

**Draft of Proposed Course Structure  
for Degree Programme  
B. Tech. in Civil Engineering**

**Presented to Academic Council on  
6<sup>th</sup> August, 2016, 23<sup>rd</sup> December, 2016  
19<sup>th</sup> February 2017, 15<sup>th</sup> April 2017**



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

## Program Objectives

Goal of the Civil engineering with a specialization in Structural Engineering (SE) at Dr. Babasaheb Ambedkar technological University, Lonere (BATU) is to provide students with preparation to become worthy of professional careers in the field and to be motivated for lifelong learning. All prescribed courses have definite objectives and outcomes. Program objectives are expected qualities of engineers as under:

- a) **Preparation:** To prepare students to excel in various educational programmes or to succeed in industry / technical profession through further education/training;
- b) **Core Competence:** To provide students with a solid foundation in mathematical, scientific fundamentals required to solve Structural problems;
- c) **Breadth:** To train students with a breadth of scientific knowledge to comprehend, analyze, design & create novel products and solutions for real life problems;
- d) **Professionalism:** To inculcate in students professional/ethical attitude, effective team work skills, multidisciplinary approach and to relate engineering issues to a broader context;
- e) **Learning Environment:** To provide students with academic environment of excellence, leadership, ethical guidelines and life-long learning needed for a long / productive career.

In addition to above DBATU graduate is expected to be

1. Taking pride in their profession and have commitment to highest standards of ethical practices and related technical disciplines;
2. Able to design structural system that is safe, economical and efficient;
3. Capable of using modern tools efficiently in all aspects of professional practices;
4. Dealing successfully with real life civil engineering problems and achieve practical solutions based on a sound science and engineering knowledge;
5. Shall be engage in continuous research, development and exchange of knowledge for professional development;
6. Be honest in their control and performing their duties and promote effective use of resources through open, honest and impartial services to the public;
7. Act in such a manner which will uphold the honour, integrity, or dignity of the engineering profession, and avoid knowingly engaging in business or professional practices of a fraudulent, dishonest or unethical nature;
8. Recognize that the lives, safety, health and welfare of the general public are dependent upon engineering, decision and practices;
9. Continue their professional development throughout their careers and provide opportunities for the professional development;

## Course Structure

**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			Credit
			L	T	P	
<b>Theory</b>						
01		Mathematics – III	3	1	-	4
02	CV 302	Solid Mechanics	3	1	✓	4
03	CV 303	Hydraulic Engineering I	3	-	-	3
04	CV 304	Surveying I	3	-	✓	3
05	CV 305	Building Construction	3	-	✓	3
06		<b>Elective I</b>	2/3	2/1		4
<b>Practical / Drawing and/or Design</b>						
07	CVL 301	Solid Mechanics Laboratory	-	-	2	1
08	CVL 302	Building Construction - Drawings Laboratory	-	-	4	2
09	CVL 303	Surveying Laboratory I	-	-	4	2
10	CVL 304	Seminar on Topic of Field Visit to Foundation Work	-	-	1	-
		Sub-Total	17/18	4/3	11	
		<b>Total</b>	<b>31</b>			<b>24</b>
<b>Elective I</b>						
	CVE1-301	Engineering Geology	2	2	-	4
	CVEL-301	Engineering Geology Lab	-	-	2	
	CVE1-302#	National Service Scheme (NSS)	3	1	-	

### Semester- IV

Sr. No.	Subject Code	Subject	Contact Hours			Credit
			L	T	P	
<b>Theory</b>						
01	CV 401	Hydraulic Engineering II	3	-	✓	3
02	CV 402	Structural Mechanics-I	3	1	-	4
03	CV 403	Surveying – II	3	1	✓	4
04	CV 404	Environmental Engineering	3	-	✓	3
05		<b>Elective II</b>	3	-	-	3
06		<b>Elective III</b>	3	-	-	3
<b>Practical / Drawing and/or Design</b>						
07	CVL 401	Hydraulic Engineering Laboratory	-	-	2	1
08	CVL 402	Surveying Laboratory II	-	-	4	2
09	CVL 403	Environmental Engineering Laboratory	-	-	2	1
10	CVL 404	Seminar on Topic of Field Visit to works involving Superstructure Construction	-	-	1	-
		Sub-Total	<b>18</b>	<b>2</b>	9	
		<b>Total</b>	<b>28</b>			<b>24</b>
<b>Elective II</b>						
	CVE2-401#	Planning for Sustainable Development	3	-	-	3
	CVE2-402#	Numerical Computations in Civil Engineering				
<b>Elective III</b>						
	CVE3-401	Engineering Management	3	-	-	3

	CVE3-402#	Operations Research				
	CVE3-403#	Engineering Economics				

### Semester- V

Sr. No	Subject Code	Subject	Contact Hours			Credit
			L	T	P	
<b>Theory</b>						
01	CV 501	Design of Steel Structures	3	1	-	4
02	CV 502	Structural Mechanics-II	3	1	-	4
03	CV 503	Geotechnical Engineering	3	1	✓	4
04	CV 504	Concrete Technology	3	-	✓	3
05		<b>Elective IV</b>	3	-	-	3
06		<b>Elective V</b>	3	-	-	3
<b>Practical / Drawing and/or Design</b>						
07	CVL 501	Geotechnical Engineering Laboratory	-	-	2	1
08	CVL 502	Concrete Technology Laboratory	-	-	2	1
09	CVL 503	Seminar on Topic of Field Visit to works related to Building Services			1	
		Sub-Total	<b>18</b>	<b>3</b>	<b>5</b>	
		<b>Total</b>	<b>25</b>			<b>23</b>
<b>Elective IV</b>						
	CVE4-501#	Basic Human Rights	3	-		3
	CVE4-502	Rock Mechanics				
	CVE4-503#	Business Communication & Presentation Skills				
<b>Elective V</b>						
	CVE5-501#	Building Materials	3	-		3
	CVE5-502	Modern Surveying Techniques				

### Semester- VI

§: Students should register for the CVP604 in Semester VI and appear at examination in Semester VII.  
Result shall appear in Grade Report of Semester VII

Sr. No.	Subject Code	Subject Title	Contact hours			Credit
			L	T	P	
01	CV 601	Design of Concrete Structures I	3	1	-	4
02	CV 602	Transportation Engineering	3	-	-	3
03	CV 603	Professional Practices	2	2	-	3
04	CV 604	Foundation Engineering	3	-	-	3
05	CV 605	Building Planning and Design	2	2	-	3
06		<b>Elective VI</b>	3	-	-	3
<b>Practical / Drawing and/or Design</b>						
07	CVL 601	Professional Practices Laboratory	-	-	2	1
08	CVL 602	Transportation Engineering Laboratory	-	-	2	1
09	CVL 603	Building Planning, Design and Drawing Laboratory	-	-	3	2
10	CVL 604	Industrial Training <sup>§</sup>	-	-	-	-
		Sub-Total	<b>16</b>	<b>5</b>	<b>7</b>	
		<b>Total</b>	<b>28</b>			<b>23</b>
<b>Elective VI</b>						
	CVE6-601	Project Management	3	-	-	3

	CVE6-602	Geographic Data Analysis and Applications				
	CVE6-603	Town and Urban Planning				

### Semester – VII

Sr. No.	Subject Code	Subject Title	Contact hours			Credit
			L	T	P	
01	CV 701	Design of Concrete Structures II	3	1	-	4
02	CV 702	Infrastructure Engineering	3	-	-	3
03	CV 703	Water Resources Engineering	3	-	-	3
04		<b>Elective VII</b>	3	1	-	4
05		<b>Elective VIII</b>	3	-	-	3
<b>Practical / Drawing and/or Design</b>						
06	CVL 701	Structural Design & Drawing of Steel Structures	-	-	3	2
07	CVL 702	Seminar or Community Project	-	-	2	1
08	CVL 703	Project Stage-I	-	-	4	2
09	CVL 704	Seminar on Topic of Field Visit Road Construction	-	-	1	-
10	CVL 705	Industrial Training <sup>s</sup>	-	-	-	2
		Sub-Total	<b>15</b>	<b>2</b>	<b>10</b>	
		<b>Total</b>	<b>27</b>			<b>24</b>
<b>Elective VII</b>						
	CVE7-701	Plastic Analysis and Design	3	1		4
	CVE7-702 <sup>#</sup>	Advanced Structural Mechanics				
	CVE7-703 <sup>#</sup>	Machine Foundations				
<b>Elective VIII</b>						
	CVE8-701 <sup>#</sup>	Waste Water Treatment	3	-		3
	CVE8-702	Advanced Water Resources Engineering				
	CVE8-703	Development Engineering				
	CVE8-704 <sup>#</sup>	Construction Economics & Finance				

### Semester – VIII

Sr. No.	Subject Code	Subject Title	Contact hours			Credit
			L	T	P	
01	CV 801	Introduction to Earthquake Engineering	3	1		4
02		<b>Elective IX</b>	3	-		3
03		<b>Elective X</b>	3	-		3
04		<b>Elective XI</b>	3	-		3
<b>Practical / Drawing and/or Design</b>						
05	CVL 801	Earthquake Engineering Laboratory	-	-	2	1
06	CVL 802	Structural Design and Drawing of RC Structures	-	-	3	2
07	CVL 803	Self-Study Report based on field visit to Infrastructure Project Works	-	-	2	1
08	CVL 804	Project Stage-II	-	-	8	6
		Sub-Total	<b>12</b>	<b>1</b>	<b>17</b>	
		<b>Total</b>	<b>29</b>			<b>23</b>
<b>Elective IX</b>						
	CVE9-801	Construction Techniques	3	-		3
	CVE9-802	Pavement Management System				
	CVE9-803	Composite Materials				

	CVE9-804	Risk Analysis, Disaster Management and Mitigation			
<b>Elective X</b>					
	CVE10-801	Bridge Engineering	3	-	3
	CVE10-802	Structural Audit			
	CVE10-803	Design of Hydraulic Structures			
<b>Elective XI</b>					
	CVE11-801	Advanced Engineering Geology	3	-	3
	CVE11-802	Water Power Engineering			
	CVE11-803	Disaster Management			
<b>Overall Total</b>				<b>232</b>	<b>196</b>

## Detailed Syllabus

### Semester III

#### MA 301 Mathematics – III

**Teaching Scheme:** (3 Lectures + 1 Tutorial) hours / Week

**Pre Requisites:** Mathematics - I and Mathematics – II

#### Course Contents

**Module1: Infinite Series**

**(7 Lectures)**

Series of number, improper integrals, Cauchy criterion, test of convergence, absolute and conditional convergence, series of functions, uniform convergence, power series, radius of convergence

**Module 2: Fourier Series**

**(5 Lectures)**

Fourier series, half-range expansions, approximation by trigonometric polynomials, fourier integrals

**Module 3: Partial Differential Equations**

**(7 Lectures)**

First and second order liner 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

**Module 4: Power Series Methods for Solution of Ordinary Differential Equations**

**(5 Lectures)**

Legendre equations and Legendre polynomials, Bessel functions of first and second kind, orthogonality, Sturm-Lowville problems

**Module 5: Laplace Transform**

**(6 Lectures)**

Laplace Transforms of Various Functions

**Module 6: Inverse Transforms**

**(6 Lectures)**

Inverse transforms, shifting on the S and T axes, convolutions, partial fractions

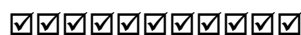
**Text Books**

- Wartikar J.N. and Wartikar P.N., “Engineering Mathematics Vol. I & 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, 2nd Edi., 2002

**Course Outcomes:** On completion of the course, student will be able to formulate and solve mathematical model of civil engineering phenomena in field of structures, survey, fluid mechanics and soil mechanics.



# CV 302 Solid Mechanics

**Teaching Scheme:** (3 Lectures + 1 Tutorial) hours / Week

**Pre Requisites:** Engineering Mechanics (EM02)

## Course Contents

### Module 1: Stress and Strain

(6 Lectures)

**Simple stress** - Analysis of internal forces, simple stress, shearing stress, bearing stress, diaphragm or skin stresses in thin walled vessels, statically indeterminate members, thermal stresses

**Simple strains** - Stress strain diagram for different engineering materials and its importance for elastic and plastic analysis, Hooke's law: axial and shearing deformations, Poisson's ratio: biaxial and triaxial deformations, strain measurement devices basis of sensors, working principles and operation, data acquisition

### Module 2: Axial Force, Shear Force and Moment in Beams

(8 Lectures)

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

**Torsion** - Assumptions, derivation of torsion formulae, torsion of circular shafts, power transmission, stresses and deformation in determinate solid/hollow homogeneous/composite shafts

### Module 3: Combined Stresses

(7 Lectures)

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

### Module 4: Beam Deflections

(7 Lectures)

Calculations of deflection for determinate beams by double integration, Macaulay's method, moment area method, moment diagram by parts, conjugate beam method, deflection by method of superposition, introduction to energy methods

### Module 5: Columns and Struts

(5 Lectures)

Concept of short and long columns, formulae by Euler and Rankin, limitation of Euler's formula, equivalent length, eccentrically loaded short compression members

### Module 6: Theories of Failure

(7 Lectures)

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

- Singer F.L. and Pytle, "Strength of Materials", Harper Collins Publishers, Fourth Edition
- Junnarkar S.B. (2014), "Mechanics of Structures", Charotor Publishers, Anand, 31st edition,
- Khurmi R.S., "Strength of Material", S. Chand and Co., Edition revised 1968, New Delhi
- Sadhu Singh, "Strength of Materials", Khanna Publishers, N. Dehli, ISBN No. 978-81-7409-048-7
- Prasad I.B., "A text book of Strength of Materials", Khanna Publishers, N. Dehli, ISBN NO:978-81-7409-069-X
- Beer F P., Jhonston E. R., John. T. D E wolf, "Mechanics of Materials" TMH, 7th edition
- Timoshenko S.P. and Young D.H., "Elements of Strength of Materials", East West Press, 4th edition 1962, New Delhi

## Reference Books

- Popov E.P., "Introduction to Mechanics of Solids", Prentice-Hall, Second Edition 2005

- Crandall S.H., Dahl N.C., & Lardner T.J., “An Introduction to Mechanics of Solids”, Tata McGraw Hill, 2<sup>nd</sup> Edi, 1978
- Nash W., “Strength of Materials Schaum’s outline series”, McGraw Hill, fourth edition
- Punmia B. C., “Mechanics of Materials” Laxmi Publications, revised edition, 2016
- Subramanian R., “Strength of Materials” Oxford University Press, 2nd edition, New Delhi

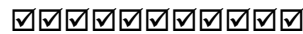
**Course Outcomes:** On completion of the course, the students will be able to:

CO1: Perform the stress-strain analysis.

CO2: Draw force distribution diagrams for members and determinate beams.

CO3: Find deflections in determinant beams.

CO4: Visualize force deformation behavior of bodies.



## CV 303 Hydraulic Engineering - I

**Teaching Scheme:** (3 Lectures + 1 Tutorial) hours / Week

**Pre Requisites:** Engineering Mechanics (EM02)

### Course Contents

**Module 1: Fundamental Concepts**

**(6 Lectures)**

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, fluid pressure

**Module 2: Fluid Statics**

**(6 Lectures)**

Forces on fluid elements, fundamental equation, manometers, hydrostatic thrust on submerged surfaces, buoyancy, stability of unconstrained bodies, fluids in rigid body motion

**Module 3: Fluid Kinematics**

**(6 Lectures)**

Types of flow, continuity equation, derivation and applications of momentum equation, Euler's equation, Bernoulli's equation, velocity potential and stream function, concept of flow net

**Module 4: Laminar Flow**

**(9 Lectures)**

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, Introduction to Boundary Layer Theory

**Module 5: Dimensional Analysis and Similitude**

**(5 Lectures)**

Nature of dimensional analysis, Rayleigh’s Method, Buckingham pi theorem, dimensionless groups and their physical significance, flow similarity and model studies, Scale Effects, Distorted and Undistorted Models

**Module 6: Flow Measurement**

**(7 Lectures)**

Direct methods, restriction flow meters, linear flow meters, traversing methods, measurements in open channel flow

**Flow Through Pipes:** Loss of energy in 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, calculation of head loss, introduction to Moody's chart, nomograms and other pipe diagrams

**Text Books**

- Fox. R. W. and Mc-Donald. A. T., “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

- Streeter V. L., Bedford K. W. and Wylie E. B., "Fluid Dynamics", New York, McGraw-Hill, Ninth Edition, 1998
- Som S. K. & Biswas G., "Introduction to Fluid Mechanics & Fluid Machines", Tata McGraw-Hill, 2<sup>nd</sup> Edi., 2003

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

CO1: Calibrate the various flow measuring devices.

CO2: Determine the properties of fluid and pressure and their measurement.

CO3: Understand fundamentals of pipe flow, losses in pipe and analysis of pipe network.

CO4: Visualize fluid flow phenomena observed in Civil Engineering systems.



## CV 304 Surveying - I

**Teaching Scheme:** (3 Lectures + 1 Tutorial) hours / Week

**Pre Requisites:** Basic Civil Engineering (BCE06)

### Course Contents

#### Module 1: Chain Surveying

(6 Lectures)

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

#### Module 2: Compass Surveying

(5 Lectures)

Prismatic compass, surveyor's compass, bearing systems and conversions, local attraction, magnetic declination, dip traversing, adjustment of errors

#### Module 3: Plane Table Surveying

(5 Lectures)

Plane table instruments and accessories, merits and demerits, methods: radiation, intersection, resection, traversing

#### Module 4: Leveling and Applications

(8 Lectures)

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

#### Module 5: Theodolite Surveying

(6 Lectures)

Theodolite - Vernier and micro-optic - 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

#### Module 6: Engineering Surveys

(6 Lectures)

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. and Kulkarni S. V., "Surveying and Leveling", Vols. I, II and III, Vidarthi Gruh Prakashan, Pune
- Punmia B.C., "Surveying", Vols. I, II and III, Laxmi Publications, 16th edition, 2016

## Reference Books

- Clark D., "Plane and Geodetic Surveying", Vol. I & II, C.B.S. Pub. and Distri., N. Delhi, 6th edi.
- Anderson J. M. and Mikhail E. M., "Introduction to Surveying", McGraw Hill Book Company
- Bannister A. and Raymond S., "Surveying", ELBS, Sixth Edition, 1992
- Kahmen Heribert and Faig Wolfgang, "Surveying", Walter de Gruyter, 1995

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

CO1: Perform measurements in linear/angular methods.

CO2: Perform plane table surveying in general terrain.

CO3: Know the basics of leveling and theodolite survey in elevation and angular measurements.



## CV 305 Building Constructions

**Teaching Scheme:** (3 Lectures) hours / Week

**Pre Requisites:** Engineering Graphics (EGP04), Basic Civil Engineering (BCE06)

### Course Contents

#### Module 1: Masonry Construction

(6 Lectures)

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 (aerated autoclaved), soil stabilized blocks, fly ash blocks, cement concrete walls

#### Module 2: Concrete for Construction

(5 Lectures)

Introduction and properties of ingredients, importance of admixture materials such as pozzolona, fly ash, specific purpose chemical admixtures, Properties of fresh and hardened concrete

#### Module 3: Arches and Lintels

(6 Lectures)

Arches and their stability, 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

#### Module 4: Means of Lateral Communication

(7 Lectures)

##### Doors and windows

Doors - classification based on parameters such as material, geometry, fixtures and fastening

Windows - classification based on parameters such as material, geometry, fixtures and fastening

Use of composite materials for doors and window frames and shutters, laying out of passages

**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

#### Module 5: Flooring Roofs and Types

(7 Lectures)

**Flooring:** Types, factors for selections of floorings, flooring in ground and upper floors, various types of tiled flooring: natural, composite, synthetic, and special purpose flooring, concrete flooring for industrial purpose: tremix flooring

**Roof coverings:** Terms used, roof and their selection, pitched roofs and their types, roof coverings and their selection. Natural, composite, synthetic, and special purpose roof coverings, timber trusses (King Post and Queen Post), steel trusses types and their suitability

#### Module 6: Precast and Pre-engineered Buildings

(5 Lectures)

Principles- advantages and disadvantages, types of prefabricate, standardization, basic, nominal and actual dimensions, tolerances, joints production, transportation and erection

### Text Books

- Punmia B.C., Jain A. K., "Building Construction", Laxmi Pub. Pvt. Ltd., 10th Edi, N. Delhi
- Arora S. P. and Bindra S. P., "Text Book of Building Construction", Dhanpat Rai Publications
- Kumar Sushil, "Building Construction" Standard Publishers, 20th Edition, 2010.

### 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
- Catalogues. Information Brochures, Trade Literature by material or product manufacturers

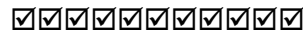
**Course Outcomes:** On completion of the course, students will be able to:

CO1: Understand types of masonry structures.

CO2: Understand composition of concrete and effect of various parameters affecting strength.

CO3: Comprehend components of building and there purposes.

CO4: Comprehend the precast and pre-engineered building construction techniques.



## CVL 301 Solid Mechanics Laboratory

**Practical:** 2 hours / week

**Term-Work:** 25 Marks

Practical Work consists of performance of at least seven experiments from the list below (excluding the eleventh study) experiment: Detailed report is expected.

### 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.

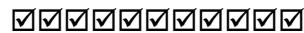
**Course Outcomes:** On completion of the course, the students will be able to:

Evaluate Young Modulus, torsional strength, hardness and tensile strength of given specimens.

Determine the strength of coarse aggregates.

Find the compressive strength of concrete cubes and bricks.

Determine physical properties of given coarse aggregates, fine aggregates and cement samples.



## CVL 302 Building Construction - Drawings Laboratory

**Practical:** 4 hours / week

**Term-Work:** 50 Marks

### List of Experiments

- 1) Sketch Book shall consist of free hand proportional scale sketches for 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, Standard Aluminum Sections.
  - g) Types of Stairs: Plan and Sectional Drawings.
  - h) Trusses: Various types, various roof covering materials, sketches for sectional profiles
  - i) Typical plan for a single room and sectional views.
- 3) Site visit: To understand various building materials and their use.

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

CO1: Draw plan, elevation and section of various structures.

CO2: Apply the principles of planning and by laws used for building planning.

CO3: Prepare detailed working drawing for doors and windows.



## CVL 303 Surveying Laboratory - I

**Practical:** 4 hours / week

**Term work:** 50 marks

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

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

CO1: Use the theodolite along with chain/tape, compass on the field.

CO2: Apply geometric and trigonometric principles of basic surveying calculations.

CO3: Plan a survey, taking accurate measurements, field booking, and adjustment of errors.

CO4: Apply field procedures in basic types of surveys, as part of a surveying team.

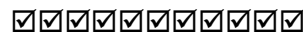
CO5: Employ drawing techniques in the development of a topographic map.



## CVL 304 Seminar on Topic of Field Visit to Foundation Work

**Term-Work:** 50 Marks

Student shall visit to ongoing construction sites in field to witness and collect necessary information from works of foundation execution. It is desirable to collect basic information of geotechnical aspects of foundation execution, types and components of foundations, tools and plants, construction machinery, etc. Intention of the work is to introduce the student to the process of collection and presentation of technical information.



## CVE1-301 Engineering Geology

**Teaching Scheme:** Lectures: 3 Hours / Week

**Pre Requisites:** Basic Civil Engineering (BCE06)

### Course Contents

#### Module 1: Introduction and Physical Geology

**(5 Lectures)**

Definition, Scope and subdivisions, applications of Geology in Civil Engineering, Major features of the Earth's structure, internal structure of earth, and 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: Origin and formation, types, examples

#### Module 2: Mineralogy and Petrology

**(8 Lectures)**

Mineralogy: Physical properties of mineral, Classification of minerals, Petrology: Definition, rock cycle, Igneous rocks: Origin, Textures and Structures, Classification, Concordant and Dis-concordant 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 anti-stress Minerals, Structures, Products of metamorphism

#### Module 3: Structural Geology

**(7 Lectures)**

Outcrop, Strike and Dip, Unconformity-Types, Outliers and Inliers, Overlap Fold and Fault: Parameters, Classification, Causes, Civil Engineering significance Joint: Types, Civil Engineering considerations

#### Module 4: Building Stones

**(4 Lectures)**

Properties of rocks, Requirement of good building stone, Building stones of India

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

#### Module 5: Geology of Dams and Reservoirs, Tunnels and Bridges

**(8 Lectures)**

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

### **Module 6: Preliminary Geological Investigations**

**(4 Lectures)**

Steps in geological investigations, 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**

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

#### **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
- Billings M. P., “Structural Geology”, Prentice Hall of India Private Ltd., New Delhi
- Legget R. F., “Geology Hand book in Civil Engineering”, McGraw-Hill, New York
- Krynine D. P. & Judd W. R., “Principles of Engineering Geology & Geo-technics”, CBS Publishers & Distri., New Delhi
- Reddy Dr. D. V., “Engineering Geology for Civil Engineering”, Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi
- Read H. H., “Rulley’s Elements of Mineralogy”, CBS Publishers & Distributors, Delhi

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

CO1: Recognise the different land forms which are formed by various geological agents.

CO2: Identify the origin, texture and structure of various rocks and physical properties of mineral.

CO3: Emphasize distinct geological structures which have influence on the civil engineering structure.

CO4: Understand how the various geological conditions affect the design parameters of structures.



## **CVEL1-301 Engineering Geology Laboratory**

**Practical:** 2 hours / Week

**Term-Work:** 25 Marks

#### **List of Experiments**

Practical Work consists of study of relevant rock and mineral samples. Detailed report is expected.

- Megascopic study of Rock forming minerals
- Megascopic study of Ore forming minerals
- Megascopic study of Igneous rocks
- Megascopic study of Secondary rocks
- Megascopic study of Metamorphic rocks
- Cross-section Preparation and interpretation of geological maps
- Study of Structural Geological models
- Preparation of bore log /lithologs
- Interpretation of bore- hole data

Study tour to the places of Engineering Geological importance

A Journal containing record of above practical work shall be examined as Term Work. Practical examination shall be based on above practical course.

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

CO1: Calculate the linear measurement on surface.

CO2: Find out engineering properties of various geological materials.

CO3: Draw subsurface lithologs.

CO4: Identify minerals and rocks by studying physical properties.



## CVE1-302 National Service Scheme (NSS)

**Teaching Scheme:** (3 Lectures + 1 Tutorial) hours/week

### Course Contents

**Module 1:** Introduction to NSS, Orientation and structure of NSS, The history of NSS, Objectives, Symbol and meaning, NSS hierarchy from national to college level,

**Module 2:** Concept of society, development of Indian society, Features of Indian constitution: Provisions related to social integrity and development

**Module 3:** Social Justice features, concept of Inclusive growth, basic social issues in India, Degeneration of value system, family system, Gender issues, Regional imbalance

**Module 4:** Dimensions of human personality, National integration and communal harmony,

**Module 5:** Socio economic survey meaning, need, design of questionnaire: data collection analysis and Report, Special campaigning activity: Concept of camp: Identification of community problems, importance of group living, team building, adaption of village, planning for camp. pre, during and post campaigning activities

**Module 6:** Training and orientation of the program unit in college, Leadership training, formation of need based programs, concept of campus to community(C To C) activities, Working with individual group and community, Ice breaking, interaction games, conflict resolution Program planning: concept of planning, features of planning, requirements for Successful implementation of program, program flow charting, feedback

### References

- National Service Scheme Manual (Revised) 2006, Government of India, Ministry of Youth Affairs and Sports, New Delhi.
- University of Mumbai National Service Scheme Manual 2009.
- Avhan Chancellor's Brigade–NSS Wing, Training camp on Disaster Preparedness Guidelines, March 2012
- Rashtriya Seva Yojana Sankalpana–Prof. Dr. Sankay Chakane, Dr.Pramod\Pabrekar, Diamond Publication, Pune.
- National Service Scheme Manual for NSS District Coordinators, National
- Annual report of National Service Scheme (NSS) published by Dept. of Higher and Technical Education, Mantralaya,
- UTKARSHA-Socio and cultural guidelines
- Case material as a Training Aid for Field Workers, Gurmeet Hans.
- Social service opportunities in hospitals, Kapil K.Krishnan, TISS
- New Trends in NSS, Research papers published by University of Pune
- ANOOGUNJ, Research Journal, published by NSS Unit C. K. Thakur college
- Training Manual for Field Work published by RGNIYD, Shreeperumbudur
- Prof. Ghatole R.N. Rural Social Science and Community Development.
- Purushottam Sheth, Dr. Shailaja Mane, National Service Scheme
- National Service Scheme in India: A Case study of Karnataka, M. B. Dishad, Trust Publications, 2001
- <http://www.thebetterindia.com/140/national-service-scheme-nss/>
- <http://nss.nic.in/adminstruct>
- <http://nss.nic.in/propexpan>
- <http://nss.nic.in>
- <http://socialworknss.org/about.htm>

## Semester - IV

Sr. No.	Subject Code	Subject	Contact Hours			Credit
			L	T	P	
<b>Theory</b>						
01	CV 401	Hydraulic Engineering II	3	-	✓	3
02	CV 402	Structural Mechanics-I	3	1	-	4
03	CV 403	Surveying – II	3	1	✓	4
04	CV 404	Environmental Engineering	3	-	✓	3
05		<b>Elective II</b>	3	-	-	3
06		<b>Elective III</b>	3	-	-	3
<b>Practical / Drawing and/or Design</b>						
07	CVL 401	Hydraulic Engineering Laboratory	-	-	2	1
08	CVL 402	Surveying Laboratory II	-	-	4	2
09	CVL 403	Environmental Engineering Laboratory	-	-	2	1
10	CVL 404	Seminar on Topic of Field Visit to works involving Superstructure Construction	-	-	-	-
		Sub-Total	<b>18</b>	<b>2</b>	<b>8</b>	
		<b>Total</b>				<b>24</b>
<b>Elective II</b>						
	CVE2-401#	Planning for Sustainable Development	3	-	-	3
	CVE2-402#	Numerical Computations in Civil Engineering				
<b>Elective III</b>						
	CVE3-401	Engineering Management	3	-	-	3
	CVE3-402#	Systems Engineering				
	CVE3-403#	Engineering Economics				

## CV 401 Hydraulic Engineering - II

**Teaching Scheme:** (3 Lectures +1 Tutorial) hours/week

**Pre Requisites:** Hydraulics Engineering-I (CV303)

### Course Contents

**Module 1: Uniform Flow in Open Channel**

**(6 Lectures)**

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

**Module 2: Steady & Uniform Flow**

**(7 Lectures)**

Chezy's & Manning's formula, Roughosity coefficient, uniform flow computations, hydraulically efficient section-considerations for rectangular, triangular, trapezoidal, circular sections

Specific energy: definition & diagram, concept of critical, sub-critical, super-critical flow, specific force, specific discharge derivation of relationships and numerical computations

**Module 3: Varied Flow**

**(6 Lectures)**

**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

**Module 4: Impact of Jet**

**(6 Lectures)**



Impulse momentum principle, impact of jet on Vanes-flat, curved (stationary and moving), inlet & outlet velocity triangles under various conditions, Series of flat, curved vanes mounted on wheel

### Module 5: Hydraulic Machines

(8 Lectures)

**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), Module quantities, specific speed, performance characteristics, selection of type of turbine, description & function of draft tube, Thomas'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

**Module 6: Boundary Layer Theory:** Concept, Boundary layer along thin plate- Characteristics, Laminar, Turbulent Boundary Layer, laminar sub layer, Various Thicknesses- Nominal, displacement, Momentum, Energy. Hydraulically smooth and Rough boundaries, Separation of Boundary layer, control of Separation, Introduction to Drag and Lift on submerged bodies ( like Flat plates, Sphere, Cylinder, aerofoil), Stokes law, Drag and Lift coefficients

### Text Books

- Modi, Seth, "Fluid Mechanics – Hydraulic & Hydraulic Mechanics" Standard Book House
- Bansal R.K., "Fluid Mechanics", Laxmi Publications, 9th edition 2017
- Garde R. J., "Fluid Mechanics through Problems", New Age Publications, 3rd edition 2011
- Jain A. K., "Fluid Mechanics", Khanna Publications, 8th edition, 2003, Delhi
- Kumar K. L., "Fluid Mechanics", Eurasia Publication House, 11th edition, Delhi
- Rangaraju, "Open Channel flow", Tata McGraw-Hill Pub. Co., Delhi
- Subramanian K., "Fluid Mechanics through Problems" Tata McGraw-Hill Pub. Co., Delhi
- Subramanian K., "Flow in Open Channel", Tata McGraw-Hill Pub. Co., Delhi

### Reference Books

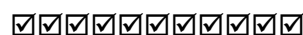
- Streeter, "Fluid Mechanics" McGraw-Hill International Book Co., 3rd edition, Auckland
- Shames, "Mechanics of Fluids", McGraw Hill, 4th edition
- Chaw V. T., "Flow in Open Channel", McGraw-Hill International Book Co., Auckland
- Hughes & Brighton, "Fluid Mechanics", Tata McGraw Hill

**Course Outcomes:** On completion of the course, the students will

CO1: Design open channel sections in a most economical way.

CO2: Know about the non uniform flows in open channel and the characteristics of hydraulic jump.

CO3: Understand application of momentum principle of impact of jets on plane



## CV 402 Structural Mechanics - I

**Teaching Scheme:** (3 Lectures + 1 Tutorial) hours/week

**Pre Requisites:** Engineering Mechanics (EM02), Solid Mechanics (CV302)

### Course Contents

#### Module 1: Introduction

(5 Lectures)

Different structural systems, concept of analysis, basic assumptions, indeterminacy, choice of unknowns, Castiglano's theorems

#### Energy Principles

Strain energy and strain energy density, strain energy in traction, shear, flexure and torsion - Castiglano'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

**Module 2: Method of Consistent Deformation**

**(7 Lectures)**

**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 - Shear Force and Bending Moment diagrams for continuous beams, settlement effects, thermal effect

**Frames up to Three Degree of Indeterminacy:** Analysis of pin jointed trusses, externally and internally redundant trusses, effects of settlement and pre-strains

**Module 3: Moment Distribution Method**

**(6 Lectures)**

Analysis of continuous beams propped cantilevers, portal frames with and without sway

**Module 4: Slope Deflection Method**

**(6 Lectures)**

Analysis of continuous beams, analysis of rigid frames, frames with sloping legs, gabled frames, frames without sway and with sway, settlement effects

**Module 5: Cables, Suspension Bridges and Arches**

**(6 Lectures)**

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

**Module 6: Thin Cylinders**

**(6 Lectures)**

Thin cylinders subjected to internal fluid pressure, wire wound thin cylinders, thin cylindrical shells, circumferential and hoop stresses, longitudinal stresses, maximum shear stress, concept of stresses in thick cylinders

**Text Books**

- Reddy C. S., "Basic Structural Analysis", Tata McGraw Hill, 3rd edition 2010
- Wang C.K., "Statically Indeterminate Structures", McGraw Hill
- Vazirani V.N., Ratwani M.M and Duggal S.K., "Analysis of Structures - Vol. I", ISBN NO: 978-81-7409-140-8
- Khurmi R.S., "Theory of Structures", S Chand, Delhi
- Punmia B.C., "Structural Analysis", Laxmi Publications

**Reference Books**

- Timoshenko and Young, "Theory of structures", McGraw Hill
- Norris C. H. and Wilbur J. B., "Elementary Structural Analysis", McGraw Hill
- Kinney J. S., "Indeterminate Structural Analysis", Oxford and IBH
- Hibbler R. C., "Structural Analysis", Pearson Publications
- Schodek, "Structures", Pearson Education
- Ramamrutham S. and Narayanan R., "Theory of Structures" Dhanpat Rai Publishers, Delhi

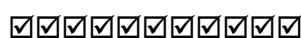
**Course Outcomes:** On completion of the course, the students will be able to:

CO1: Describe the concept of structural analysis, degree of indeterminacy.

CO2: Calculate slopes and deflection at various locations for different types of beams.

CO3: Identify determinate and indeterminate trusses and calculate forces in the members of trusses

Perform the distribution of the moments in continuous beam and frame.



# CV 403 Surveying – II

**Teaching Scheme:** (3 Lectures +1 Tutorial) hours/week

**Pre Requisites:** Survey-I (CV304), Engineering Mathematics

## Course Contents

### Module 1: Tachometry

(7 Lectures)

Significance and systems, principle, constants, basic formulae and field work stadia method, auto reduction tachometer, tangential system

**Electronic Distance Measurement:** Importance, principles of electronic distance measuring (EDM) instruments, classification of EDM's based on carrier waves used, study and use of total station

### Module 2: Triangulation

(7 Lectures)

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, tri-iteration

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

### Module 3: Field Astronomy

(5 Lectures)

Terms, co-ordinate systems, determination of latitude and true bearing by observation on the sun and pole star

### Module 4: Curves

(7 Lectures)

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

### Module 5: Photogrammetry

(5 Lectures)

Terms, types, vertical photographs, scale, ground coordinates, relief displacement, flight planning photomaps and mosaics, stereoscopy and photo interpretation

### Module 6: Remote Sensing

(5 Lectures)

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., Raymond S., Wartikar J.N., Wartikar P.N., "Surveying", ELBS, 6th Edition, 1992
- Heribert Kahmen and Wolfgang Faig, "Surveying", Walter de Gruyter, 1995
- Kanetkar T.P., "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

- James M. Anderson and Edward M. Mikhail, "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 Edition
- Agor, "Advanced Surveying", Khanna Publications, Delhi
- Arora K. L., "Surveying", Vol.1 & 2
- Basak, "Surveying and Levelling"
- Duggal S. K., "Surveying", Vol 1 & 2, Tata Mcgraw Hill Publications, New Delhi
- Gopi S., Satikumar R. and Madhu N., "Advanced Surveying", Pearson Education
- Chandra A. M., "Higher Surveying", New Age International Publication

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

CO1: Understand basics different types of curves on roads and their preliminary survey.

CO2: Perform setting of curves, buildings, culverts and tunnels.

CO3: Comprehend different geodetic methods of survey such as triangulation, trigonometric leveling.

CO4: Comprehend modern advanced surveying techniques.



## CV 404 Environmental Engineering

**Teaching Scheme:** (3 Lectures + 1 Tutorial) hours/week

**Pre Requisites:** Energy and environment engineering (EEE07)

### Course Contents

#### Module 1: Introduction

(8 Lectures)

Environment and its components, importance of water, role of environmental engineer, sources of water, water demand: Design flow, design period, design population, factors affecting water consumption, variation in demand, and design capacity for water supply components, quality of water: Physical, chemical, biological characteristics, Indian standard for quality of potable water

#### Module 2: Treatment of Water

(12 Lectures)

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, 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

#### Module 3: System of Water Supply

(6 Lectures)

Continuous and intermittent system, type of distribution systems, layouts, methods of supply: gravity, pumping and combination, hydraulic analysis of distribution system

#### Module 4: Treatment of Waste Water

(8 Lectures)

Sources of wastewater flows, components of wastewater flows, wastewater constituents, characteristic of municipal waste water, necessity of treatment of waste water, sewerage systems, concept of sewage, sullage, storm water, introduction of preliminary treatment, primary treatment, secondary treatment, tertiary or advanced treatment fundamentals of anaerobic treatment, sewage and industrial waste of common origin, types, collection and recycling and reuse of waste

#### Module 5: Treatment of Solid Waste

(8 Lectures)

Types, sources, characteristics, ill-effects of improper solid waste management, collection, processing techniques, methods of treatment of solid waste-composting, incineration, pyrolysis and sanitary land filling, biodegradable, non-degradable segregation of solid waste, concept of hazardous waste management, e-waste disposal

#### Module 6: Air Pollution

(6 Lectures)

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, 1990
- Garg S. K., "Water Supply Engineering", Khanna Publishers, New Delhi
- Birdi J. S. and Birdi G. S., "Water Supply & Sanitary Engineering", Dhanpat Rai Pub. Company, 8<sup>th</sup> edition, New Delhi

### 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 Geyer, "Environmental Engineering", McGraw Hill Publications
- Steel and McGhee, "Environmental Engineering", McGraw Hill Publications
- Viessman & Hammer, "Water Supply & Pollution Control", Harper Collins Collage Publishers
- Publications by reouted organizations such as WHO, NEERI, MERI, MPCB, CWPRS, etc.

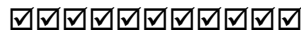
**Course Outcomes:** On completion of the course, the students will be able to:

CO1: Apply the water treatment concept and methods.

CO2: Prepare basic process designs of water and wastewater treatment plants.

CO3: Apply the wastewater treatment concept and methods.

CO4: Apply the solid waste management concepts.



## CVL 401 Hydraulic Engineering Laboratory

**Practical:** 2 hours / week

**Term work:** 50 marks

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 / orifice meter
  - 4) Study of factors affecting coefficient of friction for pipe flow (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 Fraud Number: i) Y2/Y1; 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

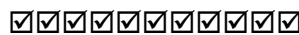
Use of computer programs such as MS Excel is desirable for post-processing of results.

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

CO1: Understand various properties of fluids and measurement techniques.

CO2: Carry out calibrations of various flow measuring devices.

CO3: Understand mechanism of hydraulic jump, various jets and pumps.



## CVL 402 Surveying Laboratory - II

**Practical:** 3 hours / week

**Term work:** 50 marks

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 SylLaboratoryus

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

CO1: Determine contour level of field.

CO2: Determine the tachometric constants and grade of a line.

CO3: Use sub tense bar for distance measurement.



## CVL 403 Environmental Engineering Laboratory

**Practical:** 2 hours / Week

**Term-Work:** 25 Marks

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:**

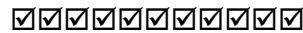
A report based on the visit to water treatment plant shall be submitted.

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

CO1: Quantify the pollutant concentration in water, wastewater and ambient air.

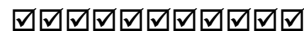
CO2: Recommend the degree of treatment required for the water and wastewater.

CO3: Analyze the survival conditions for the microorganism and its growth rate.



## **CVL 404 Seminar on Topic of Field Visit to works involving Superstructure Construction**

Student shall visit to ongoing construction sites in field to witness and collect necessary information from works of execution of superstructure of buildings or other. It is desirable to collect basic information on components of superstructure, tools and plants, construction machinery, etc. Intention of the work is to introduce the student to the chronological order of execution of works and generate data on vocabulary of terms in field.



## **CVE2- 401 Planning for Sustainable Development**

**Teaching Scheme:**(3 Lectures + 1 Tutorial) hours / Week

**Pre Requisites:** Mathematics - I and Mathematics – II

### **Course Contents**

#### **Module 1:**

Sustainable Development-explains and critically evaluates the concept of sustainable development, Environmental degradation and poverty Sustainable development: its main principles, the evolution of ideas about sustainability,

#### **Module 2:**

Strategies for promoting sustainable development, resistances to the concept, and some alternative approaches. Examine some important current issues and areas of debate in relation to sustainable development.

#### **Module 3:**

Innovation for sustainable development- Environmental management and innovation strategies.

**Module 4:** Societal transformations. Institutional theory.

**Module 5:** Governance for sustainable development. Policy responses to environmental degradation.

**Module 6:** Capacity development for innovation. Research methods.

#### **Text/Reference Books:**

- Harris, J.M. (2204) Basic Principles for Sustainable Development, Global Development and Environment
- Institute, working paper 00-04, available at:  
[http://ase.tufts.edu/gdae/publications/Working\\_Papers/Sustainable%20Development.PDF](http://ase.tufts.edu/gdae/publications/Working_Papers/Sustainable%20Development.PDF)
- Robinson, J. (2004), “Squaring the circle? Some thoughts on idea of sustainable Development” Ecological Economics 48(4): 369-384.
- Hjorth, P. & A. Bagheri (2006), “Navigating towards Sustainable Development: A System Dynamics Approach”, Futures

38: 74-92.

- Mog, J.M. (2004) „Struggling with Sustainability – A Comparative Framework for Evaluating Sustainable Development Programs”, World Development 32(12): 2139–2160. IISD Commentary on the OECD's Draft Principles for International Investor Participation in Infrastructure (PDF – 68 kb)
- Arundel, A., R. Kemp, and S. Parto (2004) Indicators for Environmental Innovation: What and How to Measure, forthcoming in International Handbook on Environment and Technology Management (ETM), edited by D. Annandale, J. Phillimore and D. Marinova, Cheltenham, Edward Elgar.
- Douthwaite, B. (2002) Enabling Innovation. A practical guide to understanding & fostering innovation, London, Zed Books.

## **CVE2- 402 Numerical Solutions in Civil Engineering**

**Teaching Scheme:** (3 Lectures) hours / Week

**Pre Requisites:** Mathematics - I and Mathematics – II

### **Course Contents**

#### **Module 1**

Basis of Computations, Matrix Operations on Computer, Multiplication and Inversion, Solution of Simultaneous Equations, Gauss Elimination Method, Cholesky Decomposition method, Gauss Jordan and Gauss Seidal Methods

#### **Module 2**

Roots of Equation, Trial and Error, Bisection, Secant Iteration, Newton Rapson Method, Solution of Ordinary Differential Equation, Euler’s Method, Modified Euler’s Method and Runga Kutta Methods.

#### **Module 3**

Interpolation with Newton's Divided Differences, Lagrange's Polynomial, Finite Difference Method, Central, Forward and Backward Differences, Least Square Polynomial Approximations Application in Deflection of Determinate Beams, Buckling Load of Long Columns

#### **Module 4**

Numerical Integration: Trapezoidal Rule, Simpon’s Rules, Gauss Quadrature Rules

#### **Module 5**

Statistical Analysis of Experimental Data, Mean, Median, Mode, Deviation, Measures of Dispersion, Least Square Method, Regression Analysis: Linear, Parabolic, Curve Fitting

#### **Module 6**

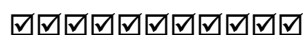
Implementation of above methods by algorithm development leading to programming in Fortran / C / C++

#### **Text Books**

- Balaguruswami E., “Numerical Methods”, Tata Mc-Graw Hill
- Scheid F, “Numerical Analysis (Schaum’s series)”, Tata Mc-Graw Hill
- Chapra. S. C. and Canale R. P., “Numerical Methods for Engineers”, by, Tata Mc-Graw Hill
- Shantha Kumar M , “Computer Based Numerical Analysis”, Khanna Publication
- Grewal B.S. and Grewal J.S., “Numerical Methods in Engineering and Science”, Khanna Publication, N. Delhi
- Sastry, S.S., "Introductory Methods of Numerical Analysis", Printice Hall of India, New Delhi

#### **Reference Books**

- Jain, Aryengon, “Numerical Methods for Scientific and Engineering Applications”, Wiley Eastern Publication
- Numerical Recipe , Oxford Publishing
- Manuals for the Commercial Computer Programmes





# CVE3-401 Engineering Management

**Teaching Scheme:** Lectures: 4 hours/week

**Pre Requisites:** None

## Course Contents

### Module 1: Evolution of Management Thought

(6 Lectures)

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

### Module 2: Functions of Management

(7 Lectures)

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 (introduction only), communication process, motivation

### Module 3: Decision Making

(7 Lectures)

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).

### Module 4: Operations Research

(5 Lectures)

Linear programming, simple l-p model, simplex method - duality, sensitivity analysis, application of linear programming in transportation and assignment models

### Module 5: Simulation Studies

(5 Lectures)

Monte-Carlo simulation, queuing or waiting line theory (simple problems), dynamic programming, introduction to emerging optimization techniques

### Module 6: Material Management

(6 Lectures)

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

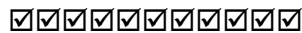
**Course Outcomes:** On completion of the course, the students will be able to:

CO1: Demonstrate the nuances of management functions.

CO2: Analyze the framework of a business organization.

CO3: Adopt an empirical approach toward business situations.

CO4: Apply various Management techniques.



## CVE3-402 Operation Research

**Teaching Schemes:** 3 Lect. hrs/week; **Evaluation Scheme:** Theory: 60; Mid-semester Exam 20; Class Assessment 20

### Course Contents

#### Module 1: Introduction to Operations Research

Introduction, Use of Operations Research in Civil Engineering and Managerial Decision making process, Structure of the Mathematical Model, Limitations of Operations Research, Identification of civil engineering systems and their methods of analysis, Introduction to Optimization Techniques and their application in Engineering Planning, Design and Construction, Multivariable optimization with and without constraints, Objective function and constraints **(07 Lectures)**

#### Module 2: Linear Programming

Introduction, Linear Programming Problem, Requirements of LPP, Mathematical Formulation of LPP, Graphical method, Simplex Method Penalty Cost Method or Big M-method, Two Phase Method, duality, Sensitivity Analysis, Civil engineering applications. **(06 Lectures)**

#### Module 3: Transportation Problem

Formulation, solution, finding basic feasible solutions – Northwest corner rule, least cost method and Vogel's approximation method. Optimality test: the stepping stone method and MODI method (Introductory Treatment only). **(06 Lectures)**

#### Module 4: Integer, Dynamic and Non-Linear programming

Integer programming Introduction, Types of Integer Programming Problems, Gomory's cutting plane Algorithm, Branch and Bound Technique

Dynamic programming Multi stage decision processes, Principle of optimality, Recursive equation, Application of D.P., Introduction to Non-Linear programming: Single variable unconstrained optimization –Local & Global optima, Uni-modal Function- Sequential Search Techniques **(08 Lectures)**

#### Module 5: Simulation

Introduction, Methodology of Simulation, Basic Concepts, Simulation Procedure, Application of Simulation Monte-Carlo Method: Introduction, Monte- Carlo Simulation, Applications of Simulation, Advantages of Simulation, Limitations of Simulation. **(06 Lectures)**

#### Module 6: Queuing Theory and Game Theory

Queuing Theory, Simulation, Sequencing model, Competitive games, rectangular game, saddle point, minimax, maximin method of optimal strategies, value of the game. Solution of games with saddle points, **(06 Lectures)**

#### References:

- Taha, H.A. "Operations Research - An Introduction", Prentice Hall, (7th Edition), 2002.
- Ravindran, A, Phillips, D. T and Solberg, J. J. "Operations Research: Principles and Practice", John Willey and Sons, 2nd Edition, 2009.
- Hiller, F. S. and Liebermann, G. J. "Introduction to Operations Research", Tata McGraw Hill, 2002.
- S. D. Sharma, Operations Research, KedarNath Ram Nath-Meerut.
- KantiSwarup, P. K. Gupta and Man Mohan, Operations Research, Sultan Chand & Sons

#### Outcomes:

Upon completion of the course the students will be able to:

CO1: Understand the theoretical workings of the simplex method

CO2: Perform sensitivity analysis to determine the direction and magnitude of change of a model's optimal solution

CO3: Understand specialized linear programming problems like the transportation and assignment problems,

CO4: Understand applications of integer programming and a queuing model and compute important performance measures.

### Semester- V

Sr. No	Subject Code	Subject	Contact Hours			Credit
			L	T	P	
<b>Theory</b>						
01	CV 501	Design of Steel Structures	3	1	-	4
02	CV 502	Structural Mechanics-II	3	1	-	4
03	CV 503	Geotechnical Engineering	3	1	✓	4
04	CV 504	Concrete Technology	3	-	✓	3
05		<b>Elective IV</b>	3	-	-	3
06		<b>Elective V</b>	3	-	-	3
<b>Practical / Drawing and/or Design</b>						
07	CVL 501	Geotechnical Engineering Laboratory	-	-	2	1
08	CVL 502	Concrete Technology Laboratory	-	-	2	1
09	CVL 504	Seminar on Topic of Field Visit to works related to Building Services				
		Sub-Total	<b>18</b>	<b>3</b>	<b>4</b>	
		<b>Total</b>	<b>25</b>			<b>23</b>
		<b>Elective IV</b>				
	CVE4-501#	Basic Human Rights	3	-		3
	CVE4-502	Rock Mechanics				
	CVE4-503#	Business Communication & Presentation Skills				
		<b>Elective V</b>				
	CVE5-501#	Building Materials	3	-		3
	CVE5-502	Modern Surveying Techniques				

## CV 501 Design of Steel Structures

**Teaching Scheme:** (3 Lectures + 1 Tutorial) hours/week

**Pre Requisites:** Solid Mechanics (CV303), Structural Mechanics I (CV402)

### Course Contents

**Module 1: Introduction**

**(5 Lectures)**

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

**Module 2: Connections**

**(6 Lectures)**

Types: Riveted, Bolted, Welded; Analysis of axially & eccentrically loaded connections (subjected to bending & torsion), Permissible Stresses, Design of connections, failure of joints

**Module 3: Axially Loaded Members**

**(6 Lectures)**

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

**Module 4: Beams**

**(8 Lectures)**

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

#### **Module 5: Columns**

**(6 Lectures)**

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 bolt

#### **Module 6: Column Bases**

**(5 Lectures)**

Analysis and design of slab base, gusseted base, grillage foundation

Introduction to IS 800-2007 Provisions of recent approaches in Steel Structure design based on Plastic Analysis Method and Limit State Approach

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

#### **Text Books**

- Duggal S. K., “Design of Steel Structures”, Tata McGraw Hill Pub. Co. Ltd., New Delhi
- Chandra Ram, “Design of Steel Structures”, Vol. I & Vol. II, Standard Book House, New Delhi
- Dayaratnam P., “Design of Steel Structures”, Wheeler Publishing, New Delhi
- Subramanian N., “Steel Structures: Design and Practice” Oxford Univ. Press, Delhi
- Vazirani V.N. and Ratwani M.M., “Design and Analysis of Steel Structures”, ISBN NO: 978-81-7409-295-3

#### **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, IS 800:1984, 2007, IS 875 (Part I to V)
- Gaylord E.H. and Gaylord C.N., “Design of Steel Structures” McGraw 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.

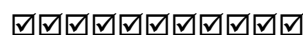
**Course Outcomes:** On completion of the course, the students will be able to:

CO1: Identify and compute the design loads and the stresses developed in the steel member.

CO2: Analyze and design the various connections and identify the potential failure modes.

CO3: Analyze and design various tension, compression and flexural members.

CO4: Understand provisions in relevant BIS Codes.



## **CV 502 Structural Mechanics-II**

**Teaching Scheme:** (3 Lectures + 1 Tutorial) hours/week

**Pre Requisites:** Solid Mechanics (CV302), Structural Mechanics I (CV402)

### **Course Contents**

**Module 1: Moving Loads and Influence Lines**

**(7 Lectures)**

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, ILD for 3 hinged arches and suspension bridges, application of Muller Breslau principle for determinate structures

**Module 2: Cables, Suspension Bridges and Arches**

**(6 Lectures)**

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. ILD for 3 hinged arches and suspension bridges

**Module 3: Analysis of Indeterminate Structures by Flexibility Method**

**(6 Lectures)**

Fundamental concepts of flexibility method of analysis, flexibility coefficients and their use in formulation of compatibility equations, application of above methods to propped cantilevers, fixed beams, continuous beams, and simple pin jointed frames including effect of lack of members

**Module 4: Analysis of Indeterminate Structures by Stiffness Method**

**(6 Lectures)**

Fundamental concepts of stiffness method of analysis, stiffness coefficients for prismatic members and their use for formulation of equilibrium equation, applications of the above methods to indeterminate beams and simple rigid jointed frames, rigid jointed frames with inclined member but having only one translational DoF in addition to rotational DoF's, including the effect of settlement of supports

**Module 5: Finite Difference Method**

**(5 Lectures)**

a) Finite difference method - Introduction, application to deflection problems of determinate beams by central difference method

b) Approximate methods of analysis of multi-storied multi-bay 2-D rigid jointed frames by substitute frame method, cantilever method and portal method

**Module 6: Finite Element Method**

**(6 Lectures)**

a) Finite element method: Introduction, discretization, types of elements-1D, 2D, 3D, isoperimetric and axisymmetric, convergence criteria, Pascal's triangle, direct stiffness method, principle of minimum potential energy. (No numerical)

b) Shape functions: CST, LST elements by using polynomials, 1D, 2D elements by using Lagrange's method, concept of local and global stiffness matrix

**Text Books**

- Reddy C. S., "Basic Structural Analysis", Tata McGraw Hill
- Pandit G. S. and Gupta S. P., "Structural Analysis - a Matrix Approach", Tata McGraw Hill, N.Delhi, 1986
- Chandrupatla T. R., Belegundu A. D., "Introduction to Finite Elements in Engineering, Prentice Hall, N. Delhi, 1996
- Thadani B. N. and Desai J. P., "Structural Analysis"
- Punmia B.C., "Structural Analysis", Laxmi Publications
- Wang C.K., "Statically Indeterminate Structures", Mc Graw Hill
- Vazirani V.N., Ratwani M.M and Duggal S.K., "Analysis of Structures - Vol. II" Khanna Publishers, N. Dehli, ISBN No. 978-81-7409-205-6
- Sadhu Singh, "Theory and Solved Problems in Adv. Strength of Materials", Khanna Publishers, N. Dehli, ISBN No. 978-81-7409-212-7

**Reference Books**

- Norris C. H. and Wilbur J. B., "Elementary Structural Analysis", Mc Graw Hill
- Beaufait, F. W., "Basic Concepts of Structural Analysis", Prentice Hall, N.J.

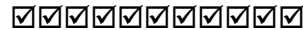
- Kinney J. S., “Indeterminate Structural Analysis”, Oxford and IBH
- Krishnamurthy, C.S., “Finite Element Analysis – Theory and Programing”, Tata Mc Graw Hill, N. Delhi 1994
- Hibbler R. C., “Structural Analysis”, Pearson Publications
- Kanchi M. B., “Matrix Methods of Structural Analysis”, Wiley Eastern Ltd., N. Delhi
- Wang C. K., “Matrix Methods of Structural Analysis”, International Text-book, Scranton, Pennsylvania, 1970
- Gere J.M., Weaver W., “Analysis of Framed Structures”, D. Van Nostrand Company, Inc., Princeton, N. Jersey

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

CO1: Have a basic understanding of matrix method of analysis and will be able to analyze the determinant structure.

CO2: Have a basic understanding of the principles and concepts related to finite difference and finite element methods

CO3: Have a basic understanding of concept of influence line



## CV 503 Geotechnical Engineering

**Teaching Scheme:** (3 Lectures + 1 Tutorial) hours/week

**Pre Requisites:** Solid Mechanics (CV302), Engineering Geology (CV306)

### Course Contents

**Module 1: Introduction**

**(6 Lectures)**

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 indexes

**Module 2: Soil Consistency**

**(6 Lectures)**

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

**Module 3: Flow of Water Through Soil: Permeability**

**(6 Lectures)**

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

**Module 4: Shear Strength**

**(7 Lectures)**

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

**Module 5: Compaction**

**(5 Lectures)**

Theory of compaction, factors influencing compaction, compacted density, Laboratory Standard and modified compaction test, Method and measurement of field compaction, Field compaction control

**Module 6: Compressibility and Consolidation**

**(6 Lectures)**

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

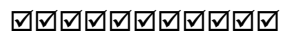
- Alam Singh, "Text book of soil mechanics in theory and practice", Asian Pub. House, Mumbai
- Taylor D.W., "Fundamentals of Soil mechanics"
- Terzaghi and Peak "Soil mechanics" John Willey and Sons, New-York
- Scott R. F., "Principal of soil mechanics"
- Lambe T.W, "Soil Testing" by Willey Eastern Ltd.,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

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

CO1: Understand different soil properties and behavior

CO2: Understand stresses in soil and permeability and seepage aspects.

CO3: Develop ability to take up soil design of various foundations.



## CV 504 Concrete Technology

**Teaching Scheme:** (3 Lectures + 1 Tutorial) hours/week

**Pre Requisites:** Building Construction (CV305), Engineering Geology (CV306)

### Course Contents

#### Module 1

(7 Lectures)

Materials for Concrete: Cement –Manufacturing Process, Physical Properties, Hydration of Cement, hydration products, Chemical Compounds in Cement, Types of Cement, Aggregates: Classification of aggregates, Physical Properties, Bulking of Sand, Mechanical Properties, Water: Specifications of Water to be used For Concrete

#### Module 2

(8 Lectures)

Properties of Fresh Concrete -Types of Batching, Mixing, Transportation, Placing Including Pumping and Compaction Techniques for Good Quality Concrete, Workability, Factors affecting workability, Methods of Measuring Workability, Segregation and Bleeding, setting time, Curing of Concrete, Types of curing, Temperature Effects on Fresh Concrete

#### Module 3

(7 Lectures)

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

#### Module 4

(8 Lectures)

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

#### Module 5

(10 Lectures)

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 (AAR), factors affecting on AAR, Deteriorating effects of AAR, Chloride Attack, Corrosion of Steel (Chloride Induced)

#### Module 6

(8 Lectures)

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”, Tata Mc-Graw Hill 2015 15th edition
- Shetty M. S. “Concrete Technology”, S. Chand 2005.
- Krishnaswamy, “Concrete Technology”, Dhanapat Rai and Sons

#### Reference Books

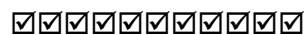
- Orchard, “Concrete Technology”, Applied Science Publishers
- Neville A. M., “Concrete Technology”, Prentice Hall, 2nd edition
- Relevant Publications by Bureau of Indian Standards, New Delhi
- IS:10262(2009), IS:456 (2009), IS 4926 (2003)

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

CO1: Understand the various types and properties of ingredients of concrete.

CO2: Understand effect of admixtures on the behavior of the fresh and hardened concrete.

CO3: Formulate concrete design mix for various grades of concrete.



## CVL 501 Geotechnical Engineering Laboratory

**Practical:** 2 hours / week

**Term work:** 50 marks

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

**Course Outcomes:** On completion of the course, the students will able to:

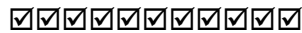
CO1: Determine different engineering properties of soil.

CO2: Identify and classify soils based on standard geotechnical engineering practices.

CO3: Perform Laboratory oratory compaction and in-place density tests.



CO4: Perform and interpret direct shear tests and estimate shear strength parameters.



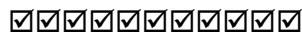
## CVL 502 Concrete Technology Laboratory

**Practical:** 2 Hours / Week

**Term Work:** 50 Marks

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.



## CVL 503 Seminar on Topic of Field Visit to works related to Building Services

Student shall visit to ongoing construction sites in field to witness and collect necessary information from works of execution of building services such as electrification, plumbing, air-conditioning, acoustics, etc. It is desirable to collect basic information on components, tools and plants, construction equipment, safety precautions, etc. Intention of the work is to introduce the student to the chronological order of execution of works and generate data on vocabulary of terms in field.

## CVE4-501 Basic Human Rights

**Teaching Scheme:** (3 Lectures ) hours / Week

**Pre Requisites:** Mathematics - I and Mathematics – II

### Course Contents

#### Module 1: Concept, Development and Evolution

Philosophical, Sociological and Political debates, Benchmarks of Human Rights Movement.

#### Module 2 Human Rights and the Indian Constitution

Constitutional framework, Fundamental Rights & Duties, Directive Principles of State Policy, Welfare State & Welfare Schemes

#### Module 3: Human Rights & State Mechanisms

Police & Human Rights, Judiciary & Human Rights, prisons & Human Rights, National and State Human Rights Commissions

#### Module 4: Human Rights of the Different Sections and contemporary issues

Unorganized Sector , Right to Environment, particularly Industrial sectors of Civil Engineering and Mechanical Engineering; Globalization and Human Rights; Right to Development,

#### Module 5: Citizens' Role and Civil Society

Social Movements and Non-Governmental Organizations, Public Interest Litigation, Role of Non Government, organizations in implementation of Human rights, Right to Information

## Module 6: Human Rights and the international scene

Primary Information with reference to;

Engineering Industry: UN Documents, International Mechanisms (UN & Regional), International Criminal Court

### Reference Books:

- Introduction to International Humanitarian Law by Curtis F. J. Doebbler - CD Publishing
- 2.Human Rights in India- A Mapping ,Usha Ramanathan: free download from
- <http://www.ielrc.org/content/w0103.pdf>
- Study material on UNESCO,UNICEF web site
- 4.Information, by Toby Mendel - UNESCO , 2008

## CVE4-502 Rock Mechanics

**Teaching Scheme:** Lectures: 4 hours/week

**Pre Requisites:** Engineering Geology (CV306)

### Course Contents

#### Module 1

(6 Lectures)

Introduction, Development of Rock Mechanics, Applications of Rock Mechanics

#### Module 2

(10 Lectures)

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

#### Module 3

(8 Lectures)

Classification, Rock Mass Classification, Rock Quality Designation, Rock Structure Rating, Geo-mechanics and NGI Classification Systems

#### Module 4

(8 Lectures)

Methods of Improving Rock Properties, Rock Reinforcement & Rock Bolting

#### Module 5

(8 Lectures)

Stability of Rock Slopes, Modes of Failure, Methods of Analysis, Prevention and Control of Rock Slope Failure, Monitoring and Maintenance

#### Module 6

(8 Lectures)

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 Zienkiewicz, "Rock Mechanics in Engineering Practice", John Wiley and Sons, India
- Subinoy Gangopadhyay , "Engineering Geology ",oxford university

### References

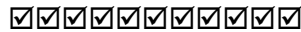
- Goodman R. E., "Introduction to Rock Mechanics", John Wiley and Sons, India
- Obert and Duvall, "Rock Mechanics and Hydraulic Structures", John Wiley and Sons, India
- Winterkorn and Fang, "Foundation Engineering Hand Book"
- Relevant Indian Standards.

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

CO1: Understand the mechanism of rock under various conditions.

CO2: Able to determine the engineering properties of rocks and sub-surface conditions or geological structure.

CO3: Identify various cause of slope failure and suggest some preventive measures for them.



## **CVE5-501 Materials in Civil Engineering**

**Teaching Schemes:** Lectures: 3 hours / week

### **Module 1**

**Stones:** Classification, Stone quarrying, Machines for quarrying, Blasting, Dressing of stones, Use of stones, Natural bed of stones, Deterioration of stones, Retardation of decay of stones, Preservation of stones, Artificial stones, Common building stones of India, Qualities of a good building stones, Tests of stones.

**Bricks:** Comparison of brickwork and stonework, Brick earth, Classification of brick earth, Manufacture of bricks, Clamp-burning and kiln-burning, Qualities of good bricks, Strength of bricks, Tests for bricks, Classification of bricks, Use of bricks, Colour, size and weight of bricks, Shape of bricks, Fire-clay, Fire-bricks, Substitutes for bricks.

**Clay Products and Refractories:** Ceramics, Tiles, Encaustic tiles, Terra-cotta, Earthen ware, Stone ware, Porcelain, Glazing, Clay blocks, Refractories.

### **Module 2**

**Lime:** Definition, Classification of binding materials, Sources of lime, Constituents of limestone's, Tests for lime stones, Classification of limes, Comparison between fat lime and hydraulic lime, Manufacture of fat lime, natural and artificial hydraulic lime, Use of lime.

**Cement:** Definition, Indian cement industry, Comparison of ordinary cement, Properties of cement, Functions of cement ingredients, Setting action of cement, Site for cement factory, Manufacture of ordinary cement, Packing of cement, Ball mills and tube mills, Field tests for cement, Laboratory tests for cement, Storage of cement, Use of cement, Varieties of cement.

### **Module 3**

**Mortar and Concrete:** Definition, Sand, Natural sources of sand, Classification of sand, Bulking of sand, Properties of good sand, Tests for sand, Substitutes for sand, Classification of mortars, Properties of good mortar mix and mortar, Preparations, Uses, Selection of mortar, Tests for mortars.

Materials used in C.C. work, Proportioning concrete, Grading of aggregates, Water-cement ratio, Workability, Mixing the materials of concrete, Transporting, placing consolidation of concrete, Curing, Water-proofing cement concrete,

### **Module 4**

**Timber:** Definition, Classification and structure of trees, Defects in timber, Qualities of good timber, Decay, Preservation, Fire-resistance, Seasoning, Conversion, Storage, Market forms of timber, Industrial timber, Advantages and uses of timber, Uses, Indian timber trees, Plantation.

**Glass:** Classification, Composition, Properties, Types of glass, Manufacture of glass, Treatment of glass, Colored glass, Special varieties of glass, Glass industry in India.

**Plastics:** Brief history, Composition, Polymerization, Classification of plastics, Resins, Molding compounds, Fabrication, Properties, Uses, PVC, Fiber glass reinforced plastic, High Density Plastics

**Paints, Varnishes and Distempers:** Painting, Varnishing, Distemping, Wall paper, White washing, Color washing.

**Miscellaneous Materials:** Abrasives, Adhesives, Asbestos, Asphalt, Cork, Electrical insulators, Fly-ash, Fuels, Gypsum, Gypsum plaster, Heat-insulating materials, Lubricants, Rubber, Sealants for joints, Sheets for pitched roof coverings, Solder, Sound absorbent materials, Tar, Turpentine, Materials used for Acoustical Treatments

**Module 5: Ferrous Metals:** Iron ores, Selection of iron ores, Pig-iron, Manufacture of Pig-iron, Properties of Pig-iron, Types of Pig-iron, Other methods of pig-iron manufacture, Cast-iron, Casting, Wrought-iron.

**Steel:** Manufacture of steel, Uses of steel, Factors affecting physical properties of steel, Magnetic properties of steel, Defects in steel, Market forms of steel. Mechanical treatment of steel, Heat treatment processes, Properties of various steel types

**Non-Ferrous Metals And Alloys:** Non-ferrous metals, (Aluminum, Cobalt, Copper, Lead, Magnesium, Nickel, Tin, Zinc), Alloys.

#### Module 6

**Failure of Materials:** Brittle fracture, ductile fracture, ductile brittle transitions, fatigue failure, creep, corrosion, oxidation

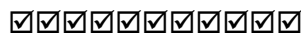
**Corrosion:** Causes of corrosion, Factors influencing corrosion, Theories of corrosion, Forms of corrosion, Effects of corrosion, Corrosion of ferrous metals, Standard electrode potential, and Prevention measures for corrosion.

#### Text Books

- 1) Rangawala, S.C. *et. al.*, “Engineering Materials”, Charotar Publishing House, Anand, 2002.
- 2) Duggal, S.K., “Building Materials”, New Age International (P) Ltd., Delhi, 2003.
- 3) Gurcharan Singh, “Building Materials”, Standard Publishers Distributors, Delhi, 2006.
- 4) Mackey W.B. and Mackey W.C., “Building Construction”,

#### Reference Books

- 1) Neville, A.M., “Properties of Concrete”, Pitman Publishing, London, 1981.
- 2) Rajput, R.K., “Engineering Materials”, S. Chand and Co. Ltd., 2008.
- 3) Shetty, M.S., “Concrete Technology”, S. Chand and Co. Ltd., 2008.
- 4) Ghosh, “Materials of Construction”, Tata McGraw Hill Publications, Delhi.



## CVE5-502 Business Communication & Presentation Skills

**Teaching Scheme:** (3 Lectures) hours / Week

**Pre Requisites:** Mathematics - I and Mathematics – II

### Course Contents

#### Module 1: Language for Technical Purpose and Presentation Tools

Technical vocabulary, Sentence structures, Computer Aids, Graphical presentations **(03 Lectures)**

#### Module 2: Formal Written Communication

Drafting Letters, e-Mails, Memos, Notices, Circulars, Schedules. **(03 Lectures)**

#### Module 3: Project Proposals and Reports

Abstract, Aims, Background & significance, Design & methods, Writing a sample proposal, Project Report: Types of reports, Planning a report, Collection & organization of information, Structure & style, Proofreading etc. **(06 Lectures)**

#### Module 4: Leadership Skill and Team Building, Working.

Leadership Skills: Leadership quality and styles, Emotional intelligence, Diplomacy and Tact and effective communication, Case studies. Need of team, Effective teams, Group development **(06 Lectures)**

#### Module 5: Business Meetings

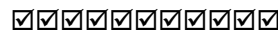
Understanding role of meetings, planning meetings, developing meeting agendas, scheduling meetings, Taking notes and publishing minutes (06 Lectures)

**Module 6: Presentation Skills**

Use of presentation tools, Presentation, nonverbal techniques, handling questions (04 Lectures)

**References:**

- S. Hariharan, et.al. Soft Skills; MJP Publishers, 2010.
- John Seely, Oxford Guide to Effective Writing and Speaking; Oxford University Press, 2009.
- Thomas N. Huckin and Leslie A. Olsen, Technical Writing and Professional Communication for Nonnative Speakers of English; Tata McGraw Hills, International Edition, 1991.
- Ann Masters & Harold R. W., Personal Development for Life & Work, 10e, Cengage, Learning India Private Limited, 2011.



## Semester- VI

§: Students should register for the CVP604 in Semester VI and appear at examination in Semester VII. Result shall appear in Grade Report of Semester VII

Sr. No.	Subject Code	Subject Title	Contact hours			Credit
			L	T	P	
01	CV 601	Design of Concrete Structures I	3	1	-	4
02	CV 602	Transportation Engineering	3	-	-	3
03	CV 603	Professional Practices	2	2	-	3
04	CV 604	Foundation Engineering	3	-	-	3
05	CV 605	Building Planning and Design	2	2	-	3
06		<b>Elective VI</b>	3	-	-	3
<b>Practical / Drawing and/or Design</b>						
07	CVL 601	Professional Practices Laboratory	-	-	2	1
08	CVL 602	Transportation Engineering Laboratory	-	-	2	1
09	CVL 603	Building Planning, Design and Drawing Laboratory	-	-	3	2
10	CVL 604	Industrial Training <sup>§</sup>	-	-	-	-
		<b>Sub-Total</b>	<b>16</b>	<b>5</b>	<b>7</b>	
		<b>Total</b>	<b>28</b>			<b>23</b>
<b>Elective VI</b>						
	CVE6-601	Project Management	3	-	-	3
	CVE6-602	Geographic Data Analysis and Applications				
	CVE6-603	Town and Urban Planning				

## CV 601 Design of Concrete Structures - I

**Teaching Scheme:** (3 Lectures + 1 Tutorial) hours/week

**Pre Requisites:** Solid Mechanics (CV302), Structural Mechanics I, II (CV402), (CV502)

### Course Contents

**Module 1:** (5 Lectures)

Basic Aspects of Structural Design, Introduction to Design Philosophies, Stress Strain behaviour of Materials, Permissible stresses, Comparison of Different Philosophies, Estimation of Loads

## Working Stress Method

### Module 2: (6 Lectures)

Stress block parameters, Balanced, under reinforced and over reinforced section: Modes of failure, properties of singly and doubly reinforced rectangular section beams, Analysis and Design of Singly and Doubly Reinforced Beams  
One Way Rectangular SLaboratories: and Two Way Rectangular SLaboratories: Behaviour of sLaboratory, types, support conditions, analysis and design with various conditions

### Module 3: (6 Lectures)

Analysis and Design of Axially and Eccentrically Loaded Columns, Isolated Column Footings, Staircases, Design of dog-legged and open well stair case, effective span and load distribution

## Limit State Method

### Module 4: Introduction to Limit State Approach (5 Lectures)

Introduction to Limit State Approach, Types and Classification of Limit States, Characteristics Strength and Characteristics Load, Load Factor, Partial Safety Factors

### Module 5: Limit State of Collapse (Flexure) (7 Lectures)

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

### Module 6: Limit States of Collapse (Shear and Bond) (7 Lectures)

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, detailing of reinforcement

### Text Books

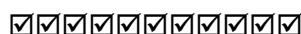
- IS: 456-2000, IS: 456-1978, Bureau of Indian Standards, New Delhi
- Karve and Shah, “Limit State Theory & Design”, Structures Publications, Pune
- Jain A.K., “Reinforced Concrete Design (Limit State)”, Nemchand Brothers, Roorkee
- Sinha and Roy, “Fundamentals of Reinforced”
- Sinha S.N., “Reinforced Concrete Design, Vol. I, II”, Tata Mc-Graw Hill
- Varghese P.C., “Limit State Design of Reinforced Concrete”, Prentice Hall of India, New Delhi
- Mehra H. and V.N. Vazirani, “Limit State Design of Reinforced Concrete Structures”, Khanna Publishers, N. Delhi, ISBN No: 978-81-7409-162-9
- Vazirani V.N. and Ratwani M.M., “Design of Reinforced Concrete Structures”, Khanna Publishers, N. Delhi, ISBN No: 978-81-7409-232-8

### Reference Books

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

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

- Comprehend to the various design philosophies used for design of reinforced concrete.
- Analyze and design the reinforced concrete beam using limit state and working state method.
- Analyze and design the reinforced concrete sLaboratory using limit state and working state method.
- Analyze and design the reinforced concrete column using limit state and working state method.



## CV 602 Transportation Engineering

**Teaching Scheme:**(3 Lectures +1 Tutorial) hours/week

**Pre Requisites:** Geotechnical Engineering (CV503),Solid Mechanics (EM02)

## Course Contents

### Module 1: Introduction

(5 Lectures)

Importance of various modes of transportation, Highway Engineering, Introduction to Intelligent Transport Systems (ITS)

### Module 2:

(6 Lectures)

Developments in Road Construction, Highway Planning, Alignment and Surveys, Geometric Design- Cross section elements, Sight distances, Horizontal alignment, Vertical alignment, Intersections

### Module 3:

(6 Lectures)

Construction of Pavements, Construction and Maintenance of Drainage, Road Arboriculture

**Highway Materials:** Soil – relevant properties, Various tests, Aggregates – strength, hardness, toughness, soundness, durability, shape, specific gravity, water absorption, Bituminous materials – Bitumen, Tar, and Asphalt – various properties, Design of Bituminous paving mixes-Marshall stability test

### Module 4: Traffic Engineering

(8 Lectures)

Traffic Characteristics, Speed, Journey Time and Delays, Vehicle Volume Counts, Origin and Destination Studies, Analysis and Interpretation of Survey Data, Traffic Operations, Design of Signals and Rotary intersections, Parking Space Design, Highway Lighting, Planning and Administration, Road Markings, Signs

**Road Accidents and Safety:** Classification, Causes, Mitigation and Control Measures, Aspects of Safety in Usage of Roads, Type and Design of anti-crash barriers,

### Module 5: Pavement Design

(5 Lectures)

Basic Principles, Methods for different Types of Pavements, Design of flexible pavement using IRC: 37- 2012, Design of rigid pavement using IRC: 58-2011

### Module 6: Other modes of Transport

(6 Lectures)

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

### Text Books

- Khanna and Justo, “Highway Engineering”, Nemchand & Bros., Roorkee
- Khanna S.K., “Highway Engineering”,
- Arora N. L., “Transportation Engineering”
- Bindra and Arora, “Highway Engineering”, Standard Publishers
- Vazirani V.N. and Chandola S.P., “Transportation Engineering”, Vol I Khanna Publishers, N. Delhi
- Vazirani V.N. and Chandola S.P., “Transportation Engineering”, Vol II Khanna Publishers, N. Delhi ISBN NO: N/A
- Shahani P.B, “ Road Techniques” Khanna Publishers, N. Delhi ISBN NO: 978-81-7409-197-1 PRICE 149/-
- Kadiyali L.R, “Traffic Engineering and Transport Planning”, Khanna Publishers, N. Delhi, ISBN NO:978-81-7409-220-X

### Reference Books

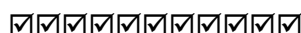
- Garber, N.J. and Hoel, L.A., “Traffic and Highway Engineering”, West Publishing Company, New York
- Jones, J.H., “Geometric Design of Modern Highways’, E & FN SPON Ltd., London.
- Khistry, C.J., “Transportation Engineering – An Introduction’, Prentice Hall of India Ltd.
- Agor R., “Surface Transportation (Railways and Highways)”, Khanna Publishers, N. Delhi ISBN NO: 978-81-7409-273-1

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

Comprehend various types of transportation systems and their history of the development

Comprehend to various types of pavements

Design the pavements by considering various aspects associated with traffic safety measures.



**Teaching Scheme:**(3 Lectures + 1 Tutorial) hours/week

**Pre Requisites:**Building Construction (CV305)

## Course Contents

### Module 1: Quantity Surveying

(8Lectures)

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

### Module 2: Costing

(8Lectures)

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

### Module 3: Tendering

(6 Lectures)

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,

### Module 4: Contracts

(4Lectures)

Essentials of legally valid contract, types and 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, introduction to arbitration

### Module 5: Valuation

(4 Lectures)

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

### Module 6:

(6 Lectures)

Valuation from yield and from life, gross yield and net yield, sinking fund, depreciation, different methods of calculating depreciation, depreciated cost, obsolescence

### Text Books

- Dutta B. N., “Estimating and Costing”, UBS Publishers Distributors
- NanavatiRoshan, “Professional Practice Estimating and Valuation”, Laksmi book Depot
- Patil B. S., “Civil Engineering Contracts and Estimates”, Universities Press, 3rd edition
- Bhasin P. L., “Quantity Surveying”, S.Chand and Co. Ltd Revised 3rd edition
- Rangwala S. C., “Elements of Estimating and Costing”, Charotar Publication 8th edition
- Birdi, “Estimating and Costing”, DhanpatRai Publication 1988 28th edition
- Chakroborty M., “Estimating, Costing & Specification in Civil Engineering”, M.Chakraborty Publication
- Rangwala S. C., “Valuation of real Properties”, Charotar Publication,2011

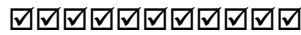
### References

- Govt. of Maharashtra P.W.and housing dept publication edition 1979 and 1981
- 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
- Publications of Bureau of Indian Standards: IS 1200 all parts, and other relevant

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



Understand the importance of preparing the types of estimates under different conditions for various structures.  
Know about the rate analysis and bill preparations and to study about the specification writing.  
Know the various types of contract, accounts in PWD, methods for initiating the works in PWD and tendering.  
Understand the valuation of land and buildings, various methods and factors affecting valuation.



## CV 604 Foundation Engineering

**Teaching Scheme:** (3 Lectures + 1 Tutorial) hours/week

**Pre Requisites:** Geotechnical Engineering (CVT503), Engineering Geology (CVT306), Solid Mechanics I (CVT302)

### Course Contents

**Module 1:**

**(6 Lectures)**

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

**Module 2:**

**(8Lectures)**

Theoretical Bearing Capacity Analysis - Failure Modes, Terzaghi's Analysis, Specialization of Terzaghi's Equations, Skempton Values for  $N_c$ , Meyerhof'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

**Module 3:**

**(5Lectures)**

Foundation Construction in Difficult Soils - Guidelines for Weak and Compressible Soils, Expansive soil, Parameters of Expansive Soils, Collapsible Soils and Corrosive Soils, Causes of Moisture changes in Soils, Effects of Swelling on Buildings, Preventative Measures for Expansive Soils, Modification of Expansive Soils, Design of Foundation on Swelling Soils, Ground Improvement Methods: Improvement of Cohesive Soils, Improvement of Cohesionless Soils, General Methods for Ground Improvement

**Module 4:**

**(5 Lectures)**

Shallow Foundations: Assumptions & Limitations of Rigid Design Analysis, Safe Bearing Pressure, Settlement of Footings, Design of Isolated, Combined, Strap Footing (Rigid analysis), Raft Foundation (Elastic Analysis), I. S. Code of Practice for Design of Raft Foundation

**Module 5:**

**(8 Lectures)**

Deep foundations: Pile Foundation: Classification, Pile Driving, Load Carrying Capacity of Piles, Single Pile Capacity, Dynamic Formulae, Static Formulae, Pile Load Tests, Penetration Tests, 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

**Module 6:**

**(6 Lectures)**

Slope Stability: Different Definitions of Factors of Safety, Types of Slope Failures, Stability of an Infinite Slope of Cohesionless Soils, Stability Analysis of an Infinite Slope of Cohesive Soils, 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", Pittsburgh vintage Grand Prix
- Murthy V.N.S., "Soil Mechanics and Foundation Engineering", CRC Press 2002

- Arora K.R., “Soil Mechanics and Foundation Engineering”, Standard publication 2009
- Punmia B. C., “Soil Mechanics And Foundation Engineering”, Laxmi publication 16th 2017
- Nayak N.V., “Foundation Design Manual”, Dhanpat Rai And Sons
- Brahma S.P., “Foundation Engineering”, Tata McGraw-Hill 5th Edition
- Braja Das, “Principles of Geotechnical Engineering”, Engage Learning 9th edition
- Bowles J.E., “Foundation analysis & Design”, McGraw-Hill Higher Education 5th edition

#### References Books

- Teng W.C., “Foundation Design”, Prentice-Hall Inc
- Tomlinson M.J., “Foundation Design & Construction”, Prentice-Hall; 7th edition
- Lee, “Sheet Piles” Concrete Publication,1961
- Relevant Publications by Bureau of Indian Standards, New Delhi
- IS 6403:1981, IS 1904:1986, IS 4091:1979

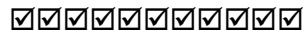
**Course Outcomes:** On completion of the course, the students will be able to:

To predict soil behavior under the application of loads and come up with appropriate solutions to foundation design queries.

Analyze the stability of slope by theoretical and graphical methods.

Analyze the results of in-situ tests and transform measurements and associated uncertainties into relevant design parameters.

Synthesize the concepts of allowable stress design, appropriate factors of safety, margin of safety, and reliability.



## CV 605 Building Planning and Design

**Teaching Scheme:**3 Lectures hours/week

**Pre Requisites:** Engineering Graphics (EGP04), Basic Civil Engineering (BCE06), Building construction (CV305)

### Course Contents

#### Planning of Buildings

**Module 1:** **(6 Lectures)**

Principles of building planning, significance sun diagram, wind diagram, orientation, factors affecting, and criteria under Indian condition, concept of green building: aspect at planning level, construction stage and operational level.

**Module 2:** **(6 Lectures)**

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

**Module3:** **(6 Lectures)**

Traditional constructions using stone, brick, timber, bamboo, mud, lime, etc. low cost housing-materials & methods (conceptual introduction only), maintenance, repairs, rehabilitation

#### Building Services

**Module 4:Plumbing Systems** **(10Lectures)**

Various materials for system like stoneware, GI, AC, CI, PVC, HDPE and 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:** wiring types, requirements & location of various points, and 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

**Module 5: Ventilation****(10 Lectures)**

Definition, necessity of ventilation, functional requirements, 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

**Module6: Introduction to Acoustics****(10 Lectures)**

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**

- Shah, Kale, Pataki, "Building Drawing", Tata McGraw- Hill
- Sane Y. S., "Building Design and Drawing", Allied Book Stall, Pune
- Jain V.K., "Automation Systems in Smart and Green Buildings", Khanna Publishers, N. Dehli ISBN No 978-81-7409-237-3
- Jain V.K., "Handbook of Designing and Installation of Services in High Rise Building Complexes", Khanna Publishers, N. Dehli, ISBN No. 978-81-7409-245-8
- Deodhar S.V., "Building Science and Planning", Khanna Publishers, N. Dehli, ISBN No. 978-81-7409-199-8
- Jain A.K., "The Idea of Green Building" Khanna Publishers, N. Dehli, ISBN No. 978-81-7409-256-4
- 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

**Course Outcomes:** On completion of the course, the students will be;

To plan buildings considering various principles of planning and bye laws of governing body.

Comprehend various utility requirements in buildings

Understand various techniques for good acoustics.

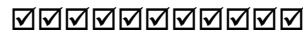


## CVL 601 Professional Practices Laboratory

Term work include detailed study and working of following set of assignments

- 1) Detailed estimate for a two storied RCC or load bearing wall building
- 2) Preparing detailed estimate for any four 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 one 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.



## CVL 602 Transportation Engineering Laboratory

**Practical:** 2 hours / week    **Term work:** 50 marks

Practical Work consists of at least Eight performances among the list below and detailed reporting in form of journal and Project Reports. Practical examination shall be based on above

### Tests on Aggregates

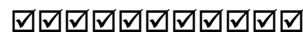
- 1) Shape Test
- 2) Specific Gravity and Water Absorption Test
- 3) Stripping Value Test
- 4) Soundness Test
- 5) CBR Test on Soil and Aggregates

### Test on Bituminous Materials

- 6) Penetration Test
- 7) Softening Point Test
- 8) Flash and Fire Point Test
- 9) Ductility Test
- 10) Viscosity Test
- 11) Specific Gravity Test
- 12) Demonstration of Marshall Test
- 13) Pavement design exercise based on flexible pavement consisting of bituminous concrete.
- 14) Visit to Road construction site for studying different construction equipment's.

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

- Perform tests on various road construction materials.
- Perform CBR tests on local soils to determine subgrade properties needed for roadways.



## CVL 603 Building Planning Design and Drawing Laboratory

**Practical:** 4 hours / week    **Term work:** 50 marks

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 as per local statutory body bye-laws such as Town Planning, Municipal Council or Corporation Authorities.
  - 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.
- 3) Setting out of planned building actually on ground using conventional or modern surveying instruments

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

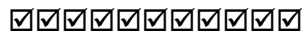
Draw plan, elevation and section of load bearing and framed structures.

Draw plan, elevation and section of public structures.



## CVL 604 Industrial Training

Students are expected to undergo industrial training for four to six weeks at construction material or component production factories / construction site / design offices or in combination of these. Training session/s 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 VI

### CVE6-601 Project Management

**Teaching Scheme:** (4 Lectures +1 Tutorial) hours/week

**Pre Requisites:** Engineering Management (CV409)

#### Course Contents

- |  |                      |
|--|----------------------|
| <b>Module 1:</b>   | <b>(6 Lectures)</b>  |
| Introduction, Steps in Project Management, fundamentals of material, machinery and manpower management in Project, Bar Chart, Mile stone chart, Development of network, Fulkerson’s Rule, Introduction to CPM, Time estimates, floats, critical path   |                      |
| <b>Module 2:</b>   | <b>(8 Lectures)</b>  |
| Network Compression, Least Cost and Optimum Duration, Resource Allocation, Updating Calculations for Updated Network   |                      |
| <b>Module 3:</b>   | <b>(8 Lectures)</b>  |
| Introduction to PERT, concept of probability, normal and beta distribution, central limit theorem, time estimates, critical path, slack, probability of project completion   |                      |
| <b>Module 4:</b>   | <b>(10 Lectures)</b> |
| 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 |                      |
| <b>Module 5:</b>   | <b>(8 Lectures)</b>  |
| Linear break even analysis – problems, quality control – concept, statistical methods – control charts   |                      |
| <b>Module 6:</b>   | <b>(8 Lectures)</b>  |
| Total quality management– philosophy of Juran, Deming, importance, Quality Circle implementation, introduction to ISO 9000 series and 14000 series, Introduction to Computer Aided Project Management  |                      |

**Text Books**

- Roy Pilcher, “Project Cost Control in Construction”, Sheridan House Inc.(Feb1988)
- Gupta R.C. “Statistical Quality Control”, khanna publishers 9th edition

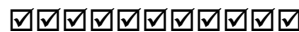
- Layland Blank and Torquin, “Engineering Economics”,Mc-Graw-Hill Edition
- Naik B. M. “Project Management”,Stosius Inc./Advent Book division
- Khanna O.P., “Work Study”,Dhanpatrai publication
- Srinath L. S. “CPM PERT”, Affiliated East-West Press (pvt) ltd

**Reference Books**

- Antill and Woodhead, “C.P.M. in Construction Practice”, Wiley-Interscience 4th edition 1990
- Taylor. G.A., “Management and Engineering Economics”, Mc-Graw Hill 4th edition
- Roy Pilcher, “Principles of Construction Management” Mc-Graw Hill Higher Education 2rd revision

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

- Understand various steps in project Management, different types of charts.
- Construct network by using CPM and PERT method.
- Determine the optimum duration of project with the help of various time estimates.
- Know the concept of engineering economics, economic comparisons, and linear break even analysis problems.
- Understand the concept of total quality Management including Juran and Deming’s philosophy.



## Elective VI

### CVE6-602 Geographic Data Analysis and Applications

**Teaching Scheme:** (3 Lectures + 1 Tutorial) hours / Week

**Pre Requisites:** Mathematics - I and Mathematics – II

#### Course Contents

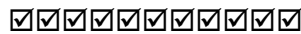
- Module 1:** **(6 Lectures)**  
 Basic concepts of GIS- Information systems, spatial and non-spatial information, geographical concepts and terminology, advantages of GIS, basic components of GIS, commercially available GIS hardware and software, organization of data in GIS.
- Module 2:** **(6 Lectures)**  
 GIS data- Field data, statistical data, Maps, aerial photographs, satellite data, points, lines and areas features, vector and raster data, advantages and disadvantages, data entry through keyboard, digitizers and scanners, digital data, preprocessing of data rectification and registration, interpolation techniques.
- Module 3:** **(6 Lectures)**  
 Data management- DBMS, various data models, run-length encoding, quadrees, data analysis-data layers, analysis of spatial and non-spatial data, data overlay and modeling, data processing: raster based and vector based, data presentation –hardcopy devices, softcopy devices.
- Module 4:** **(6 Lectures)**  
 Remote sensing and GIS integration- Principles of electromagnetic remote sensing, imaging characteristics of remote sensing systems, extraction of metric and descriptive information from remotely sensed images, integration of remote sensing and GIS.
- Module 5:** **(6 Lectures)**  
 Digitizing, Editing and Structuring of map data: Digitizing: manual, semiautomatic and automatic, editing: error detection and correction, tolerances, topology creation, Attribute map generation.  
 Digital Elevation Model: Need of DEM, Various structures of DEM: line,
- Module 6:** **(6 Lectures)**  
 Applications of GIS- Map revision, land use, agriculture, forestry, archaeology, municipal geology, water resources, soil erosion, land suitability analysis, change detection

**Term Work:**

Each student to appear for at least one written test during the semester. At least 10 assignments based on above syllabus and the graded answer paper for the semester test to be submitted.

**Text/Reference Books:**

- 1.Lo C P, Yeung A K W, Concepts and Techniques of Geographic Information Systems, Prentice Hall. India.
- 2.Kang-tsung Chang, Introduction to Geographic Information Systems, Tata McGraw Hill



## Elective VI

### CVE6-603 Town and Urban Planning

**Teaching Scheme:** Lectures: 4 Hours / Week

#### Course Contents

**Module 1:** Necessity and scope of Town Planning, Brief history, Greek and Roman Towns, Planning in ancient India - Indus Valley Civilization, Vedic Period, Buddhist Period, Medieval Period, Mogul Period, British Period, Post Independence Period, Theories in urban and regional planning

**Module 2:** Town Planners in Modern Era such as Sir Patrick Geddes, Sir Ebenezer Howard, Clarence stein, Sir Patrick Abercrombie, Le Corbusier, Present Status of Town Planning in India, Efficiency Measures, Planners skills, Integrated Area Planning in India. Distribution and sizes of Settlements

**Module 3:** Layout of Residential Units, Neighborhood Unit Planning, Radburn Plan, Grid Iron Pattern, Shoe String Development, Growth Pattern of Towns, Concentric Satellite, Ribbon Development, Scattered growth

**Module 4:** Elements of Town, Various Zones, Development Control Rules and Building Bye Laws, Urban Roads: Objective, Classification, Road Networks, Data Collection Surveys, Analysis of data,

Town aesthetics, Landscape Architecture, Suitability of Trees, Treatment of Traffic Islands, Open Spaces Walkways Public Sit-outs, Continuous Park System, Green ways

**Module 5:** Town Planning works with reference to M.R.T.P. Act, Land Acquisition Act, Necessity and procedure of acquisition

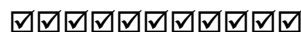
**Module 6:** Village Planning, Multilevel Planning, Decentralization Concepts, Rural Developments, Planning Methodology, Growth Centre Approach, Area Development Approach, Integrated Rural Development Approach

**Text Books**

- Gandhi N.K., “Town and Country Planning”,
- Hiraskar G.K., “Town and country Planning”
- Rangawala S.C., “Town Planning”, Charotar Publications, Anand
- Sundaram K.V., “Urban and Regional Planning in India”, Vikash Publishing House Pvt. Ltd.
- MRTP Act 1966
- Land Acquisition Act - 1894
- Misra S.N., “Rural Development Planning-Design and Method”, Satvahan Publications, N. Delhi

**Reference Books**

- Lewis Kuble, “Town and Country Planning”
- Gallion, “The Urban Pattern”, Eisner



## Semester- VII

Sr. No.	Subject Code	Subject Title	Contact hours			Credit
			L	T	P	
01	CV 701	Design of Concrete Structures II	3	1	-	4
02	CV 702	Infrastructure Engineering	3	-	-	3
03	CV 703	Water Resources Engineering	3	-	-	3
04		<b>Elective VII</b>	3	1	-	4
05		<b>Elective VIII</b>	3	-	-	3
<b>Practical / Drawing and/or Design</b>						
06	CVL 701	Structural Design & Drawing of Steel Structures	-	-	3	2
07	CVL 702	Seminar or Community Project	-	-	2	1
08	CVL 703	Project Stage-I	-	-	4	2
09	CVL 704	Seminar on Topic of Field Visit Road Construction	-	-	-	-
10	CVL 705	Industrial Training <sup>s</sup>	-	-	-	2
		Sub-Total	<b>15</b>	<b>2</b>	<b>9</b>	
		<b>Total</b>	<b>26</b>			<b>24</b>
<b>Elective VII</b>						
	CVE7-701	Plastic Analysis and Design	3	1		4
	CVE7-702 <sup>#</sup>	Advanced Structural Mechanics				
	CVE7-703 <sup>#</sup>	Machine Foundations				
<b>Elective VIII</b>						
	CVE8-701 <sup>#</sup>	Waste Water Treatment	3	-		3
	CVE8-702	Advanced Water Resources Engineering				
	CVE8-703	Development Engineering				
	CVE8-704 <sup>#</sup>	Construction Economics & Finance				

### CV 701 Design of Concrete Structures II

**Teaching Scheme:** (3 Lectures + 1 Tutorial) hours/week

**Pre Requisites:** Design of Concrete Structure – I (CV601), Building construction (CV305), Structural Mechanics (CV402), Structural Mechanics (CV502)

#### Course Contents

##### Limit State Method

**Module 1:**

**(7Lectures)**

Limit State of Collapse (Torsion) - Types of torsion, behaviour of R.C. rectangular sections subjected to torsion, Design of sections subjected to combined bending and Torsion

**Module 2:**

**(7Lectures)**

Analysis and design of axially and eccentrically loaded short columns (Circular and Rectangular), detailing of reinforcement, and construction of Interaction diagrams for uni-axial bending, concept of bi-axial bending

##### Prestressed Concrete

**Module 3:**

**(5 Lectures)**

Introduction to prestressed concrete, concepts, types, systems and methods of pre stressing,

**Module 4:**

**(5 Lectures)**

Stress analysis for rectangular and symmetrical I sections, Pressure Line, Cable Profiles

**Module 5:**

**(6 Lectures)**

Losses in Prestressing for Pre-tensioned & Post tensioned members



**Module 6:****(6 Lectures)**

Design of Rectangular and Symmetrical I sections, Design of End Block

Structural audit of various structures such as load bearing wall type, RCC, Steel Framed, Prestressed Concrete, etc.: conceptual introduction to elaborate necessity, implementation of audit, format of reporting, consequences

**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
- Lin T.Y., “Prestressed Concrete”, John Willey & Sons New York
- Jain A.K., “Reinforced Concrete Design (Limit State)”, Nemchand Brothers, Roorkee
- Sinha S.N., “Reinforced Concrete Design”, Vol. I, 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, II, Laxmi Publications
- Varghese P.C., “Limit State Design of Reinforced Concrete”, Prentice Hall of India, New Delhi
- Relevant Publications by Bureau of Indian Standards, New Delhi
- Indian Standard codes related with nondestructive testing, Government Resolutions related to Structural Audits (BMC Act, etc.), Field manuals and reports by Expert Consultants.

**Course Outcomes:** On completion of the course, the students will be;

Able to identify the behavior, analyze and design of the beam sections subjected to torsion.

Able to analyze and design of axially and eccentrically loaded column and construct the interaction diagram for them.

Understand various concepts, systems and losses in pre-stressing.

Able to analyze and design the rectangular and symmetrical I-section pre-stressed beam/girders.



## CV 702 Infrastructure Engineering

**Teaching Scheme:**(3 Lectures +1 Tutorial) hours/week**Pre Requisites:** Transportation Engineering I (CV602), Survey I (CV304), Engineering Geology (CV306)

### Course Contents

**Module 1:****(5Lectures)**

Railway Engineering: Permanent Way, gauges, rails, sleepers, ballast, subgrade formation, fixtures and fastenings, Geometric Design of tracks- Horizontal Alignment, Vertical Alignment

**Module 2:****(8 Lectures)**

Points and Crossings: Standard types, Design of simple turnout, various types of Junctions, Stations and Yards: Purpose, Location, Site selection, general layouts of Terminus and Junction, Signalling and Interlocking, Construction and Maintenance of Track, Modern trends in Railways

**Module 3:****(8 Lectures)**

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

**Module 4:****(10Lectures)**

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, and Dredging- Special Equipments

**Module 5:****(10Lectures)**

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

**Module 6:****(7 Lectures)**

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**

- Antia K. F., “Railway Engineering”, New Book Company Pvt. Ltd
- Saxena and Arora, “A Course in Railway Engineering,” DhanpatRai& Sons Delhi
- Quinn, “Planning and Construction of Docks and Harbours”, Tata McGraw Hill, Latest Edition
- Oza, “Dock and Harbour Engineering”, Chartor Publishing House, Anand
- Shrinivasan, Rangawala, “Dock, Harbour and Tunnel Engineering”, Chartor Publishing House
- Arora N. L., “Transportation Engineering”, IPH New Delhi
- Bindra S. P., “Bridge Engineering”, Dhanpatrai and Sons
- Khanna and Arora, “Airport Engineering” 6th Edition, Nemchand& Bros., 1999
- Rangawala, “Airport Engineering”, Charotar Publishing House Pvt. Limited
- Hariharan K. V., “Containersation Multimodal Transport & Infrastructure Development in India”, Shroff Publishers, Mumbai

**References**

- Publications of Bureau of Indian Standards, New Delhi, Relevant To the SylLaboratoryus
- Cormick H. F., “Dock and Harbour Engineering”Giffin Publisher
- Raina V K, “Handbook for Concrete Bridges” Vol. 1 and 2, Shroff Publishers, Mumbai
- Horonjeff, “Planning and Design of Airports”,Fifth edition

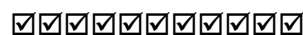
**Course Outcomes:**On completion of the course, the students will be able to:

Know about the basics and design of various components of railway engineering

Understand the types and functions of tracks, junctions and railway stations.

Know about the aircraft characteristics, planning and components of airport

Understand the types and components of docks and harbors.



## CV 703 Water Resources Engineering

**Teaching Scheme:**(3 Lectures hours/week)

**Pre Requisites:** Water Resource Engineering-I (CV405), Hydraulics Engineering-I (CV303) &II (CV401)

## Course Contents

### Module 1: Introduction

(6 Lectures)

Introduction, definition, scope, necessity, ill-effects of irrigation, advantages, types of irrigation systems, difference between weir, barrage and dam, methods of distribution of water, development of irrigation in India

Introduction to hydrology: hydrologic cycle, rain, surface and ground water

### Water Requirement of Crops

Water requirement of crops, base, delta and duty, methods of improving duty, types of soil, types of soil water, soil moisture, consumptive use, irrigation frequency, irrigation methods, crops season, crop pattern

### Module 2: Reservoirs and Dams

(6 Lecturers)

Planning of Reservoirs: Classification of Reservoir, Selection of site for Reservoir, Investigation works for Reservoir, Yield and Capacity of Reservoir, Mass Curve and Demand Curve, Storage Calculations, Control Levels, Useful Life of Reservoir, Silting of Reservoirs, Losses in Reservoirs

Gravity Dams – Estimation of Loading, Design Criteria, Causes of Failure of Gravity Dam, Precaution against Failure, Theoretical and Practical Profile, Stability Calculations, Galleries, Joints, Earth Dams: Components and their Functions, Design Criterion, Inverted Filters, Downstream Drainage, Causes of Failure of Earthen Dam. Arch Dams – Types, Forces on Arch Dam,

### Module 3: Spillway Weirs and Canals

(8 Lectures)

Spillway, Necessity and Different Types, Location of Spill Ways, Selection Criterion, Gates For Spillways,

Weirs on Permeable Foundations: Theories of Seepage, Bligh's Creep Theory, Limitations of 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

### Module 4: Lift Irrigation

(6 Lectures)

Lift irrigation, wells and tube wells, introduction, classification of well, specific yield, deep and shallow wells, comparative advantage of well and canal irrigation, duty of well water, types of tube wells, types of strainers, boring methods. Darcy's law, permeability, safe yield of basin.

Lift irrigation schemes: Various components and their design principles (Only concepts)

### Module 5: Hydrology

(6 Lectures)

Hydrology, measurement of rainfall, peak flow, base flow, precipitation and its measurement, average depth of precipitation, water losses, flood frequency, catchment area formulae, flood hydrograph, rainfall analysis, infiltration, run off, estimation of runoff, unit hydrograph and its determination, s- hydrograph

### Module 6: Water logging and drainage

(6 Lectures)

Causes of water logging, preventive and curative measures, drainage of irrigation of lands, reclamation of water logged, alkaline and saline lands, Preventive and Curative Measures

Water Conservation: Rain water Harvesting, Ground Water Recharge, small scale techniques of surface water detention such as: Soil embankments, field ponds, concrete bandhara

### 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 & Hydraulic Structures", Khanna Publishers, N. Delhi, ISBN NO: 978-81-7409-047-9
- Priyani, "Irrigation and Water Power", Charotar Publishing House, Anand
- Bharat Singh, "Irrigation", Nemchand Brothers, Roorkee
- Subramanya K., "Engineering Hydrology", Tata Mc-Graw Hill Company Limited, N. Delhi

### References Books

- USBR, "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"

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

CO1: Understand need of Irrigation in India and water requirement as per farming practice in India.

CO2: Understand various irrigation structures and schemes.

CO3: Develop basis for design of irrigation schemes.



## CVL 701 Structural Design & Drawing of Steel Structures

**Practical:**4 Hours / Week **Term Work:** 50 Marks

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, 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.

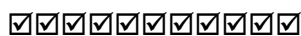
**Course Outcomes:** On completion of the course, student will be able to simulate a practical design requirement in to a theoretical statement to solve mathematically to arrive at a safe economical and realistic feasible solution that can be executed.



## CVL 702 Seminars or Community Project

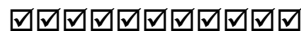
Student shall choose a topic of his interest in consultation with faculty in the department. The topic for Seminar or community project may be related to Civil Engineering area and/or interdisciplinary area.

Student shall attempt to collect necessary information 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. Simplified tools or devices may be presented in form of working model and a brief report stating development. A presentation for 10 minutes duration shall be to the satisfaction of the panel of examiners.



## CVL 703 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.

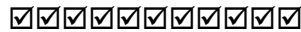


## CVL 704 Seminar on Topic of Field Visit Road Construction

Student shall visit to ongoing construction sites in field to witness and collect necessary information from works of execution of roads. It is desirable to collect basic information on components of roads, construction machinery, etc. Intention of the work is to introduce the student to the sequential order of execution of road works, preparation of road alignment and various surveys

## CVL 705 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 VIII

### CVE8-701 Plastic Analysis and Design

**Teaching Scheme:** (3 Lectures +1 Tutorial) hours/week

**Pre Requisites:** Engineering Mechanics (EM02), Structural Mechanic I (CV402), Structural Mechanics-II (CV502), Design of Steel Structure (CV501)

### Course Contents

- |  |                     |
|--|---------------------|
| <b>Module 1:</b>   | <b>(5Lectures)</b>  |
| 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  |                     |
| <b>Module 2:</b>   | <b>(7 Lectures)</b> |
| 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 |                     |
| <b>Module 3:</b>   | <b>(7 Lectures)</b> |
| 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   |                     |
| <b>Module 4:</b>   | <b>(6 Lectures)</b> |
| Secondary design considerations, design of beams with high shear, interaction of bending and shear, interaction of bending and axial force   |                     |
| <b>Module 5:</b>   | <b>(6 Lectures)</b> |
| Design of portal frames, design of corner connection with and without haunches   |                     |
| <b>Module 6:</b>   | <b>(5 Lectures)</b> |
| 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

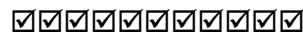
#### References

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

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

Understand modes of structural collapse

Perform the plastic analysis and design of various determinant and in-determinant structures.



## Elective VIII

### CVE8-701 Waste Water Treatments

**Teaching Scheme:**(3 Lectures +1 Tutorial) hours/week

**Pre Requisites:** Environment Engineering I (CV404), Water Resource Engineering-I (CV405)

#### Course Contents

##### Module 1: Wastewater Treatment

(5 Lectures)

Introduction of wastewater, its types and various sources, Concept of sewage, sullage and storm water, Necessity of treatment of waste water

**Preliminary treatment:** screening and grit removal units, oil and grease removal, Primary treatment,

**Secondary treatment:** Activated sludge process, trickling filter, sludge digestion, drying bed. Stabilization pond, septic tank, soakage system, Imhoff Tank, recent trends and advanced wastewater treatment: nutrient removal, solids removal

##### Module 2: Low cost wastewater treatment methods

(7 Lectures)

Principles of waste stabilization pond, Design and operation of oxidation pond, aerobic & anaerobic Lagoons, Aerated Lagoon, Oxidation ditch, Septic tank. Concept of recycling of sewage Disposal of waste water-stream pollution, Self Purification, DO sag curve, Streeter Phelp's Equation, Stream classification, disposal on land, effluents standards for stream and land disposals

##### Module 3: Industrial Waste Water Treatment Management

(6 Lectures)

**Sources of Pollution:** Physical, Chemical, Organic and Biological properties of Industrial Wastes – Differences between industrial and municipal waste waters –Effects of industrial effluents on sewers and treatment plants, Prevention vs Control of Industrial Pollution

**Pre and Primary Treatment:** Equalization, Proportioning, Neutralization, Oil Separation by Floatation, Prevention vs Control of Industrial Pollution

##### Module 4: Waste Water Treatment Methods

(7 Lectures)

Nitrification and De-nitrification – Phosphorous removal – Heavy metal removal – Membrane Separation Process–Reverse osmosis– Chemical Oxidation–Ion Exchange – Air Stripping and Absorption Processes – Special Treatment Methods – Disposal of Treated Waste

**Common Effluent Treatment Plants (CETPs):** Location, Need, Design, Operation & Maintenance Problems and Economical aspects

**Module 5: Environmental Sanitation**

**(6 Lectures)**

Communicable diseases, Methods of communication, Diseases communicated by discharges of intestines, nose and throat, other communicable diseases and their control

**Insects and Rodent Control**-Mosquitoes, life cycles, factors of diseases control methods - natural and chemical, Fly control methods and prevention of fly breeding, Rodents and public health, plague control methods, engineering and bio-control methods

**Module 6:Rural Sanitation**

**(5 Lectures)**

Rural areas, Population habits and environmental conditions, problems of water supply and sanitation aspects, low cost excreta disposal systems, Rural sanitation improvement schemes

**Text Books**

- Manual on sewerage and sewage Treatment-Government of India Publication
- Masters G.M., “Introduction to Environmental Engineering and Science”
- Metcalf & Eddy, “Waste Water Engineering Treatment & Disposal”, Tata McGraw Hill, 1982
- Garg S.K., “Sewage Disposal and Air Pollution Engineering”, Khanna Publishers
- Rao M.N.&Datta, Waste water treatment
- EhalersVictor & Earnest W Steel, Municipal and Rural sanitation

**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
- Bhatia H. S., Environmental Pollution and Control, Galgotia Publication Pvt. Ltd., New Delhi

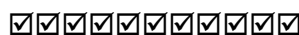
**Course Outcomes:**On completion of the course, the students will be able to:

Determine the sewage characteristics and design various sewage treatment plants.

Understand municipal water and wastewater treatment system design and operation.

Apply environmental treatment technologies and design processes for treatment of industrial waste water.

Understand the rural sanitation schemes.



## CVE8-702 Development Engineering

**Course Objectives:**

The main objectives of the course are:

1. To provide an overview to the students of the various fields within planning, such as community development, urban planning and sustainability, challenges at rural level, rural development.
2. To enable students to develop professional capabilities through field and design work in real world problems in the field of planning and development of urban and rural areas.

**Teaching Scheme:**(3 Lectures + 1 Tutorial) hours / Week

**Pre Requisites:** Mathematics - I and Mathematics – II

## Course Contents

### Module1:

Introduction to Development Engineering: need of development engineering, core disciplines and concept, major issues in development; urban development; rural development; socioeconomic development; scientific social research, formulation of research problem, field work and data collection, report drafting

### Module2:

Design of Sustainable Communities: Concept and development of sustainable communities; Sustainable design, principles, building regulations, codes and standards - ANSI, ASTM,ASHRAE, approval process; green buildings- green building techniques- energy solutions, site solutions, site solutions, exterior and interior solutions, Certification -BREEAM, GRIHA, NAHB, LEED, IGBC;

### Module 3:

Town / City Planning: Town Planning- history of town planning 111 India, characteristics of city/town, town planning at national, regional and local levels, planning standards, master plan, site layout and development, zoning and density control, green belt, slum redevelopment; Smart city planning- introduction to city planning, infrastructure elements of smart city planning, dimensions of smart cities - global standards and performance benchmark; smart solutions- e governance, waste management, water management, energy management, urban mobility, citizen services, other services such as tele-medication and education, trade facilitation, skill development; GIS for planning

### Module 4:

Planning and Development of Rural Areas: District administration, District Planning, introduction to various sectors of rural areas such as drinking water, waste water treatment, electricity, public transport, irrigation, sanitation and cooking energy; issues and challenges associated with these sectors; People's participation and role in development of rural areas; various schemes and policies floated by state and central government - phases in the schemes; life cycle costing of these schemes.

### Module 5:

Geoinformatics for Planning and Development: Introduction to Geoinformatics; Advantages, benefits and limitations; Interdisciplinary applications; Data extraction; use of Geoinformatics for planning, mapping and preparation of layouts.

### Module 6:

Development aspects: Urban and Rural: Planning and designing of a model town / city and using AutoCad and/ or GIS. Visit to a village or small town - The project will be carried out in groups. Problem faced by the villagers pertaining to various sectors or existing schemes; define the need, method, tools and techniques for development; deliver technology based solution.

### Recommended Books:

- Chand, M. and Puri, U.K.( 1983), 'Regional Planning in India', Allied Publishers, N. Delhi.
- Kaiser, E. J ., et.al. (1995), 'Urban Land use Planning', (ed) Urbana, University of Illinois Press.
- Sundaram, K.V. 1985 'Geography & Planning', Concept Publishing Co., New Delhi.
- Ayyar, C.P.V. (1987), 'Town Planning in Early South India', Mittal Publications, Delhi.
- Reeder, L. Hoboken, NJ, 'Guide to green building rating systems', John Wiley & Sons, Inc., 2010.
- Longley, P.A., Michael F. Goodchild, Maguire, D.J., Rhind, D. W. (2005), 'Geographic Information Systems and Science', Second Edition 2005: John Wiley & Sons, New York.
- Desai, V. (2005), 'Rural Development of India', Himalaya publishing house, Mumbai.
- Rau, S.K. (200 I), 'Global Search for Rural Development', NIRD, Hyderabad
- References:



o Institute of Town Planners, India, Ministry of Urban Affairs & Employment, Government of India, New Delhi, UDPFI Guidelines, 1996.

- Miles R. Simon, 1970, 'Metropolitan Problems' Methuen Publications, Canada.
- B.I.S., 1980, "National Building Code of India", ISI, New Delhi.
- ANSI/ASHRAE/USGBC/IES Standard 189.1, Standard for the Design of High-Performance Green Buildings Except Low - Rise Residential Buildings
- ASHRAE Standard 90. 1, Energy Standard for Buildings Except Low-Rise Residential Buildings

**Course Outcomes:** The required course for emphasis in development engineering will help students

1. To develop multi scaled perspective about decisions in the built environment,
2. To expose the students to the analysis and evaluation of real world problems aiming to bring desired change in the society.

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### Semester – VIII

Sr. No.	Subject Code	Subject Title	Contact hours			Credit
			L	T	P	
01	CV 801	Introduction to Earthquake Engineering	3	1		4
02		<b>Elective IX</b>	3	-		3
03		<b>Elective X</b>	3	-		3
04		<b>Elective XI</b>	3	-		3
<b>Practical / Drawing and/or Design</b>						
05	CVL 801	Earthquake Engineering Laboratory	-	-	2	1
06	CVL 802	Structural Design and Drawing of RC Structures	-	-	4	2
07	CVL 803	Self-Study Report based on field visit to Infrastructure Project Works	-	-	2	1
08	CVL 804	Project Stage-II	-	-	8	6
		Sub-Total	<b>12</b>	<b>1</b>	<b>16</b>	
		<b>Total</b>	<b>29</b>			<b>23</b>
<b>Elective IX</b>						
	CVE9-801	Construction Techniques	3	-		3
	CVE9-802	Pavement Management System				
	CVE9-803	Composite Materials				
	CVE9-804	Risk Analysis, Disaster Management and Mitigation				
<b>Elective X</b>						
	CVE10-801	Bridge Engineering	3	-		3
	CVE10-802	Structural Audit				
	CVE10-803	Design of Hydraulic Structures				
<b>Elective XI</b>						
	CVE11-801	Advanced Engineering Geology	3	-		3
	CVE11-802	Water Power Engineering				
	CVE11-803	Disaster Management				
<b>Overall Sub Total</b>						
<b>Overall Total</b>			<b>229</b>			<b>196</b>

# CV 801 Introduction to Earthquake Engineering

**Teaching Scheme:** (3 Lectures +1 Tutorial) hours/week

**Pre Requisites:** Engineering Geology (CV306), Solid Mechanics (CV302), Structural Mechanics-I (CV402), Structural Mechanics II (CV502), Building Construction (CV305)

## Course Contents

- Module 1:** (5 Lectures)  
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
- Module 2:** (5 Lectures)  
Structural dynamics: Free and forced vibrations of single degree of freedom systems, un-damped and viscously damped vibrations, equations of motion, Duhamel integral
- Module 3:** (6 Lectures)  
Response Spectrum Theory: construction of Design Response Spectrum, effect of foundation and structural damping on design spectrum, design spectrum of IS 1893, evaluation of lateral loads
- Module 4:** (8 Lectures)  
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
- Module 5:** (6 Lectures)  
Construction aspects of masonry and timber structures, retrofitting and strengthening techniques of low cost and low rise buildings, provisions of IS 4326
- Module 6:** (6 Lectures)  
Dynamic properties of soils, field and Laboratory tests, site evaluation, behavior under dynamic loads, effect on bearing capacity, settlement, liquefaction

### Text Books

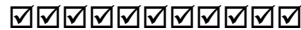
- IS 456, IS 1498, IS 1893, IS 1905, IS 2131, IS 13920, IS 4326 of recent editions, Bureau of Indian Standards, New Delhi.
- Chopra A.K. (2001), "Dynamics of Structures", 2<sup>nd</sup> Edi, Pearson Education Pvt. Ltd., India, ISBN 81-7808-472-4.
- Mario Paz, "Structural Dynamics", CBS Publication.
- Arya A.S., "Elements of Earthquake Engineering", South Asian Pub., New Delhi.

### Reference Books

- Clough R.W. and Penzien J.(1993), "Dynamics of Structures", McGraw Hill New York
- Humar J. L., "Dynamics of Structures", 2nd Edition (2002), Swets and Zeitlinger, Netherlands.
- FarzadNaiem, "The Seismic Design Handbook", Kluwer Academic Pub. (2001), Massachusetts, ISBN: 0-7923-7301-4.
- Dowrick D. J., "Earthquake Resistant Design for Engineers & Architects", John Wiley and Sons Ltd. ISBN: 0-471-91503-3.
- Pauley T. and Priestley M.J.N., "Seismic Design of Reinforced Concrete and Masonry Buildings", (1992) John Wiley & Sons Inc., USA, ISBN 0-471-54915-0.
- Nayak N. V., "Foundation Design Manual", Dhanpatrai and Sons, Delhi.
- Housner G.W. & Hudson D. E., "Applied Mechanics- Dynamics", East-West Edition, N. Delhi.

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

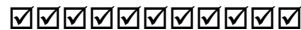
- Capture complexities in earthquake resistant design of structures
- Grasp Nature of earthquake vibration and associated forces on structures
- Understand importance of designing the building to targeted seismic performance.



## **CVL 801 Earthquake Engineering Laboratory**

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

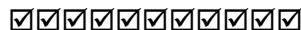
- 1) Planning of earthquake resistant building
- 2) Construction of design response spectra
- 3) Evaluation of lateral loads on multi-storeyed building as per IS 1893
- 4) Ductile detailing of members as per IS 13920
- 5) Detailing of masonry structures



## **CVL 802 Structural Design and Drawing of RC Structures**

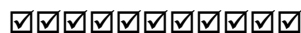
Term work shall consist of detailed analytical report for structural design and drawing of the following RC structures:

- 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



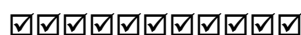
## **CVL 803 Self-Study Report based on field visit to Infrastructure Project Works**

Student shall visit to any one ongoing construction site in field to witness and collect necessary information from works of execution of infrastructure works such as bridges, railways, airports, docks, harbors, tunnels, industrial establishments, planned cities, etc. It is desirable to collect basic information on aspects of planning, operation, various specializations involved, etc. Intention of the work is to introduce the student to data on vocabulary of terms in field.



## **CVL 804 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 IX

## CVE9-801 Construction Techniques

**Teaching Scheme:** 4 Lectures hours/week

**Pre Requisites:** Project Management (CV604).

### Course Contents

**Module 1:** **(7 Lectures)**

Introduction, planning of a new project, site access and services, mechanical and manual construction, excavation in earth: Understanding basics and functions of equipment, earthmoving equipment - 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

**Module2:** **(6 Lectures)**

Excavation in hard rock, Rippers, jack hammers, drills, compressors and pneumatic equipment, blasting explosives, detonators, fuses, drainage in excavation – necessity and methods of dewatering

**Module3:** **(6Lectures)**

RMC Plant, layout and production capacity, type of concrete mixers, machinery for vertical and horizontal transportation of concrete, grouting, Shotcreting, under water concreting, Type of formwork, Slip formwork, equipment for placing of concrete in normal and difficult situations

**Module 4:** **(7 Lectures)**

Prefabricated construction: Relative economy, steel construction: planning and field operations, erection equipment, cranes of various types such as tower, crawler, luffing jib tower crane, floating and dredging equipment

**Module 5:** **(7 Lectures)**

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

**Module6:** **(6 Lectures)**

Diaphragm walls: purpose and construction methods, safety measures in construction, prevention of accidents and introduction to disaster management

#### **Text Books**

- Peurifoy R.L. “Construction, Planning, Equipment & Methods”, McGraw hill Book Co. N.Delhi
- VermaMahesh, “Construction Equipment”, Metropolitan book Co.,New York
- Singh J., “Heavy Construction - Planning, Equipment & Methods”, Oxford & IBH Pub., N.Delhi
- Taylors, “Reinforced Concrete Bridges”,

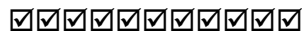
#### **Reference Books**

- Quin, “Planning and Construction of Docks and Harbors”,Mc-Graw Hill Company, New York.
- Stubbs, “Hand Book of Heavy Construction”,Mc-Graw Hill Inc,US 2nd edition.
- Boyes R.G.H, “Structural & cut off Diaphragm Walls”, Applied Science Publishers Ltd. London.
- Ataev S. S., “Construction Technology”, Mir Publishers, Moscow.

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

1. Understand the planning of new project with site accessibility and services required.
2. Comprehend thevarious civil construction equipment's.

3. Familiar with layout of RMC plant, production, capacity and operation process.
4. Recognize various aspect of road construction, construction of diaphragm walls, railway track construction etc.



## CVE9-802 Pavement Management System

**Teaching Scheme:** (4 Lectures + 1 Tutorial) hours/week

**Pre Requisites:** Transportation Engineering I (CV602), Transportation Engineering II (CV702),

### Course Contents

**Module 1:**

Pavement distresses Distresses in flexible/rigid pavements causes and remedies. Visual Surface distress survey procedures and techniques. Serviceability Indicators for roads. Measurement of Serviceability Indicators using various equipments like Bump Indicator, Skid tester, Distress surveys & Benkelman Beam. Functional evaluation of pavements- Serviceability Concepts, Visual Rating, Pavement Serviceability Index, Roughness Measurements, Skid Resistance, Roughness, and Safety Aspects. Inventory System.

**Module 2:**

Maintenance operations/alternatives- Classification of maintenance operations, Routine, Periodic, Special. Common types of maintenance: Potholes, Cracked surface, Ruts & undulations, Resurfacing, Interface treatments, Bituminous Thin Surface Courses- Seal Coat, Surface Dressing, Premixed carpet, Mixed seal surfacing, Micro asphalt concrete (MAC), Bituminous Surface Courses: Semi-Dense Bituminous Concrete, Bituminous Concrete, and Bitumen Mastic. Road maintenance in high rainfall areas. Choice of materials. Modified bitumen & geo-fabrics. Maintenance alternatives including recycling.

**Module 3:**

Pavement Management/ Maintenance Management System-Components of PMS and their Activities, Major Steps in Implementing PMS, Inputs, Design, Construction and Maintenance, Rehabilitation and Feedback Systems, Examples of HDM package, Highway Financing, Fund Generation, Evaluating Alternate Strategies and Decision Criteria.

**Module 4:**

Prediction Deterioration Models- Factors that affect performance, Types of prediction models, Prediction deterioration model development, Method to assess the precision and accuracy of the developed model.

**Module 5:**

Pavement Structural Design and Economic Analysis; Emerging Technology in Pavement Management Systems.

**Text/Reference Books:**

## Elective X

## CVE10-801 Bridge Engineering

**Teaching Scheme:** (4 Lectures + 1 Tutorial) hours/week

**Pre Requisites:** Transportation Engineering I (CV602), Transportation Engineering II (CV702), Hydraulic Engineering I

### Course Contents

**Module 1: Introduction**

**(6 Lectures)**

History of bridges, components and definitions, classification of road bridges, span length, classical examples of each type, people involved in the total process, history of analysis

**Module 2: Selection of site and initial decision process**

**(8 Lectures)**

Survey and alignment, geotechnical investigations and interpretations

**River Bridge:** Selection of bridge site and planning, collection of bridge design data, hydrological calculation, waterway calculation, scour calculation, depth of foundation, freeboard.

**Road Bridge:** Selection of bridge site and planning, collection of bridge design data, vertical clearance.

**Module 3: Standard loading for bridge design as per different codes (10 Lectures)**

**Road Bridges:** IRC, BS code, AASHTO code. dead load, live load, impact factor, centrifugal force, wind loads, hydraulic forces, longitudinal forces, seismic forces, earth pressure, buoyancy, lane concept, equivalent loads, trafficload, width of roadway and footway, influence lines for statically, determinate structures. I.L. for statically indeterminate structures, transverse distribution of live loads among deck longitudinal, load combinations for different working state and limit state designs.

**Railway Bridges:** Loadings for railway bridges, rail road data, pre-design considerations, rail road vs.highway bridges.

**Module 4: Superstructures (10 Lectures)**

Selection of main bridge parameters, design methodologies, choices of superstructure types: orthotropic plate theory, load distribution techniques, grillage analysis, finite element analysis (Preferable), different types of superstructure (RCC and PSC), Longitudinal analysis of bridge, slab bridge and voided slab bridge, beam-slab bridge, box girder bridge.

**Transverse analysis of bridge:** Slab bridge and voided slab bridge, beam-slab bridge, box girder bridge, temperature analysis, distortional analysis, effects of differential settlement of supports, reinforced earth structures.

**Typical details:** Slab bridge, slab-girder bridge (straight/skew), box girder bridge (straight/skew).

**Module 5: Substructure (8 Lectures)**

Pier, abutment, wing walls, importance of soil structure interaction

**Foundations:**open foundation, pile foundation, well foundation, examples - simply supported bridge, continuous bridge.

**Module 6: Bearings and deck joints (6 Lectures)**

Different types of bridge bearings and expansion joints, Design of bearings and joints.

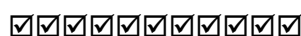
**Parapets for highway bridges:** Definitions, classification of bridge parapets, various details

**Text/Reference Books**

- Victor D. J., Essentials of Bridge Engineering, Oxford & IBH.
- Raju N. K., Design of Bridges, Oxford & IBH.
- Ponnuswamy S., Bridge Engineering, Tata McGraw Hill
- Raina V K, "Handbook for Concrete Bridges" Vol. 1 and 2, Shroff Publishers, Mumbai
- Raina V. K., Concrete Bridge Practice, (Analysis, Design Economics), 4<sup>th</sup> Edition, Shroff Publishers, Mumbai
- Raina V. K., Concrete Bridge Practice, (Construction, Maintenance, Rehabilitation),, 2<sup>nd</sup> Edition, Shroff Publishers, Mumbai
- Raina V. K., Field Manual for Highway and Bridge Engineers", 3<sup>rd</sup> Edition, Shroff Publishers, Mumbai
- Raina V. K., "World of Bridges", Shroff Publishers, Mumbai

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

1. Understand components of bridges and its various types.
2. Understand site selection criteria and comprehend various forces acting on bridges.
3. Analyze bridge structures using different analysis techniques.
4. Understand the importance of different types of bridge bearings.



# CVE10-802 Structural Audit

**Teaching Scheme:** (3 Lectures + 1 Tutorial) hours/week

**Pre Requisites:** Structural analysis (CV306).

## Course Contents

### Module 1: Introduction to Structural Audit

Introduction to Structural Audit, Objectives, Bye-laws, Importance, Various Stages involved, Visual inspection: scope, coverage, limitations, Factors to be keenly observed.

Aspects of audit of Masonry buildings, RC frame buildings, Steel Structures **(06 Lectures)**

### Module 2: Causes and types of deterioration in Structures

Causes of deterioration in structures: Permeability of concrete, capillary porosity, air voids, Micro cracks and macro cracks, corrosion of reinforcing bars, sulphate attack, alkali silica reaction,.

Causes of deterioration in Steel Structures: corrosion, Uniform deterioration, pitting, crevice, galvanic, laminar, Erosion, cavitations, fretting, Exfoliation, Stress, causes of defects in connection **(06 Lectures)**

### Module 3: Elementary aspects of Non Destructive Testing

Concrete Strength Assessment: Rebound hammer, Ultrasonic Pulse velocity, Penetration resistance, Pull out test, Chemical test: Carbonation test, Chloride test, Corrosion potential assessment, Fire damage assessment: Differential thermal analysis, X ray diffraction, Structural Integrity and soundness assessment: Radiography, Impact echo test, dynamic testing of structure, Interpretation and evaluation of test results. **(06 Lectures)**

### Module 4: Strength Evaluation of Existing Structures

Reserve strength, identification of critical sections, structural system and its validation, evaluation of damage in RC structures **(06 Lectures)**

### Module 5: Approach to conduct Structural Audits

Guidelines of Statutory Bodies, Legal aspects, Responsibility of calling Structural Audit, Scope of Investigation **(06 Lectures)**

### Module 6: Structural Audit Report

Study of sample Structural audit report for up-gradation of existing building, Audit for continuation of usage of old Buildings, Audit for Buildings damaged due to Earthquakes, Fire, **(06 Lectures)**

### References

- Indian Standard codes related with nondestructive testing, Government Resolutions related to Structural Audits (BMC Act, etc.), Field manuals and reports by Expert Consultants.

### Outcomes:

Upon completion of the course the students will be able to:

- Gain the knowledge of Bye laws, procedure of Structural audit and study the typical problems in structures.
- Aware of causes and types of deterioration in structures.
- Develop skills for use of various Nondestructive tests required during auditing of structures.
- Strength evaluation of existing structures.
- Acquire knowledge of legal procedure to conduct structural audits.
- Prepare a Structural audit report.

# Elective XI

## CVE11- 801 Advanced Engineering Geology

**Teaching Scheme:** (3 Lectures +1 Tutorial) hours/week

**Pre Requisites:** Engineering Geology (CV306), Rock Mechanics (CV509)

### Course Contents

#### Module 1

(6 Lectures)

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

#### Module 2

(8 Lectures)

**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, introduction to geological map

**Sub-surface water:**Runoff, fly off and percolation of surface water, juvenile, connate and meteoric water, water table, zones of subsurface water, perched water table, aquifer theory

#### Module 3

(10 Lectures)

**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 breccias and fractures, laterites: origin, occurrence and engineering aspects, ground water bearing capacity of rocks of Deccan trap region, percolation tanks

#### Module 4

(6 Lectures)

**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

#### Module 5

(10 Lectures)

**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

#### Module 6

(8 Lectures)

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, cause and prediction and preventive measurement of landslide in Deccan trap region.

#### 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.

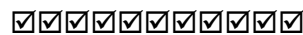


## Reference Books

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

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

- 1) Understand geological time scale and physiographic division of India and their geological characteristics and different geological formation in India.
- 2) Perform sub surface exploration and interpret core log.
- 3) Solve numerical problem based on core drilling and seismic data.
- 4) Familiar with origin of earthquake, seismic wave and landslide in Deccan trap.



## CVE11- 802 Water Power Engineering

**Teaching Schemes:** Lectures: 4 Hours/Week

**Pre Requisites:** Mathematics - I and Mathematics – II

### Course Contents

#### Module 1:

Introduction, Sources of Energy, Types of Power Plants, Choice of Type of Generation, Components of Water Project, Types of Hydro Power Schemes, General Layouts, Estimation of Hydro Power, Nature of Demand: Load Curve, Load Duration Curves, Load Factor, Firm Power Secondary Power

#### Module 2:

Intake, Types, Hydraulics of Intake, Trash Rack Transition, Conduits: Types, Economic Section, Power Canals, Pen-stock Types, Hydraulic Design, Anchor Blocks

Tunnels: Classification, Location, Hydraulic Design, Tunnel Linings

Surge Tank: Functions, Behaviour, Location, Types of Surge Tanks, Basic Design Criteria of Simple Surge Tank, Forebay

#### Module 3:

General Arrangements of Power Station, Power House, Sub-structure and super structure Under Ground Power Station: Necessity, Types, Development and Economics. (04)

#### Module 4:

Turbines: Classification, Characteristics of Different Types, Choice of Specific Type, Turbine Setting and Cavitation, Tail Race: Functions, Types, Channel and Tunnel Draft Tubes

#### Module 5:

Pumped Storage Plants, Purpose, General Layout, Types, Typical Arrangements of the Upper Reservoirs, Economics of Pumped Storage Plants

#### Module 6:

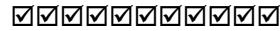
Tidal Power Stations: Necessity, Advantages, Classification, Limitations

## Text Books

- Dandekar and Sharma, “Water Power Engineering”, Vikas Pub. House Pvt. Ltd.
- Bhattacharya P. K., “Water Power Engineering”, Khanna Publications, New Delhi
- Deshmukh M. M. “Water Power Engineering”, Dhanapatrai and Sons N. Delhi

#### References

- Creager and Justin, “Hydro – Electric Hand Book”
- Brown G., “Hydro-electric Engineering Practice”, Vol. I to III
- Mosonvi, “Water Power Development”



## CVE11- 803 Disaster Management

**Teaching Scheme:** Lectures: 3 Hours/Week, Tutorial: 1 Hour / Week

**Pre Requisites:** Mathematics - I and Mathematics – II

### Course Contents

#### Module 1: Introduction

Concepts and definitions: disaster, hazard, vulnerability, risk, capacity, impact, prevention, mitigation).

#### Module 2: Natural Disasters

Disasters classification; natural disasters (floods, draught, cyclones, volcanoes, earthquakes, tsunamis, landslides, coastal erosion, soil erosion, forest fires etc.); hazard and vulnerability profile of India.

#### Module 3: Man made Disasters

Manmade disasters (industrial pollution, artificial flooding in urban areas, nuclear radiation, chemical spills etc); hazard and vulnerability profile of India, mountain and coastal areas, ecological fragility.

#### Module 4: Disaster Impacts

Disaster impacts (environmental, physical, social, ecological, economical, political, etc.); health, psycho-social issues; demographic aspects(gender, age, special needs); hazard locations; global and national disaster trends; climate change and urban disasters.

#### Module 5: Disaster Risk Reduction (DRR)

Disaster management cycle – its phases; prevention, mitigation, preparedness, relief and recovery; structural and nonstructural measures; risk analysis, vulnerability and capacity assessment; early warning systems, Post-disaster environmental response (water, sanitation, food safety, waste management, disease control); Roles and responsibilities of government, community, local institutions, NGOs and other stakeholders; Policies and legislation for disaster risk reduction, DRR programmes in India and the activities of National Disaster Management Authority.

#### Module 6: Disasters, Environment and Development

Factors affecting vulnerability such as impact of developmental projects and environmental modifications (including of dams, land-use changes, urbanization etc.), sustainable and environmental friendly recovery; reconstruction and development methods.

#### Text/Reference Books:

- <http://ndma.gov.in/> (Home page of National Disaster Management Authority).
- <http://www.ndmindia.nic.in/> (National Disaster management in India, Ministry of Home Affairs).
- Pradeep Sahni, 2004, Disaster Risk Reduction in South Asia, Prentice Hall.
- Singh B.K., 2008, Handbook of Disaster Management: techniques & Guidelines, Rajat Publication.
- Ghosh G.K., 2006, Disaster Management, APH Publishing Corporation.

