration: Necessity, Planning, Exploration Methods, Soil Sampling Disturbed and undisturbed, Rock Drilling and Sampling, Core Barrels, Core Boxes, Core Recovery, Field Tests for Bearing Capacity evaluation, Test Procedure & Limitations

**Unit 2:** Theoretical Bearing Capacity Analysis - Failure Modes, Terzaghi’s Analysis, I.S. Code Method of Bearing Capacity Evaluation, Effect of Water Table, Eccentricity of load, Safe Bearing Capacity and Allowable Bearing Pressure, Settlement Analysis: Immediate Settlement - Consolidation Settlement, Differential Settlement, Tolerable Settlement, Angular distortion

**Unit 3:** Foundation Construction in Difficult Soils - Guidelines for Weak And Compressible Soils, Expansive soil, Collapsible Soils and Corrosive Soils, Ground Improvement Methods

**Unit 4:** Shallow Foundations: Assumptions & Limitations of Rigid Design Analysis, Design of Isolated, Combined, Strap Footing (Rigid analysis), Raft Foundation (Elastic Analysis)

**Unit 5:** Deep foundations: Pile Foundation: Classification, Single Pile Capacity, Negative skin Friction, Under Reamed Piles, Group Action of Piles, Caissons Foundations: Box, Pneumatic, Open Caissons, Forces, Grip Length, Well Sinking, Practical Difficulties And Remedial Measures Sheet Piles: Classification, Design of Cantilever Sheet Pile in Cohesionless and Cohesive soils. Design of Anchored Sheet Pile by Free Earth Support Method, Cellular Cofferdams: Types, Cell Fill Stability Considerations

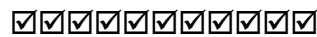
**Unit 6:** Slope Stability: Stability of Finite Slopes- Slip Circle Method, Semi Graphical And Graphical Methods, Friction Circle Method, Stability Number Concept and its use

**Text Books**

- Kasamalkar B.J., “Foundation Engineering”
- Murthy V.N.S., “Soil Mechanics And Foundation Engineering”
- Arora K.R., “Soil Mechanics And Foundation Engineering”
- Punmia B.C., “Soil Mechanics And Foundation Engineering”
- Nayak N.V., “Foundation Design Manual”, Dhanpat Rai And Sons
- Brahma S.P., “Foundation Engineering”
- Braja Das, “Principles of Geotechnical Engineering”,
- Bowles J.E., “Foundation analysis & Design”

**References**

- Teng W.C., “Foundation Design”,
- Tomilson M.J., “Foundation Design & Construction”,
- Lee, “Sheet Piles”
- Relevant Publications by Bureau of Indian Standards, New Delhi



**CV 604: Concrete Technology**

**Unit 1:** Materials for Concrete: Cement –Manufacturing Process, Physical Properties, Hydration of Cement, Chemical Compounds in Cement, Types of Cement, Aggregates: Physical Properties, Bulking of Sand, Mechanical Properties, Water: Specifications of Water to be used For Concrete.

**Unit 2:** Properties of Fresh Concrete -Types of Batching, Mixing, Transportation, Placing Including Pumping and Compaction Techniques for Good Quality Concrete, Workability Segregation and Bleeding, Curing of Concrete, Methods of Measuring Workability, Temperature Effects on Fresh Concrete.

**Unit 3:** Admixtures In Concrete: Types, Plasticizers and Super-plasticizers and their Effects On Workability, Air Entraining Agents, Accelerators, Retarders, Pozzolanic Admixtures, Bonding Admixtures, Damp-Proofing Admixtures, Construction Chemicals

**Unit 4:** Desired Properties of Concrete, Strength, Durability & Im-permeability, Characteristic Strength, Compressive, Tensile and Flexure Of Concrete, Tests On Concrete, Modulus of Elasticity, Effect Of W/C Ratio and admixtures on Strength, Concrete Mixes For Different Strength, High Strength and High Performance Concrete

**Unit 5:** Creep and Shrinkage of Concrete, Significance, Types of Shrinkage and Their Control, Factors Affecting Creep. Durability of Concrete: Minimum & Maximum Cement Content, Strength & Durability Relationship, Exposure to Different Conditions, Factors Contributing to Cracks in Concrete, Sulphate Attack, Alkali Aggregate Reaction, Chloride Attack, Corrosion of Steel (Chloride Induced).

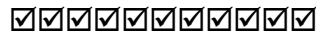
**Unit 6:** Objectives, Design Mix Concrete, Nominal Mix Concrete, Factors Governing Mix Design, Methods Of Expressing Proportions, Trial Mixes, Acceptance Criteria, Types of Concrete, Factors Causing Variations, Field Control, Statistical Quality Control, Quality Measurement in Concrete Construction., Non-destructive Testing of Concrete

**Text Books**

- Gambhir M. L. “Concrete Technology”
- Shetty M. S. “Concrete Technology”
- Krishnaswamy, “Concrete Technology”

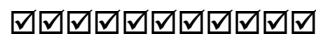
**Reference Books**

- Orchard, “Concrete Technology”,
- Neville A. M., “Concrete Technology”,
- Relevant Publications by Bureau of Indian Standards, New Delhi

**CV 605: Concrete Technology Laboratory**

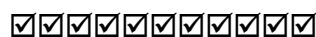
Term work shall consist of performing minimum five experimental sets from the list below.

- 1) Testing of Cement: Consistency, Fineness, Setting Time, Specific Gravity,
- 2) Soundness and Strength Test for Cement
- 3) Testing of Aggregates: Specific Gravity, Sieve Analysis, Bulking of Fine Aggregate, Flakiness Index, Elongation Index and Percentage Elongation
- 4) Placement Tests on Concrete: Workability Tests: Slump, Compaction,
- 5) Strength Tests on Concrete: Compression, Flexure, Split & Tensile Test
- 5) Effects of Admixture: Accelerator, Retarder, Super Plasticizer
- 6) Exercise and verification of Concrete Mix Design
- 7) Non-destructive Testing for Concrete

**CV 606: Structural Design and Drawing of Steel Structures**

Term work shall consist of detailed analytical report for structural design and drawing of any one of the following steel structures:

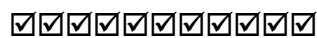
- 1) Industrial Shed: Roof Truss with Necessary Bracing System, Purlins, Column and Column Bases
- 2) Industrial Shed: With Portal or Gable Frames of Solid or Open Web Sections with Necessary Bracing System, Purlins, Column and Column Bases
- 3) Industrial Shed: Gantry Girder, Roof and Gantry Columns, with Necessary Bracing System, Purlins, Column and Column Bases
- 4) Foot Bridge: Analysis using Influence lines for Main Truss, Cross Beams, Raker, Joint Details
- 5) Plate Girder: Analysis and Design of Rivetted or Welded Plate Girder.
- 6) Elevated Water Tank: Analysis and Design of Staging and Tank Body.



## **CV607: Building Planning Design and Drawing Laboratory**

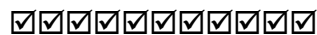
Term work shall consist of detailed report of in form of set of drawings mentioned below. In practice sessions, free-hand sketching in drawing book shall be insisted.

- 1) Imperial size sheets based on actual measurement of existing residential building consisting of plan, elevation, section passing through staircase, Site plan. Area statement & brief specifications.
- 2) Planning & design of a building (Minimum G+1): Full set of drawings for:
  - 1) Municipal Submission drawing
  - 2) Foundation / Center Line Drawing
  - 3) Furniture layout plan
  - 4) Electrification plan
  - 5) Water supply & drainage plan
  - 6) Project report giving details of Drainage System, Water Supply System, Water Tank, Septic Tank Design of terrace Drainage System



## **CV 608: Industrial Training**

Students are expected to undergo industrial training for at least four weeks at factory / construction site / design offices or in combination of these. Training session shall be guided and certified by qualified engineer / architect / contractor in civil engineering. A neat detailed report on activities carried out during training is expected. Students should undergo training in Summer Vacation after Semester VI and appear at examination in Semester VII.



### **Elective III**

## **CV612: Building Planning and Design**

### **Planning of Buildings**

**Unit 1:** Site Selection Criteria: Principles of Building Planning, Significance Sun Diagram, Wind Diagram, Orientation, Factors affecting, Criteria under Indian condition.

**Unit 2:** Building Planning Byelaws & regulations as per SP-7, National Building code of India group 1 to 5, Planning of Residential Building: Bungalows, Row Bungalows, Apartments and Twin Bungalows, Procedure of Building Permission, significance of commencement, plinth completion or occupancy certificate.

**Unit 3:** Traditional Constructions, Low cost Housing-Materials & Methods (Conceptual introduction only), Maintenance, Repairs, Rehabilitation, Structural Audit of Buildings (Conceptual introduction only)

### **Building Services**

**Unit 4:** Plumbing Systems, Various Materials for system like PVC, GI, AC, CI, HDPE, and Stoneware, Various types of traps, Fittings, Chambers, Need of Septic Tank, Concept of Plumbing

& Drainage plan, Introduction to rainwater harvesting. Concept of rain water Gutters. Rainwater outlet & Down Tank Systems.

Electrification: Concealed & Open Wiring, Requirements & Location of various points, Concept of earthing.

Fire resistance in building: Fire protection precautions, confining of fire, fire hazards, Characteristics of fire resisting materials, building materials and their resistance to fire.

**Unit 5:** Ventilation: Definition and necessity of Ventilation, functional requirement, various system & selection criteria.

Air conditioning: Purpose, Classification, Principles, Various Systems

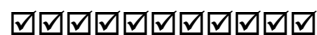
Thermal Insulation: General concept, Principles, Materials, Methods, Computation of Heat loss & heat gain in Buildings.

**Unit 6:** Introduction to Acoustics: Absorption of sound, various materials, Sabine's formula, optimum reverberation time, conditions for good acoustics.

Sound Insulation: Acceptable noise levels, Noise prevention at its source, Transmission of noise. Noise control-general considerations.

**Reference Books:**

- Building Drawing – Shah, Kale, Patki (Tata McGraw- Hill)
- Building Design and Drawing – Y. S. Sane (Allied Book Stall, Pune)
- SP 7- National Building Code Group 1 to 5- B.I.S. New Delhi
- I.S. 962 – 1989 Code for Practice for Architectural and Building Drawings





## **B. Tech. (Civil) Semester – VII**

### **CV 701: Design of Concrete Structures II**

#### **Limit State Method**

**Unit 1:** Limit State of Collapse (Torsion) - Behaviour of R.C. rectangular sections subjected to torsion, Design of sections subjected to combined bending and Torsion

**Unit 2:** Analysis and Design of axially and eccentrically loaded Columns (Circular and Rectangular). Construction of Interaction diagrams for un-axial bending, concept of bi-axial bending.

#### **Prestressed Concrete**

**Unit 3:** Introduction to prestressed concrete, concepts, systems and methods of prestressing

**Unit 4:** Stress analysis for rectangular and symmetrical I sections, Pressure Line, Cable Profiles

**Unit 5:** Losses in Prestressing for Pre-tensioned & Post tensioned members.

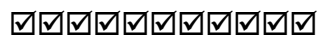
**Unit 6:** Design of Rectangular and Symmetrical I sections, Design of End Block

#### **Text Books**

- IS: 456, IS 1343, SP16, SP24, SP34 of Recent Editions, Bureau of Indian Standards, New Delhi
- Karve & Shah, “Limit State Theory & Design”, Structures Publications, Pune
- Jain A.K., “Reinforced Concrete Design (Limit State)”, Nemchand Brothers, Roorkee
- Sinha S.N., “Reinforced Concrete Design, Vol. I”, Tata Mc-Graw Hill
- Sinha S.N., “Reinforced Concrete Design, Vol. II”, Tata Mc-Graw Hill
- Sinha & Roy, “Fundamentals of Reinforced Concrete”, S. Chand & Co. New Delhi
- Sinha & Roy, “Prestressed Concrete”, S. Chand & Co. New Delhi
- Krishnaraju N., “Prestressed Concrete”, Tata Mc-Graw Hill

#### **Reference Books**

- Punmia B.C., “Reinforced Concrete Design, Vol. I”, Laxmi Publications
- Punmia B.C., “Reinforced Concrete Design, Vol. II”, Laxmi Publications
- Lin T.Y., “Prestressed Concrete”, John Willey & Sons New York
- Varghese P.C., “Limit State Design of Reinforced Concrete”, Prentice Hall of India, New Delhi
- Relevant Publications by Bureau of Indian Standards, New Delhi



### **CV 702: Transportation Engineering – II**

**Unit 1:** Railway Engineering: Permanent Way, Gauges, Rails, Sleepers, Ballast, Subgrade Formation, Fixtures and Fastenings, Geometric Design of Tracks

**Unit 2:** Points and Crossings: Standard Types, Design of Simple Turnout, Various Types of Track Junctions, Stations and Yards: Purpose, Location, Site Selection, General Layouts of Terminus and Junction, Signalling and Interlocking, Construction and Maintenance Track, Modern trends in Railways

**Unit 3:** Tunnel Engineering: Shape and Size of Tunnel Shafts, Pilot Tunnels, Tunnelling In Hard Rock, Tunnelling In Soft Materials, Drilling-Patterns, Blasting, Timbering Mucking, Tunnel Lining, Advances In Tunnelling Methods, Safety Measures, Ventilation, Lighting and Drainage of Tunnels

**Unit 4:** Dock and Harbour Engineering: Inland Water Transport In India, Tides Winds and Waves Erosion, Transport of Sediments, Beach Drift, Littoral Drift Sand Bars, Coast Protection, Classification of Ports and Harbours, Site Selection, Features of Break Waters, Jetties, Wharves, Piers, Facilities required, Dry Docks, Wet Docks, Lift Docks, Floating Docks, Spillways, Navigational Aids, Lighthouses, Terminal Buildings, Special Equipments, Dredging.

**Unit 5:** Bridge Engineering: Determination of Design Discharge, Linear Water Way, Economical Span, Location of Piers And Abutments, Afflux, Scour, Depth, Standard Specification For Bridges: Indian Road Congress Bridge Code, Aesthetics in Bridge Design, Bridge Foundations, Types, Components, Foundations in Special Conditions, Foundation Failures, Piers For Viaducts, Construction Aspects of Various Types of Bridges: Launching, erection and Performance of Bridges, Bridge Bearings

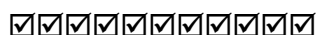
**Unit 6:** Airport Engineering: Planning, Airport Surveys, Site Selection, Zoning Laws, Runways, Geometric Design, Airport Capacity, Terminal Buildings, Parking Systems, Taxiways, Hangers, Airport Drainage, Air Traffic Control, Airport Lighting

### **Text Books**

- Railway Engineering – K. F. Antia
- Saxena and Arora, “A Course in Railway Engineering,” Dhanpat Rai & Sons Delhi
- Quinn, “Planning and Construction of Docks and Harbours”,
- Oza, “Dock and Harbour Engineering”, Chartor Publishing House, Anand
- Shrinivasan, Rangawala, “Dock, Harbour and Tunnel Engineering”, Chartor Publishing House
- Arora N. L., “Transportation Engineering”
- Bindra S. P., “Bridge Engineering”, Dhanpatrai and Sons
- Kanna and Arora, “Airport Engineering”
- Rangawala, “Airport Engineering”
- G.K.Rao, “Transportation Engineering”, Tata McGraw Hill Company

### **References**

- Publications of Bureau of Indian Standards, New Delhi, Relevant To The Syllabus
- Cormick H. F., “Dock and Harbour Engineering”
- Raina, “Handbook on Bridge Design”
- Horonjeff, “Planning and Design of Airports”



## **CV 703: Professional Practices**

**Unit 1:** Quantity Surveying: Introduction to Estimating, Purpose, Types, Items of inclusion, Modes of measurement for different works, Administrative approval and Technical Sanction to Estimates, Specifications: Purpose General and Detailed Specifications for various items of work. Prime cost, Provisional sums and provisional quantities, taking out quantity, P.W.D. method. Recording of Measurements

**Unit 2:** Costing: Analysis of rates for various items of construction of civil engineering works. Standard schedule of rate, Price Escalation, Detailed and approximate estimates for buildings,

R.C.C works, culverts, earthwork for canals. Roads including hill roads and other civil engineering works

**Unit 3:** Tendering: Types, Preparation of Tender Papers, Conditions of Contracts, Competitive bidding, Types of bids, Invitation of tenders, Scrutiny and acceptance of Tenders, Award of jobs, Introduction to B.O.T. and similar other basis of execution, Introduction to Arbitration.

**Unit 4:** Contracts: Essentials of legally valid contract, types, forms of Contract between various agencies, Organizational set up of P.W.D. Classification of works, method of carrying out work in P.W.D. Mode of payment, Bill forms.

**Unit 5:** Valuation: Principles, Types, Price and Cost, Attributes of value, Valuer and his duties, Factors affecting the valuation of properties, Methods of Valuation, different types of lease

**Unit 6:** Valuation from yield and from life, gross yield and net yield, Sinking fund, Depreciation, different methods of calculating depreciation, Depreciated cost, Obsolescence

### **Text Books**

- Bhasin P. L., “Quantity Surveying”
- Rangwala S. C., “Elements of Estimating and Costing”
- Patil B. S., “Civil Engineering Contracts and Estimates”
- Nanavati Roshan, “Professional Practice Estimating and Valuation”
- Dutta B. N., “Estimating and Costing”
- Birdi, “Estimating and Costing”
- Chakroborty M., “Estimating, Costing and Specification in civil engineering”
- Rangwala S. C., “Valuation of real Properties”

### **References**

- P. W. D. Maharashtra, “Standard Specifications”, Volumes I & II
- C.P.W.D. Specifications
- C.P.W.D. Schedule of Rates
- P.W.D. Maharashtra Schedule of Rates



## **CV 704: Plastic Analysis and Design**

**Unit 1:** Plasticity in ductile materials, stress-strain for mild steel, elasto-plastic behavior of beam in flexure, shape factor for different cross sections, yield zones, concept of plastic hinge.

**Unit 2:** Plastic collapse loads of determinate and indeterminate structures such as beams and rectangular portal frames, statical and kinematical methods, basic and combined mechanisms. Determination of plastic collapse loads, bending moment diagram at collapse.

**Unit 3:** Philosophy of Limit State design, requirement of steel for design, Limit State of Strength and Serviceability, partial safety factors, design of laterally supported beams, shear resistance.

**Unit 4:** Secondary design considerations, design of beams with high shear, interaction of bending and shear, interaction of bending and axial force.

**Unit 5:** Design of portal frames, design of corner connection with and without haunches.

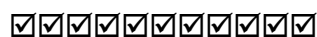
**Unit 6:** Consideration of deformations, calculation of deflections for plastically deformed structures

### Text Books

- Bureau of Indian Standards, “Handbook for Structural Engineers: Application of plastic Theory in Design of Steel Structures SP: 6 (6)”
- Bureau of Indian Standards, “IS: 800 Code of Practice for General Construction in Steel”
- Arya A.S. and Ajmani J.L., “Design of Steel Structures”, Nemchand & Bros., Roorkee
- Ramchandra, “Design of Steel Structures Vol – II”, Standard Book House, Delhi
- Neal B.G., “Plastic Method of Structural Analysis”, Chapman & Hall
- Beedle L.S., “Plastic Design of Steel Frames”, John Wiley & Sons

### References

- Bureau of Indian Standards, “Handbook for Structural Engineers SP 6”
- INSDAG Kolkatta, “Teaching Resource for Structural Steel Design”
- “Steel Designers Manual” ELBS

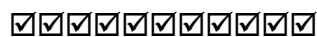


## CV 705: Professional Practices Lab

Term work include detailed study and working on at least of following set of assignments

- 1) Detailed estimate for a two storied RCC or load bearing wall building
- 2) Preparing detailed estimate for any one of the following:
  - a) a small culvert
  - b) a stretch of a road about 1 Km. long including earthwork
  - c) a reach of canal about 1 Km. long
  - d) a percolation tank
  - e) a factory shed of steel frame
  - f) Water supply scheme
  - g) Drainage scheme
  - h) Water Treatment plants
- 3) Valuation report including valuation certificate for any two of the following:
  - a) a building for residential purpose or commercial purpose
  - b) a hotel
  - c) a theatre
  - d) Any one construction machine.
- 4) Drafting of Detailed specification for any five civil engineering items. This shall include at least one item each from Roads, Irrigation works, Water Supply, Sanitation and buildings

Assignment (1) and (2) shall include Rate Analysis of at least two items.



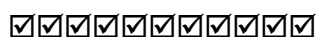
## CV 706: Seminar or Community Project

Student shall choose a topic of his interest in consultation with faculty in the department. The topic for Seminar or community project may be related to Civil Engineering area and/or interdisciplinary area related to Civil Engineering such as:

- |                             |                               |
|-----------------------------|-------------------------------|
| 1) Structural Engineering   | 2) Environmental Engineering  |
| 3) Geotechnical Engineering | 4) Transportation Engineering |

- |  |                                |
|--|--------------------------------|
| 5) Infrastructural Engineering           | 6) Water Resources Engineering |
| 7) Town & Country Planning               | 8) Construction Engineering    |
| 9) Surveying & Remote Sensing Techniques | 10) Earthquake Engineering     |
| 11) Legal Aspects in Civil Engineering   | 12) Project Management         |
| 13) Disaster Management                  | 14) Architectural Engineering  |

Attempts shall be made by the student to collect necessary information from all possible sources and present a summary indicating comprehension of the topic and acquired depth of knowledge. For community projects it is desirable to obtain industry or community sponsorship. A presentation for 10 minutes duration shall be to the satisfaction of the panel of examiners.



### CV 707: Project Phase I

Term work shall consist of detailed report for chosen topic and final working proposed in next semester. Report shall summarise the literature survey, spell out the scope of work, proposed methodology and expected results. It is desirable to have a topic sponsored by Industry or research organization or community.



### Elective IV

#### CV 709: Waste Water Treatment

**Unit 1:** Components of wastewater flows, wastewater sources and flow rate, Variations in flow rates and strength, wastewater constituents, Characteristic of Municipal waste water, Quantity of storm water, Ground water infiltration, Sewerage systems, Types of sewers, Collection system, Appurtenances, Design of sanitary and storm water sewers, Maintenance of sewerage systems, Sewage and Sludge pumping, Location, Capacity, Types of pumps, Pumping station design

**Unit 2:** Primary Treatment-Screening, Grit removal, Oil and Grease trap, Chemical Precipitation, Secondary Treatment-Activated sludge process, Process design and operating, parameters, Modification of ASP, Operational problems, trickling filter, classification, process design considerations, Secondary clarification

**Unit 3:** Fundamentals of Anaerobic treatment, Sludge characteristics, Treatment and disposal, Concept of different anaerobic reactors, Low cost wastewater treatment methods-Principles of waste stabilization pond, Design and operation of oxidation pond, Selection of alternative Treatment process flow sheets, Concept of recycling of sewage  
Disposal of waste water-stream pollution, Self Purification, DO sag curve, Phelp's Equation, Effluents standards for stream and land disposals

**Unit 4:** Solid waste management-Solid wastes Definition, Types, Sources, Characteristics, Functional outlines-storage, Collection, Processing techniques, Methods of treatment of solid waste-Composting, Incineration, Pyrolysis and Sanitary land filling. Concept of Hazardous waste management

**Unit 5:** Air Pollution-Definition, Sources and classification of pollutants, Effect, Introduction to Meteorological aspects and control of industrial air pollution, Settling Chamber, Bag Filters,

Cyclone separators, Scrubbers, Electrostatic precipitators. Control of vehicular pollution, Air quality standards

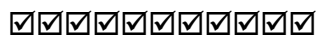
**Unit 6:** Noise Pollution-Decibel scales, Noise characteristics and measurements, Levels of noise and standards, control measures of community and industrial noise, Introduction to Environmental Impact Assessment and Environmental Legislation

**Text Books**

- Manual on sewerage and sewage Treatment-Government of India Publication
- Masters G.M., “Introduction to Environmental Engineering and Science”
- Rao. M.N. and Rao H.V.N., “Air Pollution”, Tata McGraw Hill ,1990
- Bhide A.D. and Sundrasen B.B., “Solid Waste Management in Developing Countries”, Indian National Scientific Documentation Centre New Delhi
- Metcalf & Eddy, “Waste Water Engineering Treatment & Disposal”, Tata McGraw Hill, 1982
- Garg S.K., “Sewage Disposal and Air Pollution Engineering”, Khanna Publishers
- Manual on Municipal Solid Waste Management, Ministry of Urban Development Govt. of India

**Reference Books**

- Peavey, Rowe D.R. and Tchobanoglous, “Environmental Engineering”, McGraw-Hill Book Co.
- Viessman and Hammer, “Water Supply and Pollution Control”, Harper Collins College Pub.
- Hammer M.J., “Water and Waste water Technology”, Prentice-Hall of India Private Limited
- Canter, “Environmental Impact Assessment”, Tata McGraw Hill Publication



## B. Tech. (Civil) Semester – VIII

### CV 801: Introduction to Earthquake Engineering

**Unit 1:** Elements of Seismology: Terminology, Structure of the Earth, Causes of an Earthquake, Seismic waves, Magnitude and Intensity, Seismograph, Strong Motion Earthquakes, Accelerogram, Prominent Earthquakes of India

**Unit 2:** Structural Dynamics: Free and forced vibrations of Single Degree of Freedom Systems, Un-damped and Viscously Damped Vibrations, Equations of Motion, Duhamel Integral

**Unit 3:** Response Spectrum Theory: Construction of Design Response Spectrum, Effect of Foundation and Structural Damping on Design Spectrum, Design spectrum of IS 1893 – 2002 Part I, Evaluation of Lateral Loads

**Unit 4:** Principles of Earthquake Resistant Design (EqRD), Planning Aspects, Resistance of Structural Elements and Structures for Dynamic Load, Design Criteria, Ductile Detailing of RCC Members, Energy Absorption, Provisions of IS 13920

**Unit 5:** Construction Aspects of Masonry and Timber Structures, Retrofitting and Strengthening Techniques of Low Cost and Low Rise Buildings, Provisions of IS 4326

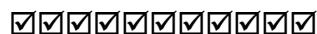
**Unit 6:** Dynamic Properties of Soils, Field and Laboratory Tests, Site Evaluation, Behavior under Dynamic Loads, Effect on Bearing Capacity, Settlement, Liquefaction

#### Text Books

- IS 456, IS 1498, IS 1893, IS 1905, IS 2131, IS 13920, IS 4326 of Recent Editions, Bureau of Indian Standards, New Delhi
- Chopra A.K. (2001), “Dynamics of Structures”, Second Edition, Pearson Education (Singapore) Pte. Ltd., India, ISBN 81-7808-472-4
- Mario Paz, “Structural Dynamics”, CBS Publication
- Arya A.S., “Elements of Earthquake Engineering”, South Asian Pub., New Delhi

#### Reference Books

- Humar J. L. (2002), “Dynamics of Structures”, 2nd Edition, Swets and Zeitlinger, Netherlands
- Farzad Naiem (2001), “The Seismic Design Handbook”, Kluwer Academic Publishers, Massachusetts, ISBN: 0 7923 7301 4
- Dowrick D. J. (1994), “Earthquake Resistant Design for Engineers and Architects”, John Wiley and Sons Ltd. ISBN: 0 471 91503 3
- Pauley T. and Priestley M.J.N. (1992), “Seismic Design of Reinforced Concrete and Masonry Buildings”, John Wiley & Sons Inc., USA, ISBN 0-471-54915-0
- Nayak N. V., “Foundation Design Manual”, Dhanpatrai and Sons, Delhi
- Housner G.W. and Hudson D. E., “Applied Mechanics- Dynamics”, East-West Edition, N. Delhi



### CV 802: Project Management

**Unit 1:** Introduction, Steps in Project Management, Bar Chart, Mile stone chart, Development of network, Fulkerson’s Rule, Introduction to CPM, Time estimates, floats, critical path

**Unit 2:** Network Compression, Least Cost and Optimum Duration, Resource Allocation, Updating Calculations for Updated Network

**Unit 3:** Introduction to PERT, Concept of Probability, Normal and Beta Distribution, Central limit Theorem, Time Estimates, Critical Path, Slack, Probability of Project completion.

**Unit 4:** Introduction to Engineering Economics, Importance, Demand and Supply, Types of Costs, Types of interests, Value of Money – time and equivalence, tangible and intangible factors, Introduction to inflation, Cash – flow diagram, Economic comparisons –Discontinuing methods:, Non discontinuing criteria

**Unit 5:**1. Linear Break even analysis – Problems, Quality Control – Concept, Statistical Methods – control charts

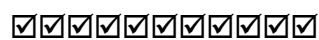
**Unit 6:**1. Total quality Management – Philosophy of Juran, Deming, importance, Quality Circle Implementation, Introduction to ISO 9000 series and 14000 series

### **Text Books**

- Roy Pilcher, “Project Cost Control in Construction”
- Gupta R.C. “Statistical Quality Control”
- Layland Blank and Torquin, “Engineering Economics”
- Naik B. M. “Project Management”
- Khanna O.P., “Work Study”
- Srinath L. S. “CPM PERT”

### **Reference Books**

- Antill and Woodhead, “C.P.M. in Construction Practice”
- Taylor. G.A., “Management and Engineering Economics”
- Roy Pilcher, “Principles of Construction Management”



## **CV 803: Construction Techniques**

**Unit 1:** Introduction, Planning of a new project, site access and services, Mechanical and Manual construction. Excavation in Earth: Earth moving equipments - Tractors, Bulldozers, Scrappers, Power shovel,, Hoes, simple numerical problems based on cycle time and production rates. Drag line, Clamshell, Trenchers, Compactors- types and performance, operating efficiencies, lifting capacities,

**Unit 2:** Excavation in hard rock, Rippers, jack hammers, drills, compressors and pneumatic equipments, Blasting explosives, detonators, fuses, Drainage in excavation – necessity and methods of dewatering.

**Unit 3:** RMC Plant, layout and production capacity. Grouting, Shotcreting, under water concreting. Slip formwork

**Unit 4:** Prefabricated construction: Relative economy, Steel construction: Planning and field operations, Erection equipments, Floating and dredging equipments.

**Unit 5:** Road Construction Aspects, Asphalt mixing and batching plant (Hot mix plant), Sensor Paver for rigid roads, Crushing plants Belt conveyers, cableway, Construction of a new railway track, aspects of bridge construction

**Unit 6:** Diaphragm Walls – Purpose and Construction Methods, Safety measures in construction, prevention of accidents, Introduction to Disaster management

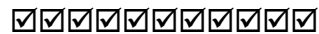


### **Text Books**

- Peurifoy R. L. "Construction, Planning, Equipment and Methods", McGraw hill book Co N.Delhi
- Mahesh Verma, "Construction Equipment", Metropolitan book co ,New york
- Jagmohan Singh, "Heavy Construction – Planning, Equipment and Methods", Oxford and IBH Publishers, New Delhi
- Taylors, "Reinforced Concrete Bridges",

### **Reference Books**

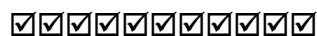
- Quin, "Planning and Construction of Docks and Harbors"
- Stubbs, "Hand Book of Heavy Construction"
- Boyes R.G.H, "Structural & cut off Diaphragm Walls", Applied Science Publishers Ltd. London.
- Ataev S. S., "Construction Technology", Mir Publishers, Mascow



## **CV 804: Earthquake Engineering Lab**

Term work includes detailed study and working on following set of assignments:

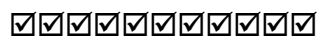
- 1) Planning of Earthquake Resistant Building
- 2) Construction of Design Response Spectra
- 3) Evaluation of Lateral Loads on Multi-storeyed Building as per IS 1893
- 4) Ductile Detailing of Members as per IS 13920
- 5) Detailing of Masonry Structures



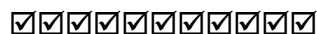
## **CV 805: Structural Design and Drawing of RC Structures**

Term work shall consist of detailed analytical report for structural design and drawing of the following RC structures:

- A) G + 2 Building
- B) Any one of the following
  - 1) Retaining Wall
  - 2) Elevated Water Tank: Analysis and Design of Staging and Tank Body.
  - 3) Staircase of Special Form such as Helicoidal Stair
  - 4) Shell Roofs
  - 5) Special Foundation Type such as Combined Footing, Raft, Pile Foundation

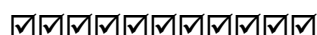


## **CV 806: Self Study Report based on Topic Related to Foundation Engineering and field visits.**



## **CV 807: Project Phase II**

Term work shall consist of detailed report for chosen topic and output of final working proposed in previous semester. Report shall summarise the literature survey, spell out the scope of work, methodology and results. Viva-voce Examination shall be based on work carried out by the student.



## Elective V

### CV 808: Advanced Engineering Geology

**Unit 1:** Stratigraphy and Indian Geology: Geological Time Scale, Physiographic Divisions of India and their Geological, Geomorphologic and Tectonic Characteristics, Study of Important Geological formations of India namely: Vindhyan, Gondwana, and Deccan traps with respect to: Distribution, Lithology, Tectonics, Economic importance etc. Significance of these studies in Civil Engineering

**Unit 2:** Sub-surface Exploration: Steps in Geological Studies of Project Site, Engineering Consideration of Structural Features, Exploratory Drilling, Preservation of Cores, Core Logging, Graphical Representation of Core Log, Limitations of Exploratory Drilling Method, Numerical Problems on Core Drilling

Sub-surface Water: Runoff, Fly off and Percolation of Surface Water, Juvenile, Connate and Meteoric Water, Watertable, Zones of Subsurface Water, Perched Watertable, Aquifer Theory

**Unit 3: Engineering Geology of Deccan Traps:** Types of Basalts and Associated Volcanic Rocks, Engineering Characteristics, Infillings of Gas Cavities, Compact and Amygdaloidal Basalt as Construction Material, Effect of Jointing, Hydrothermal Alteration and Weathering on Engineering Behaviour, Tail Channel Erosion Problem in Deccan Trap Region, Suitability for tunnelling, Problems due to Columnar Basalt, Dykes, Red Bole, Tachylitic Basalt, Volcanic Breccia and Fractures, Laterites: Origin, Occurrence and Engineering Aspects, Ground Water Bearing Capacity of Rocks of Deccan Trap Region, Percolation Tanks

**Unit 4:** Geology of Soil Formations: Soil Genesis, Geological Classification of Soils, Residual and Transported Soils, Soil Components, Characteristics of Soils Derived From Different Types of Rocks. Nature of Alluvium and Sand from Rivers of Deccan Trap Region, Scarcity of Sand

**Unit 5:** Geophysics: Various Methods: Magnetic Gravitational and Electrical Resistivity Methods, Applications of Electrical Resistivity Method using Wenner Configuration in Civil Engineering Problems such as: Finding Thickness of over Burden and Depth of Hard Rock, Locating the Spot for Ground Water Well, Seepage of Water Finding

Rock Mechanics: General Principles, Engineering Properties of Rocks and their Dependence Upon Geological Characters, In-Built Stresses in Rocks, Measurements of these Stresses

**Unit 6:** Plate Tectonics, Seismic Zones of World, Seismic activity of Deccan Trap Region. Various Theories on the Origin of the Seismic Activity of Deccan Trap Region, Prediction of Earthquake, Earthquake Resistant Constructions, Numerical Problems based on Seismic Data

#### Text Books

- Gupte R. B., "A Text Book of Engineering Geology", Pune Vidyarthi Griha Prakashan, Pune
- Gokhale K.V.G.K. and Rao D. M., "Experiments in Engineering Geology", TMN, New-Delhi
- Mukerjee P. K., "A Text Book of Geology", The World Press Pvt. Ltd., Calcutta
- Prabin Singh, "Engineering and General Geology", S. K. Katariya and sons, Delhi

#### Reference Books

- G. W. Tyrrell, "Principles of Petrology", B. I. Publication Pvt. Ltd., New Delhi
- A. Holmes, "Principles of Physical Geology", ELBS Chapman & Hall, London
- M. P. Billings, "Structural Geology", Prentice Hall of India Private Ltd., New Delhi
- L. W. Farmer, "Engineering Properties of Rocks", Chapman & Hall, London
- Reddy, "Engineering Geology for Civil Engineering", Oxford & IBH Publishing Co. N. Delhi
- B. S. SathyaNarayanswami, "Engineering Geology", Dhanpat Rai & Co.(P) Ltd, Delhi

