



DEPARTMENT OF CIVIL ENGINEERING  
NATIONAL INSTITUTE OF TECHNOLOGY SRINAGAR  
HAZRATBAL, SRINAGAR - 190006 (J&K)

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## REVISED SCHEME

For

UNDER GRADUATE PROGRAMME  
(Bachelor of Technology)

IN

CIVIL ENGINEERING

(EFFECTIVE FROM: 2019 BATCH)

DEPARTMENT OF CIVIL ENGINEERING  
NATIONAL INSTITUTE OF TECHNOLOGYSRINAGAR  
HAZRATBAL, SRINAGAR, KASHMIR, J&K, INDIA - 190006



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**B. TECH. 1<sup>ST</sup> SEMESTER**

<u>Course No.</u>	<u>Course title</u>	<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
CIP100	Engineering Drawing	1	0	6	4

**B. TECH. 2<sup>ND</sup> SEMESTER**

<u>Course No.</u>	<u>Course title</u>	<u>L</u>	<u>T</u>	<u>P</u>	<u>C</u>
CIL100	Engineering Mechanics	3	1	0	4

**B.TECH.3<sup>RD</sup> SEMESTER (CIVIL)**

Course No.	Course title	L	T	P	C
CVT201	<b>Structural Analysis- I</b>	2	2	0	4
CVL201	Structural Analysis Lab- I	0	0	2	1
CVT202	Fluid Mechanics	2	1	0	3
CVL202	Fluid Mechanics Lab-I	0	0	2	1
CVT203	Surveying-I	2	1	0	3
CVL203	Surveying Lab-I	0	0	4	2
MAT201	Mathematics-I	3	1	0	4
CVT204	<b>Building Materials and Construction</b>	3	1	0	4
HUL201	Humanities & Social Science-I	2	1	0	3
Total Lecture Hours and Credits		27			25
<b>COURSES OFFERED TO OTHERS DEPARTMENTS (METALLURGY)</b>					
CIV- 304	Geology & Mineralogy	2	2	0	4
CE-304(P)	Geology &Mineraology Lab.	0	0	2	1



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**B.TECH. 4<sup>th</sup> SEMESTER (CIVIL)**

Course No.	Course title	L	T	P	C	Remarks
CVT250	<b>Structural Analysis- II</b>	2	1	0	3	* Two weeks survey camp immediately after exam. of 4 <sup>th</sup> semester (July)
CVT251	Fluid Flow in Pipes and Channels	2	1	0	3	
CVL251	Fluid Mechanics Lab-II	0	0	2	1	
CVT252	Surveying-II	2	1	0	3	
CVL252	Surveying Lab-II	0	0	2	1	
CVT255	Surveying Camp*	0	0	4	2	
CVT253	Engineering Geology	2	1	0	3	
CVL253	Geology Lab.	0	0	2	1	
<b>CVT254</b>	<b>Civil Engineering Drawing</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	
MAT256	Mathematics-II	3	1	0	4	
Total Lecture Hours and Credits		27			25	

**BTECH. 5<sup>th</sup>- SEMESTER (Civil)**

Course No.	Course title	L	T	P	C	
CVT301	Design of Structures-I	2	2	0	4	
CVL301	Concrete Laboratory	0	0	2	1	
CVT302	Highway Engineering and PMS	3	1	0	4	
CVL302	Highway Laboratory	0	0	2	1	
CVT303	Geotechnical Engineering-I	2	2	0	4	
CVL303	Geotechnical Laboratory-I	0	0	2	1	
CVT304	Water Resources Engineering	2	2	0	4	
CVT305	<b>Structural Analysis-III</b>	2	1	0	3	
	<b>Elective Courses</b>					
CVT307	Architecture and Town Planning	2	1	0	3	
	Concrete Technology					
	Engineering Seismology					
Total Lecture Hours and Credits		28			25	



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**B.TECH. 6<sup>th</sup> SEMESTER (Civil)**

Course No.	Course title	L	T	P	C
CVT350	<b>Design of Structures-II</b>	2	2	0	4
CVL350	Structural Engineering Lab.-II	0	0	2	1
CVT351	Traffic Engineering and Road Facilities	2	2	0	4
CVL351	Traffic Engineering Laboratory	0	0	2	1
CVT352	Geotechnical Engineering-II	2	2	0	4
CVL352	Geotechnical Laboratory-II	0	0	2	1
CVT353	Irrigation and Hydraulic Structures	2	1	0	3
CVT1453	Industrial Training & Presentation	0	0	0	1
	<b>Elective Courses</b>				
CVT/MAT	Water Shed Management	2	1	0	3
	Operations Research				
	<b>Numerical Methods in Civil Engineering</b>				
CVT354	Computer Aided Design	2	1	0	3
	Disaster Management				
	Applied Hydrology				
	<b>Advanced Structural Analysis</b>				
Total Lecture Hours and Credits		27			25

**B.TECH. 7<sup>th</sup> SEMESTER (Civil)**

Course No.	Course title	L	T	P	C
CVT401	Environmental Engineering-I	2	1	0	3
CVL401	Water Quality Lab	0	0	2	1
CVT402	Structural Dynamics	3	1	0	4
CVT403	Construction Technology & Management	2	1	0	3
CVT404	Design of Structures-III	2	2	0	4
CVT405	Quantity Surveying and Cost Evaluation	2	1	0	3
CVS405	Seminar	0	2	0	2
CVP406	Project Pre-Work	0	0	4	2
<b>Elective courses</b>					
CVT406	Railway and Airport Engineering	2	1	0	3
	Fluvial Hydraulics				
	Advanced Geotechnical Engineering				



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Total Lecture Hours and Credits	28	25
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**B TECH. 8<sup>th</sup> SEMESTER (Civil):**

Course No.	Course title	L	T	P	C
CVT450	Hydropower Engineering	2	2	0	4
CVT451	<b>Bridge Engineering</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
CVP452	Project*	0	5	10	10
<b>ELECTIVE COURSES</b>					
CVT454	Rock Mechanics and Tunneling Technology	2	1	0	3
	Transportation Planning and Economics				
	<b>Non-Conventional Energy</b>				
CVT455	Ground Improvement Techniques	3	1	0	4
	Earthquake Resistant Design				
	Environmental Engineering-II				
Total Lecture Hours and Credits		30			25

\*The evaluation will be done as per statutes.



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<b>Subject: Engg. Drawing (Code: CIP: 100)</b>	<b>Syllabus for B.Tech.-1<sup>st</sup> Year Common for all branches</b>	<b>Total Course Credit: 4</b>				
Mid-Term Examination	Continuous Assessment	Internal	End semester examination	L	T	P
30 Marks	10 Marks		60 Marks	2	0	2

**Course Objective:** To inculcate the ability to translate geometric and topological information of common engineering object (two/three dimensional) into engineering drawing using standard graphical techniques.

**Course Outcomes:**

**CO1:** Comprehend general projection theory, with an emphasis on the use of orthographic projection to represent three-dimensional objects in two-dimensional views.

**CO2:** Apply auxiliary or sectional views to most practically represent engineered parts.

**CO3:** Understand the intersection, development of surface of body and fasteners.

**CO4:** To interpret Orthographic, Isometric and Perspective views of objects.

S. No.	Contents	Contact Hours
01.	Types of projections, concept of solid as 3-dimensional object, lines and planes, first and third angle practices. Projections of simple geometrical solids, placed in simple positions with single rotation of the face, edge or axis of solid with respect to one of the principal planes of projection.	24
02.	Section of simple geometrical solids, types of sectional planes, true shape of sections	12
03.	Intersection of surfaces, simple case of intersection of two prisms, two cylinders, and cone and a cylinder Development of surfaces of simple sectional solids and intersecting solids	12
04.	Isometric projections of given orthographic projections. Orthographic projections of simple blocks	12

**Text book:**



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1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50<sup>th</sup> Edition, 2010.

**References:**

1. Gopalakrishna K. R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
2. Shah M. B., and Rana B. C., "Engineering Drawing", Pearson, 2nd Edition, 2009.
3. Luzzader, Warren. J. and Duff, J. M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4. Venugopal K. and Prabhu R. V., "Engineering Graphics", New Age International (P) Limited, 2008.
5. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.
6. Basant A. and Agarwal C. M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
7. Gowri S., and Jeyapooan T., "Engineering Graphics" Vikas Publishing House ( P) Limited, 2011.



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<b>Engineering Mechanics” (Code: CIL- 100)</b>	<b>Contact Hours - 42</b>	<b>Total Course Credit: 4</b>			
Mid-Term	Class Assessment	End-Term	L	T	P
30 Marks	10 Marks	60 Marks	3	1	0

**Course Objective:**

To establish an understanding of the techniques needed to solve general engineering mechanics problems.

**Course Outcomes:**

**CO1:** Determine the resultants in planer force systems. Identify and quantify all forces associated with a static framework.

**CO2:** Calculate the center of gravity, center of mass, and centroid for simple and composite volumes. Determine moment of area of plane sections. To determine the forces in members of a plane truss.

**CO3:** Determine the resultants in planer force systems using energy principles.

**CO4:** Understand the fundamental concepts of stress and strain and the relationship between both through the strain-stress equations in order to solve problems for simple tri-dimensional elastic solids

**CO5:** Solve problems in kinematic and dynamic systems

<b>S. No.</b>	<b>Contents</b>	<b>Contact Hours</b>
01.	<b>Statics:</b> Fundamental concepts and laws of mechanics. Equilibrium of bodies: Free-body diagrams, conditions of equilibrium, torque due to a force, statical determinacy. Force systems: principle of moments, resultant of forces, couple systems, equilibrium of rigid bodies, Support reactions.	9
02.	<b>Properties of plane surfaces:</b> First moment of area, centroid, second moment of area etc.	5
03.	<b>Plane trusses:</b> Forces in members of a truss by method of joints and method of sections.	5
04.	<b>Friction:</b> General concept of friction. Static and Dynamic Friction.	4
05.	<b>Virtual Work:</b> Principle of virtual work, calculation of virtual displacement and virtual work. <b>Work and Energy:</b> Work and energy, work-energy theorem, principle of conservation of energy, collisions, principles of momentum etc.	8



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06.	<b>Dynamics of Rigid Bodies:</b> Newton's Laws, D'Alembert's Principle, Energy Principles.	5
07.	<b>Concept of stress and strain:</b> Conditions of equilibrium, compatibility and stress strain relations. Stress-strain diagrams, Hooke's law, Modulus of elasticity (E), Lateral strains, Poisson's ratio, Multi-axial stress system, Volumetric strain, Bulk modulus (K), Shear stress concept, Modulus of rigidity (G). Relation between E, G and K.	6

**Textbook:**

1. Hibbeler, R.C., "Mechanics of Materials", 6th SI edition, Prentice Hall.
2. Hibbeler, R.C., Engineering Mechanics: Statics and Dynamics, Prentice Hall (2012).

**References:**

1. Beer, P.F. and Johnston (Jr.) E.R. "Mechanics of Materials", S.I. Version, Tata McGraw Hill, India, 2001.
1. Beer, Johnston, Clausen and Staab, Vector Mechanics for Engineers, Dynamics, McGraw-Hill Higher Education (2003)
2. Timoshenko and Young, Engineering Mechanics, Tata McGraw Hill Education Private Limited (2000).
3. Shames, I. H. Engineering Mechanics: Dynamics, Pearson Education India (2002).
4. Popov, E.P., Engineering Mechanics of Solids, Prentice-Hall, 1999.
5. Gere J.M. and Goodno, B. J., Strength of Materials, Cengage Learning.
6. Craig, R.R., "Mechanics of Materials", 2nd edition, John Wiley and Sons.



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**B.TECH.3<sup>RD</sup> SEMESTER (CIVIL)**

Course No.	Course title	L	T	P	C
CVT201	<b>Structural Analysis- I</b>	2	2	0	4
CVL201	Structural Analysis Lab- I	0	0	2	1
CVT202	Fluid Mechanics	2	1	0	3
CVL202	Fluid Mechanics Lab-I	0	0	2	1
CVT203	Surveying-I	2	1	0	3
CVL203	Surveying Lab-I	0	0	4	2
MAT201	Mathematics-I	3	1	0	4
CVT204	<b>Building Materials and Construction</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
HUL201	Humanities & Social Science-I	2	1	0	3
Total Lecture Hours and Credits		27			25
<b>COURSES OFFERED TO OTHERS DEPARTMENTS (METALLURGY)</b>					
CIV- 304	Geology & Mineralogy	2	2	0	4
CE-304(P)	Geology &Mineraology Lab.	0	0	2	1



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<b>Structural Analysis - I (Code: CVT201)</b>	<b>Contact Hours = 42</b>	<b>Total Course Credit: 4</b>			
Mid-Term	Class Assessment	End-Term	L	T	P
30 Marks	10 Marks	60 Marks	3	1	0

**Course Objective:** The objective of this course is elaborate on the knowledge of engineering mechanics (statics) and to teach the students the purpose of studying strength of materials with respect to civil engineering design and analysis. The course introduces the students to the concepts of engineering mechanics of materials and the behavior of the materials and structures under applied loads.

**Course Outcomes:**

**CO1:** Understand the concepts of stress and strain, principal stresses and principal planes.

**CO2:** Determine Shear force and bending moment in beams and understand concept of theory of simple bending.

**CO3:** Calculate the deflection of beams by different methods and selection of method for determining slope or deflection

**CO4:** Apply basic equation of torsion in design of circular shafts and helical springs

**CO5:** To understand the buckling behavior of columns subjected to axial loads.

S. No.	Contents	Contact Hours
01.	<b>Review of Basic Concepts of Stress and Strain:</b> Hooke's law; Poisson's ratio; Stress-strain diagram of ductile and brittle materials; Elastic limit; Modulus of elasticity; Bulk Modulus:  Beam Statics: Support reactions, concepts of redundancy, axial force, shear force and bending moment diagrams for concentrated, uniformly distributed, linearly varying load, concentrated moments in simply supported beams, cantilever and overhanging beams	10
02.	<b>Symmetric Beam Bending:</b> Simple theory of bending, Bending and shear stress for regular sections, shear centre	6
03.	<b>Two Dimensional Stress Problems:</b> Principal stresses, maximum shear stresses, Mohr's circle of stresses, construction of Mohr's circle, applications.	6



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04.	<b>Deflection of statically determinate beams:</b> Slope and deflection of beams by integration, area-moment and conjugate beam methods	8
05.	<b>Introduction to thin cylindrical &amp; spherical shells:</b> Hoop stress and meridional - stress and volumetric changes. <b>Torsion:</b> Pure torsion, torsion of circular solid shaft and hollow shafts, torsional equation, torsional rigidity, closed coil helical; springs	7
06.	<b>Columns:</b> Fundamentals, column buckling theory, Euler's load for columns with different end conditions, limitations of Euler's theory - problems, eccentric load.	5

**Textbooks:**

1. Beer, P.F. and Johnston (Jr.) E.R. "Mechanics of Materials", S.I. Version, Tata McGraw Hill, India, 2001.
3. Hibbeler, R.C., "Mechanics of Materials", 6th SI edition, Prentice Hall.
4. Junnarkar.S.B. and Shah.H.J, "Mechanics of Structures", Vol I, Charotar Publishing House, New Delhi 2016.
5. Gambhir. M.L., "Fundamentals of Solid Mechanics", PHI Learning Private Limited., New Delhi, 2009.

**References:**

7. Popov, E.P., Engineering Mechanics of Solids, Prentice-Hall, 1999.
8. Gere J.M. and Goodno, B. J., Strength of Materials, Cengage Learning.
9. Craig, R.R., "Mechanics of Materials", 2nd edition, John Wiley and Sons.



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<b>Course Title: Structural Engg. Lab. -I (Code: CVL- 201)</b>	<b>Syllabus for B.Tech. 3rd Semester (Civil Engg)</b>	<b>Total Course Credit: 1</b>		
Internal Examination	External Examination	L	T	P
50 Marks	50 Marks	0	0	2

- CO1** To understand the behavior of structural members/elements under loading.
- CO2** To understand the properties of structural members so that one can judge at a glance safety and usage of a given structure.
- CO3** To determine crippling load of columns with different end conditions.
- CO4** To measure the ultimate shear strength.

S No	Name of experiment	Objective
1	Tensile Test of Steel	To determine yield strength, ultimate tensile strength, percentage elongation and modulus of elasticity (Plot, stress strain curve).
2	Tensile and Compressive strength of Timber	i. Parallel to grains ii. Perpendicular to grains.
3	Shear test of steel/timber	To measure ultimate shear strength. Shear modulus. Plot shear stress strain Curve.
4	Torsion test of steel	To measure angle of twist. Ultimate Torsional strength stress strain Curve.
5	Buckling load of columns various end conditions.	To determine crippling load of columns with different end conditions and compare theoretical values.
6	Verification of Maxwell's Theorem.	To verify the Principle of Maxwell's theorem
7	Testing of Bricks and Stones as per IS Specifications.	
8	Verification of horizontal thrust in a three hinged arch	To evaluate experimentally horizontal thrust in a three hinged arch and draw influence line diagram for the horizontal thrust



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<b>Course Title: Fluid Mechanics -I (Code: CVT202)</b>	<b>Syllabus for B.Tech. 3rd Semester (Civil Engineering)</b>	<b>Total Course Credit: 3</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	End Term Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	1	0

**Course Objective:** To develop the understanding of basic principles of mechanics of fluids at rest and in motion and their applications in solving the real engineering problems.

**Course Outcomes:**

**CO1:** Analyze Physical properties of fluids.

**CO2:** Analyze and perform calculations on Pressure Intensity pressure on plane and curved surfaces, centre of pressure;

**CO3:** Perform calculations for determination Steady and unsteady, uniform and non uniform, laminar and turbulent flows; one, two and three dimensional flows; Stream lines, Streak lines and path lines.

**CO4:** Determine Euler's equation of motion along a streamline and its integration to yield Bernoulli's equation.

S. No.	Course Contents	Contact Hours
01.	<b>INTRODUCTION:</b> Physical properties of fluids viz, mass density, viscosity, compressibility, vapour pressure, surface tension, capillarity, etc. Ideal Fluids and Real Fluids; Newtonian and Non-Newtonian Fluids.	03
02.	<b>FLUID STATICS:</b> Pressure Intensity, Pascal's law; Pressure- density- height relationships, manometers; pressure on plane and curved surfaces, centre of pressure; Buoyancy, Stability of immersed and floating bodies.	05
03.	<b>KINEMATICS OF FLUID FLOW:</b> Steady and unsteady, uniform and non-uniform, laminar and turbulent flows; one, two and three dimensional flows; Streamlines, and pathlines; Continuity equation; Rotation and Elementary explanation of stream function and velocity Graphical and Experimental methods of drawing flow nets.	06



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04.	<b>DYNAMICS OF FLUID FLOW:</b> Euler's equation of motion along a streamline and its integration to yield Bernoulli's equation; Flow measurement, flow through orificemeter, Venturimeter, orifices, mouth pieces, pitot and Prandtl tubes, sluice gates under free and submerged conditions, Various types of Notches and weirs under free and submerged flow conditions, Aeration of nape.	10
05.	<b>MOMENTUM EQUATION:</b> Momentum equation and its application to stationary and moving vanes, pipe bends.	04
06.	<b>DIMENSIONAL ANALYSIS AND HYDRAULIC SIMILITUDE:</b> Dimensional analysis, Buckingham's theorem, Important dimension less numbers and their significance, Geometric, Kinematic and dynamic similarity; Model analysis.	04
07.	<b>BOUNDARY LAYER ANALYSIS:</b> Boundary layer thicknesses, Boundary layer over aboundary layer, Application of momentum boundary layer, Laminar sub-layer, smooth and rough boundaries, localand Average friction coefficients, separation.	06

**References:**

1. Kumar, D.S. "Fluid Mechanics and Fluid Power Engineering". Seventh Ed. S.K. Kataria & Sons Publishers, New Delhi, 2008-2009.
2. Garde R.J "Engineering Fluid Mechanics", 1988.
3. Kumar, K.L. "Engg. Fluid Mechanics", Eurasia Publishing House (P) Ltd. New Delhi, 1984.
4. Streeter, V.L., Wylie, E.B. and Bedford, K.W. "Fluid Mechanics" McGraw Hill, New York, 2001.
5. Asawa, GL, Fluid Flow in Pipes & Cannels 2008? CBS Publishers, new Delhi, 2000.
6. Mohanty "Fluid Mechanics" Printice Hall of India second Ed., 2010.



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<b>Course Title:</b> <b>MECHANICS</b> <b>(Code: CVL- 202)</b>	<b>FLUID</b> <b>LAB-I</b>	<b>Syllabus for B.Tech. 3rd</b> <b>Semester</b> <b>(Civil</b> <b>Engineering)</b>	<b>Total Course Credit: 1</b>		
Internal Examination		External Examination	L	T	P
50 Marks		50 Marks	0	0	2

**CO1:** To develop understanding about hydrostatic law, principle of buoyancy and stability of a floating body and application of mass, momentum and energy equation in fluid flow.

**CO2:** To imbibe basic laws and equations used for analysis of static and dynamic fluids.

**CO3:** To inculcate the importance of fluid flow measurement and its applications in Industries.

**CO4:** To give fundamental knowledge of fluid, its properties and behavior under various conditions of internal and external flows.

**List Of Experiments:**

1	To determine experimentally the metacentric height of a ship model.
2	To verify the Bernoulli's equation experimentally.
3	To determine the coefficient of discharge, coefficient of velocity and coefficient of contraction of an orifice or a mouthpiece of a given shape.
4	To calibrate an orifice meter and to study the variation of coefficient of discharge with Reynold's number.
5	To calibrate a venturimeter and to study the variation of coefficient of discharge with Reynold's Number.
6	To calibrate sharp crested rectangular and triangular weir.
7	To verify momentum equation experimentally



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<b>Course Title:</b> <b>SURVEYING-I (Code: CVT203)</b>	<b>Syllabus for B.Tech. 3<sup>rd</sup> Semester (Civil Engineering)</b>	<b>Total Course Credit: 3</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	End-Term Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	1	3

**Course Objective:** To impart basic understanding of various aspects related to system of Geometrics and other physical measurements in the field of Civil Engg.

**Course Outcomes:**

- CO1:** To understand the importance of Engineering Surveys especially land surveying.
- CO2:** To know about the basic principles and types of land surveying.
- CO3:** To understand the mechanics concerned with the response of the rock to the force field of its physical environments.
- CO4:** To know the theory, working principles, and numerical aspects of various surveying method viz., chain, compass, plain table and levelling

**Details of Course**

Unit	Course Contents	Lecture Hours
<b>Unit -1</b>	<b>a. Introduction:</b> Importance, Principles of Surveying. Types of Surveying.	<b>4</b>
	<b>b. Chain Surveying:</b> Field Equipment, Methods of chaining, Offsets, corrections in chaining, obstacles in chain surveying; plotting; Degree of accuracy. Tape and chain corrections	<b>7</b>
<b>Unit - 2</b>	<b>a. Prismatic compass surveying:</b> Instruments; Principle, Procedure and precautions. Closed traverse; corrections; local attraction; plotting.	<b>6</b>
	<b>b. Plane Table Surveying:</b> Field equipments, Methods of plane tabling, Two point and Three point problem, Precautions, Accuracy	<b>6</b>



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<b>Unit - 3</b>	<b>a. Levelling: Instruments:</b> Field book recording, Bench mark & its types, methods of reduction of levels, various types of field works; contouring; Plotting. Testing and Permanent adjustments. Sensitivity of bubble tube. <b>b. Areas and Volumes:</b> Methods of determining areas and volumes viz Borrow - pits.	<b>9</b> <b>4</b>
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**References:**

1. Surveying Vols. I & II by Dr. K.R. Arora
2. Surveying Vols. I & II, by Duggal, S.K.
3. Surveying & Levelling by Basak
4. Surveying & Levelling Vols. I & II by Kanetkar, T. P. and Kulkarni, S.V
5. Surveying & Levelling by P.B. Shahni
6. Surveying Vol. I & II, by Punmia, B. C



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NATIONAL INSTITUTE OF TECHNOLOGY SRINAGAR  
HAZRATBAL, SRINAGAR - 190006 (J&K)**

<b>Course Title: SURVEYING LAB-I (Code: CVL- 203 )</b>	<b>Syllabus for B.Tech. 3rd Semester (Civil Engineering)</b>	<b>Total Course Credit: 2</b>		
Internal Examination	External Examination	L	T	P
50 Marks	50 Marks	0	0	4

- CO1** To handle and use basic surveying equipment viz., chain/ Tape, compass. Prepare layout plans.
- CO2** To measure angles and bearings.
- CO3** To handle and use plain table, and level.
- CO4** To handle and use level. Preparation of L -sections and X-sections showing relative levels of various points

<b>Unit No.</b>	<b>Course Contents</b>	<b>Lecture Hours</b>
<b>Unit -1</b>	Introduction: Importance, Principles of Surveying. Types of Surveying.	4
	Chain Surveying: Field Equipment, Methods of chaining, Offsets, Correction in chaining, Obstacles in chain-surveying; plotting Degree of accuracy. Tape and chain corrections	7
<b>Unit -2</b>	Prismatic compass surveying. Instruments; Principle, Procedure and precautions, Closed traverse; Corrections, Local attraction, Plotting	6
	Plane Table Surveying; Field equipment, Methods of plane tabling, Two point and Three-point problem, Precautions, Accuracy	6
<b>Unit -3</b>	Levelling; Instruments; Field book recording, Bench Mark and its types, Methods of reduction of levels, Various types of field works,	9
	Areas and Volumes: Methods of determining areas and volumes viz., Borrow - pits.	4



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<b>Building Materials and Construction (Code: CVT204)</b>	<b>Contact Hours = 42</b>	<b>Total Course Credit: 4</b>			
Mid-Term	Class Assessment	End-Term	L	T	P
30 Marks	10 Marks	60 Marks	3	1	0

**Course Objective:** At the end of this course the students should have learnt about the various materials, both conventional and modern, that are commonly used in civil engineering construction. Further the students should be able to appreciate the criteria for choice of the appropriate materials and the various tests for quality control in the use of these materials.

**Course Outcomes:**

After successful completion of the course, the student will be able to:

1. Develop knowledge of material science and behavior of various building materials used in construction.
2. Identify the construction materials required for the assigned work.
3. Provide procedural knowledge of the simple testing methods of cement, lime and concrete etc.
4. Adopt suitable repair and maintenance work to enhance durability of buildings.
5. Develop knowledge of various state-of-the-art materials used in construction in the modern times.

<b>S. No.</b>	<b>Contents</b>	<b>Contact Hours</b>
01.	<b>Introduction:</b> Functions of buildings and structure in general. Loads on buildings as per IS 875, IS 1893 and NBC. Functional requirements of buildings and necessity of byelaws.	2
02.	<b>Stones - Bricks - Concrete Blocks:</b> Stone as building material; Criteria for selection; Tests on stones; Deterioration and Preservation of stone work; Bricks , Classification, Manufacture of clay bricks, Tests on bricks, Compressive Strength, Water Absorption, Efflorescence, Bricks for special use - Refractory bricks, Cement and Concrete hollow blocks, Light weight concrete blocks - Code Practices.	6
03	<b>Lime - Cement - Aggregates - Mortar:</b> Lime, Preparation of lime mortar, Cement - Ingredients, Manufacturing process, Types and Grades, Properties of cement and Cement mortar, Hydration, Compressive strength, Tensile strength, Soundness and consistency, Setting time, Aggregates - Natural stone aggregates, Industrial byproducts (EAF Slag, Steel Slag), Crushing strength,	8



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	Impact strength, Flakiness, Abrasion Resistance, Grading, Sand - Bulking - Code Practices	
04.	<b>Concrete:</b> Concrete, Ingredients, Manufacture, Batching plants, RMC - Properties of fresh concrete - Slump Flow and compaction. Properties of hardened concrete - Compressive, Tensile and shear strength, Modulus of rupture Tests. Mix specification - Mix proportioning: IS method. High Strength Concrete and HPC - Other types of Concrete - Code Practices	6
05.	<b>Metals:</b> Composition and properties of ferrous and non ferrous metals used in civil engineering. Effect of various heat treatments on the properties of steel and its alloys. Corrosion and methods of corrosion control.	4
06.	<b>Modern Materials:</b> Glass - Ceramics, Fibre glass reinforced plastic, Clay products - Refractories, Composite materials, Applications of laminar composites, Fibre textiles - Geosynthetics for Civil Engineering applications. Thermocol - Panels of laminates, Properties and uses of asphalt, bitumen, rubber and asbestos.	8
07	<b>Timber:</b> Characteristics of good timber, defects in timber, seasoning of timber, tests on timber. Market forms, Industrial timber, Plywood, Veneers.	4
08.	<b>Paints and Varnishes:</b> Composition, preparation, properties, test and uses of paints, varnishes and distempers	4

**TEXT BOOKS:**

1. Building Materials and Construction - Arora & Bindra, Dhanpat Rai Publications.
2. Building Construction by B. C. Punmia, Ashok Kumar Jain and Arun Kumar Jain - Laxmi Publications (P) Ltd., New Delhi.
3. R. K. Rajput, Engineering Materials, S. Chand & Company Ltd., 2000.

**REFERENCES:**

1. Building Materials by Duggal, New Age International.
2. Alternate Building Materials and Technology, Jagadish, Venkatarama Reddy and others; New Age Publications.
3. M. S. Shetty, Concrete Technology (Theory and Practice), S. Chand & Company Ltd., 2003.



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<b>MAT- 201 Mathematics -I</b>	<b>Contact Hours = 42</b>	<b>Total Course Credit: 4</b>			
Mid-Term	Class Assessment	End-Term	L	T	P
30 Marks	10 Marks	60 Marks	3	1	0

**Course Outcomes (COs)**

CO1: Develop the concept of various measures of data in statistics with real life examples.

CO2: Develop the concept of probability and various theorems with real life examples.

CO3: Develop the concept of Random variables and distribution functions with real life examples.

CO4: Develop the concept of fitting of curves, regression and correlation analysis.

CO5: Develop the concept of Fourier Transformation with real life examples.

**Unit-1 (Statistics and Probability):**

Measures of Central tendency and Measures of Variations (Dispersions), Moments, Measures of skewness and kurtosis. Random experiment, sample space, Events, Classical statistical and Axiomatic Definitions of Probability. Statements and proof of theorems on addition and multiplication of probabilities. Simple problems. Baye's theorem on conditional probability. Random Variables, Derivation of formulae for mean, Variance and moments of random variables for discrete and continuous cases. Laws of expectation, Binomial, Poisson and normal Distributions, Beta and gamma Distribution,  $t$ -distribution, F-Distribution, Chi-square Distribution and their applications. Methods of least squares, fitting a straight line and parabola of Degree ' $p$ '. Regression and correlation. Multiple and partial correlation.

**Unit-2 (Fourier Transforms):**

Definition of Fourier transform, Fourier sine and cosine transform, Fourier integral formula, Applications to solutions of boundary value problems.

**Text Books:**

1. Fundamentals of Mathematical Statistics , S. C. Gupta and V.K Kapoor.
2. Introduction to Mathematical Statistics, P. E Walpole.
3. Data Analysis for Scientists and Engineers , Meyer, John Wiley and sons
4. The use of Integral transforms by I. N Sneddon, Tata McGraw Hill.
5. Integral Transform by Lokenath Debnath, C. R. C Press New York.



**NATIONAL INSTITUTE OF TECHNOLOGY SRINAGAR**  
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<b>Humanities and Social Sciences-I (Code: HUL 201)</b>	<b>Contact Hours = 42</b>	<b>Total Course Credit: 3</b>			
Mid-Term	Class Assessment	End-Term	L	T	P
30 Marks	10 Marks	60 Marks	2	1	0

**1. Course Objectives:**

- I. Describe the economic terms; concepts and explain the function of market, its types and determination of price under various competencies.
- II. Identify the ability to employ the economic way of thinking like application of marginal analysis, use of benefit/cost analysis, utility and demand forecasting techniques.
- III. Describe the process of management's four functions: planning, organizing, directing and controlling and make an appropriate staffing decision which includes recruitment and selection.
- IV. Demonstrate organization's characteristics and how they might impact on management practices and analyze both qualitative and quantitative information to isolate issues and formulate best control methods.

**Details of Course**

S. No	Contents
<u>1</u>	<b>INDUSTRIAL ECONOMICS:</b> Meaning and importance of industrialization. Organizations- various types of organizations. Division of Economics, Basic Constituents (Micro & Macro Economics)
<u>2</u>	<b>CONSUMPTION AND MARKET STRUCTURE:</b> Law of Demand and Elasticity of Demand, Consumer's surplus, Utility and its measurement, Types of market structure - Perfect, Monopoly, Monopolistic and Oligopoly, Demand forecasting techniques. Meaning and factors influencing location of Industrial Units, Scale of production- large vs Small Industrial Units
<u>3</u>	<b>MANAGEMENT- INTRODUCTION TO MANAGEMENT:</b> Management and its nature, purpose and definitions. Process and functions of management- Planning, Organizing, Actuating and controlling, Functional areas of management, skills and role of Management
<u>4</u>	<b>PLANNING:</b> Nature and purpose of planning, types of plans, steps in planning process. <b>Objectives:</b> nature and importance of objectives, Types of objectives, primary, secondary, individual and personal objectives. Guidelines for setting objectives



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	<p><b>Decision Making:</b> Importance and limitations of rational decision making, types of decisions- programmed and non-programmed decision making. Process of decision making under certainty, uncertainty and risk.</p>
<u>5</u>	<p><b>ORGANISING:</b>          Nature and purpose of organizing: steps in organizing/ process of organizing, formal and informal organizations; span of control &amp; factors determining effective span.  <b>Decentralization of Authority:</b> Nature of decentralization, degree of decentralization, decentralization as philosophy and policy  <b>Delegation of authority:</b> Meaning of authority/delegation, steps in the process of delegation, factors determining the degree of delegation, art of delegation.  <b>Line/staff organization:</b> Line organization, staff organization, line and staff organization, functional and committee organization, the nature of line and staff relationship.</p>
<u>6</u>	<p><b>ACTUATING:</b>          Nature and purpose of Actuating, steps in actuating process.  <b>Essentials of Human Resource Management:</b> Importance and functions of Human resource management, Importance of Human resource planning, Recruitment, selection, training and development, performance appraisal, compensation packages, promotions, transfers demotion and separation etc.  <b>Leadership:</b> Meaning and importance, Leadership qualities  <b>Motivation:</b> The need - want - satisfaction chain.</p>
<u>7</u>	<p><b>CONTROLLING:</b>          Nature and purpose of controlling, steps in controlling/ process of controlling, types of controls, recruitments of effective controls.</p>

**Course Outcomes of Humanities and Social Sciences-I (HUL-201)**

**After the completion of course, students will be able,**

CO1	Develop the ability to explain economic terms and concepts.
CO2	Understand and explain the function of market, its types and determination of price under various competencies.
CO3	Demonstrate the ability to employ the economic way of thinking like application of marginal analysis, use of benefit/cost analysis, utility and demand forecasting techniques.
CO4	Demonstrate the ability to recognize when change is needed, adapt to change as it occurs, and lead the change as effective managers.



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- CO5 Practice the process of management's four functions: planning, organizing, directing and controlling. make an appropriate staffing decision which includes recruitment and selection design, implement and evaluate training programmes.
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- CO6 Understand an organization's characteristics and how they might impact on management practices and analyze both qualitative and quantitative information to isolate issues and formulate best control methods.
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<b>Course Title: GEOLOGY AND MINERALOGY</b> <b>(Code: CVT- 257)</b>	<b>Syllabus for B.Tech. 3<sup>rd</sup> Semester</b> <b>(Civil Engineering)</b>	<b>Total Course Credit: 3</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	End-Term Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	1	1

**Course Objective:** To impart the basic understanding of the formation of rocks and minerals and to expose the students to the basic erosional and depositional processes.

**Course Outcomes:**

- CO1** To impart the basic understanding of the formation of rocks and minerals.
- CO2** To understand of basic erosional, depositional processes and geological structures.
- CO3** To understand the physical attributes of minerals. Description of physical attributes is the simplest way to identify, classify, and categorize minerals.
- CO4** To summarize results of studies performed on mineral substances and have an understanding of systematic process, accurate descriptions of physical characteristics of minerals.

S. No.	Course Contents	Contact Hours
<b>Part A Physical Geology</b>		
01.	Introduction to the science of geology.	03
02.	Crust of earth and its composition.	03
03.	Minerals and Rocks.	03
04.	Weathering of Rocks; Erosion, transportation and deposition by wind, Water and ice.	06
05.	Introduction to geological structures.	03
<b>Part B Mineralogy</b>		
01.	Rock forming minerals and ore forming minerals. Processes of mineral formation. Physical properties of minerals.	04



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02.	Introduction to ore minerals. Principle ore minerals of Aluminum, Copper, Lead, Zinc, Antimony, Nickel, Tin, Chromium, Magnesium and Iron, their important properties, mode of formation, mode of occurrence, uses and distribution in India.	10
03.	Study of Refractory minerals, coal and petroleum.	04

**References:**

1. Bangar, K.M, Principles of Engineering Geology, Standard Publishers Distributors, New Delhi,1995.
2. Parbin Singh Engineering Geology, Katson Publishers New Delhi, 2009.
3. Billings, M.P., Structural Geology, Prentice-Hall India, New Delhi, 1974.
4. Blyth, F.G.H and de Freitas, M.H. Geology for Engineers, ELBS, London, 1974.
5. Gokhale, KVG.K and Rao, D.M., Experiments in Engineering Geology, Tata-McGraw Hill, New Delhi, 1981.
6. Kesavulu, C. Textbook of Engineering Geology, Macmillan, India Ltd. New Delhi, 1993.
7. Geology for Civil Engineers by McLean and Gribble, Spon Press, Taylor &Francis Group, London, 1999.



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**B.TECH. 4<sup>th</sup> SEMESTER (CIVIL)**

Course No.	Course title	L	T	P	C	Remarks
CVT250	<b>Structural Analysis- II</b>	2	1	0	3	* Two weeks survey camp immediately after exam. of 4 <sup>th</sup> semester (July)
CVT251	Fluid Flow in Pipes and Channels	2	1	0	3	
CVL251	Fluid Mechanics Lab-II	0	0	2	1	
CVT252	Surveying-II	2	1	0	3	
CVL252	Surveying Lab-II	0	0	2	1	
CVT255	Surveying Camp*	0	0	4	2	
CVT253	Engineering Geology	2	1	0	3	
CVL253	Geology Lab.	0	0	2	1	
<b>CVT254</b>	<b>Civil Engineering Drawing</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	
MAT256	Mathematics-II	3	1	0	4	
Total Lecture Hours and Credits		27			25	



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<b>Structural Analysis - II</b> <b>(Code: CVT250)</b>	<b>Contact Hours = 42</b>	<b>Total Course Credit: 3</b>			
Mid-Term	Class Assessment	End-Term	L	T	P
30 Marks	10 Marks	60 Marks	2	1	0

**Course Objective:** To introduce the students to basic theory and concepts of classical methods of structural analysis.

**Course Outcomes:**

**CO1:** Identify the degree of indeterminacy of different types of structures

**CO2:** Determine the strain energy and compute the deflection of determinate beams, frames and trusses using energy principles.

**CO3:** Analyze statically indeterminate structures by force methods.

**CO4:** Analyze statically indeterminate structures by force methods.

**CO5:** Analyze building frames by approximate methods for horizontal and vertical loads.

S. No.	Contents	Contact Hours
01.	<b>Indeterminate Structures:</b> Introduction to Indeterminate Structures; Stability; Static and Kinematic Indeterminacy of Structures viz. Beams, Frames, Trusses	4
02.	<b>Energy Methods of Analysis of structures:</b> Strain energy and strain energy density - strain energy due to axial load (gradual, sudden and impact loadings) , shear, flexure and torsion - Castigliano's theorems - Maxwell's reciprocal theorem - Principle of virtual work - unit load method - Application of energy theorems for computing deflections in determinate beams , plane frames and plane trusses - lack of fit and temperature effects - Williot Mohr's Diagram.	10
03.	<b>Force methods of Analysis of structures:</b> Method of least Work; Method of consistent deformation for analysis of indeterminate beams; continuous beams; Deflection of truss joints; Analysis of two hinged arches, Clepyron's Three- Moment Equation.	10
04.	<b>Displacement methods of Analysis of structures:</b> Analysis of Indeterminate Beams & Frames (with & without Sway) by Classical Displacement Methods viz; Slope Deflection Method, Kani's Method & Moment Distribution Method.	12
05.	<b>Approximate Methods for Indeterminate Structural Analysis:</b> Portal and Cantilever methods for the analysis of frames.	6



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**Textbooks:**

1. Hibbeler, R. C. (2002). *Structural Analysis*, Pearson Education (Singapore) Pt. Ltd., Delhi
2. Leet, K. M. and Uang, C-M. (2003). *Fundamentals of Structural Analysis*, Tata McGraw-Hill Publishing Company Limited, New Delhi.

**References:**

1. C. S. Reddy, 'Basic Structural Analysis', Tata McGraw Hill, New Delhi.
2. C.K. Wang, 'Intermediate Structural Analysis', Tata McGraw Hill, New Delhi.
3. Junnarkar.S.B. and Shah.H.J, "Mechanics of Structures", Vol II, Charotar Publishing House, New Delhi 2016.



**NATIONAL INSTITUTE OF TECHNOLOGY SRINAGAR**  
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<b>Course Title: FLUID FLOW IN PIPES AND CHANNELS (Code CVT251)</b>	<b>Syllabus for B.Tech. 4<sup>th</sup> Semester (Civil Engineering)</b>	<b>Total Course Credit: 3</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	End-Term Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	1	0

**Course Objective:** To develop the understanding of basic principles of fluid flow through pressure and gravity type conduit systems to ensure adequate water distribution to consumers and management of surface water resources.

**Course Outcomes:**

- CO1:** Analyze and perform calculations on open channel flows, compute water surface profiles and hydraulic jump characteristics.
- CO2:** Analyze and perform calculations on pipe flow problems involving turbulent flow, understand the concept of friction factor, head loss, and design of pipes and analysis of pipe-networks.
- CO3:** Perform calculations for determination of the drag and lift forces on submerged bodies.
- CO4:** Analyze water hammer phenomenon in closed conduits and design of surge tanks & Determine various hydraulic characteristics of turbines and pumps.

S. No.	Course Contents	Contact Hours
01.	<b>FLOW IN OPEN CHANNELS:</b> Uniform flow, Critical depth, Normal depth, Specific energy, Resistance formulae, Gradually varied flow equations, Classification of water surface profiles, Computation of water surface profiles, step by step method and graphical integration method. Hydraulic Jump, Momentum Principle for open channels, Evaluation of the jump elements. Venturi flumes.	14
02.	<b>FLOW THROUGH PIPES:</b> Nature of turbulent flow in pipes, Hydraulic and energy grade lines. Equation for velocity distribution over smooth and rough pipes, Resistance coefficient and its variation, Nikuradse experiments, Moody diagram, Flow in sudden expansion, Contraction, diffusers, Bends, Valves and Siphons; Concept of equivalent length, branched pipes, pipes in series and parallels, Simple networks, Transmission of power.	11



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03.	<b>FLUID FLOW PAST SUBMERGED BODIES:</b> Drag and lift, Drag on a sphere, cylinder and disc: Lift, Magnus effect and Circulation.	03
04.	<b>WATER HAMMER AND SURGE TANKS:</b> Sequence of events after sudden valve closure, pressure diagrams, Gradual closure or opening of the valve, Instantaneous closure of valve in a rigid pipe, Instantaneous closure of valve in an Elastic pipe and Compressible fluid, Methods of Analysis; Surge Tanks, Location of Surge Tanks, Types, Design of surge Tanks.	04
05.	<b>HYDRAULIC MACHINES:</b> Types of Turbines, Description and principles of Impulse and reaction Turbines, Unit quantities and specific speed, Runaway speed, Turbine characteristics, Selection of Turbines, Cavitation; Draft Tube, Draft Tube dimensions, Types of draft tubes; Governing of Turbines; Centrifugal pumps, specific speed, power requirements, Reciprocating pumps.	06

**References:**

1. Kumar, D.S. "Fluid Mechanics and Fluid Power Engineering". Seventh Ed. S.K. Kataria & Sons Publishers, New Delhi, 2008-2009.
2. K. Subramanaya "Open channel Flow" 3rd. Tata McGraw Hill Pub. Co. New Delhi, 1999.
3. RangaRaju, K.G., "Flow Through Open Channels", 2nd. Tata McGraw Hill Publishing Company Ltd., New Delhi, 1986.
4. Nigam "Handbook of Hydroelectric Engg.", 2001.
5. Garde R.J "Engg. Engineering Fluid Mechanics", 1988.
6. Deshmukh, M.M, " Water Power Engineering" Danpat Rai & Sons, Nai Sarak New Delhi, 1978.
7. Asawa, G.L "Fluid Flow in Pipes and Channels" CBS Publishing.



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<b>Course Title:</b> <b>MECHANICS</b> <b>(Code: CVL - 251)</b>	<b>FLUID</b> <b>LAB-II</b>	<b>Syllabus for B.Tech. 4th</b> <b>Semester</b> <b>Engineering)</b> <b>(Civil</b>	<b>Total Course Credit: 1</b>		
Internal Examination	External Examination	L	T	P	
50 Marks	50 Marks	0	0	2	

<b>S. No.</b>	<b>Contents</b>	<b>Contact Hours</b>
1	To find friction factor for pipes of different materials.	3
2	To determine the minor head loss coefficient for different pipe fittings.	3
3	To determine the surface profile and total head distribution of a vortex.	3
4	To determine the elements of a hydraulic jump in a rectangular channel.	3
5	To determine the Manning's rugosity coefficient of a laboratory flume.	3
6	To obtain the velocity distribution for an open channel and to determine the values of $\alpha$ , $\beta$ and $n$ .	3
	Total	18



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<b>Course Title: SURVEYING-II</b> <b>(Code: CVT252)</b>	<b>Syllabus for B.Tech. 4<sup>th</sup> Semester</b> <b>(Civil Engineering)</b>	<b>Total Course Credit: 3</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	End-Term Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	1	0

**Course Objective:** To impart basic understanding of various aspects related to system of Geometrics and other physical measurements in the field of Civil Engg.

**Course Outcomes:**

**CO1** To understand traversing and numerical aspects of traversing.

**CO2** To understand trigonometric leveling and geodetic surveying.

**CO3** To understand curves and setting out works.

**CO4** To understand tachometric surveying involving angular measurements.

S. No.	Course Contents	Contact Hours
01.	<b>a. Theodolite:</b> Construction, Temporary and Permanent adjustment of transit Theodolite; angle measurements and errors, Theodolite Traversing-Traverse calculations; Traverse adjustments.	06
	<b>b. Tacheometry:</b> Stadia and its principal, analytic lens, Heights and distances from stadia intercepts; subtense method, tangential method; Accuracy, tacheometric alidade	06
02.	<b>a. Trigonometrical levelling:</b> Curvature and refraction, Axis-signal correction, method of trigonometrical levelling.	04
	<b>b. Curves:</b> Elements of simple curve; design and setting out of a simple curve, compound curve, transition curve, Vertical Curves.	08
03.	<b>a. Setting out works:</b> Setting out Buildings, Culverts and bridges, Tunnels. Transfer of alignment. Fixing of horizontal and vertical controls.	06
	<b>b. Geodetic surveying:</b>	06



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	Triangulation-principles: choice of stations, Base line measurements- electronic methods of distance measurements, Triangulation adjustments- Heights-figure adjustments; Spherical excess, Computations of sides of spherical triangles	
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**References:**

1. K. R. Arora., Surveying Vol. I & II, standard book; 16 edition 2018
2. Duggal, S.K., Surveying Vols. I & II, McGraw Hill Education; Fourth edition 2017
3. Basak, Surveying & Levelling, McGraw Hill Education; 2 edition 2017.
4. Kanetkar, T. P. and Kulkarni, S.V, Surveying & Levelling Vols. I & II, Pune Vidyarthi Griha Prakashan, 2014.
5. P.B. Shahani, Advance Surveying, Vol I & II, Handbook, New Delhi Oxford and IBH publication, 1981.
6. Punmia, B. C., Surveying Vol. I & II, Laxmi Publications Pvt Ltd 2016.



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<b>Course Title: SURVEYING LAB-II (Code: CVT-252)</b>	<b>Syllabus for B.Tech. 4<sup>th</sup> Semester (Civil Engineering)</b>	<b>Total Course Credit: 1</b>		
Internal Examination	External Examination	L	T	P
50 Marks	50 Marks	0	0	2

<b>Unit No.</b>	<b>Course Contents</b>	<b>Lecture Hours</b>
Unit -1	a. Study of Equipment: Ordinary Theodolites, E D M Theodolites and G T S Theodolites.	15
	a. Temporary Adjustments of a Theodolite.	
	b. Field work using a Theodolite: (i). Measurement of Horizontal and Vertical Angles by ordinary and electronic Theodolites. (ii). Measurement of linear and angular measurements using EDM/GTS Instruments (Basic Introduction)	
Unit -2	a. TACHEOMETRIC SURVEYING: (i) Study of equipment and graduated staff. (ii) Temporary adjustment	15
	b. Field work: (i). Determination of Constants " K & C " (ii). Stadia Traversing & recording stadia field book (iii). Location of Details by Tacheometric Methods	
	a. Subtense Bar Method: Theory and Field work	
	Total	30



**NATIONAL INSTITUTE OF TECHNOLOGY SRINAGAR**  
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<b>Course Title: Engg. Geology (Code: CVT 253)</b>	<b>Syllabus for B.Tech. 4<sup>TH</sup> Semester (Civil Engineering)</b>	<b>Total Course Credit: 3</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	End-Term Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	1	1

**Course Objective:** To impart the basic understanding of the formation of rocks and to expose the students to the basic erosional and depositional processes.

**Course Outcomes:**

- CO1- Understand the behavior of rocks at different scales, under loading conditions at ground surface and in the subsurface.
- CO2- The link between rock mechanics, geology and hydrogeology.
- CO3- The various engineering properties of earth's materials.
- CO4- Geologically significant places to learn in-situ character of rocks in quarries/ outcrops, road cuttings, dams, tunnels and underground excavations.

**Details of Course:**

S. No	Contents	Lecture Hours
1.	Physical Geology; geology and its relevance to civil engineering, geological work of wind, rivers, glaciers and seas.	6
2.	Petrology; formation of rocks, types/field classification, weathering of rocks, origin of soils.	6
3.	Structural Geology; folds, faults, joints, unconformities.	4
4.	Engineering Geology; geological considerations in tunnels, dams, bridges, building sites; landslides	6
5.	Earthquakes; basic definitions, types and causes, distribution in the world, seismic zones.	6

**Books recommended:**

**S.No. Name of Books/ Authors/ Publishers**

1. Bangar, K.M, Principles of Engineering Geology Standard Publishers Distributors, New Delhi.



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2. Parbin Singh Engineering Geology, Katson Publishers New Delhi.
3. Billings, M.P., Structural Geology, Prentice-Hall India, New Delhi.
4. Blyth, F.G.H and de Freitas, M.H. Geology for Engineers, ELBS, London.
5. Gokhale, KVG.K and Rao, D.M., Experiments in Engineering Geology, Tata- McGraw Hill, New Delhi.
6. Kesavulu, C. Textbook of Engineering Geology, Macmillan, India Ltd. New Delhi.
7. Geology for Civil Engineers by McLean and Gribble, Spon Press, Taylor & Francis Group, London.
8. Building Materials by Parbin Singh, Katson Publishers New Delhi.
9. Civil Engineering Material by Gurbachan Singh, Standard Publishers New Delhi.
10. Building Material by Dutta.
11. Building Materials by Duggal S. K., New Age International (P) Ltd. Publishers, New Delhi.



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<b>Course Title: CIVIL ENGINEERING DRAWING (Code: CVT 254)</b>	<b>Syllabus for B.Tech. 4<sup>th</sup> Semester (Civil Engineering)</b>	<b>Total Course Credit: 4</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	End-Term Examination	L	T	P
30 Marks	10 Marks	60 Marks	3	1	0

**Course Objective:** To impart understanding & knowledge of various aspects of Building Drawing and Construction.

**Course Outcomes:**

**CO1:** Identify the factors to be considered in planning and construction of buildings and execute construction activities in building projects

**CO2:** Knowledge about various types of foundations and their constructional aspects

**CO3:** Able to draw different types of drawings required for construction of buildings

**CO4:** Drawing of building plan, elevation and sections including slabs

S. No.	Course Contents	Contact Hours
01.	Standard Conventions in Drawing: Basic principles of planning and design in buildings.	02
02.	Foundations: Principles of foundations, types and suitability of foundations including strip, pad, raft, pile and pier foundation, timbering for excavation of foundation.	02
03.	Damp proofing: Causes, effects, parts of building likely to be affected of methods of damp-proofing , materials of damp proofing.	02
04.	Masonry: Principles and significance of brick masonry; terms used and types of brick bonds; principles and significance of stone masonry; types of stone masonry walls; building uses of common types of stones.	03
05.	Drawing of plans, elevations and sections giving construction details of important building components including foundation, plinth, DPC, lintels, slabs and roofs; full specifications for each component.	12
06.	Simple drawing exercises on layouts of building services such selectrical, water supply and plumbing, sanitation etc.	04
07.	Doors, Windows, Ventilators and Lintels; Location, size and different types including steel and aluminum: types of lintels and their construction details. Drawing of typical doors, windows and ventilators.	05



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08.	Drawing of R.C.C. slabs & beams (including cantilevers), columns and footings.	05
09.	Stairs and Staircases: Various types and materials; proportioning of staircase, brief introduction of ramps, lifts and escalators. Drawing of R.C.C. stair case.	04
10.	Floors; Consideration of choice in ground and upper floors; various types of floors and their suitability; flooring materials and their construction details.	04
11.	Roofs & Roof Coverings: Classification of roofs with special reference to pitched roofs; different roof coverings and details of rain proofing at top wall. Drawings of various timber roof trusses with joint details.	05

**References:**

1. Shah M.G, Building Drawing, McGraw-Hill Inc., US; 2nd Revised edition 1985.
2. Chakorobarty, Civil Engineering Drawing
3. J.B. Mc. Kay, Civil Engineering Drawing
4. Sharma and Koul, Textbook of Building Construction, S Chand & Co Ltd; 6th Revised edition, 1987.
5. Nevile, A. M., Properties of Concrete, Pearson Education India; 5 edition 2012.

<b>Course</b> <b>Mathematics-II</b> <b>(Code: MAT 256)</b>	<b>Title:</b>	<b>Syllabus for B.Tech. 4<sup>th</sup></b> <b>Semester (Civil Engineering)</b>	<b>Total Course Credit: 4</b>
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Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	End-Term Examination	L	T	P
30 Marks	10 Marks	60 Marks	3	1	0

### Course Outcomes (COs)

At the end of the course, the student will be able to

**CO1:** Understand the concept of complex differentiation and analyticity of complex valued functions.

**CO2:** Understand the concept of complex integration and its properties.

**CO3:** Expand a complex valued function about a point using Taylor and Laurent's theorem.

**CO4:** Understand the concept of Special functions like Legendre and Bessel functions and their properties

### Syllabus

**Complex Variables** Analytic functions, Cauchy Riemann equations, complex integration, Cauchy's fundamental theorem, Cauchy's integral theorem, Cauchy's inequality and Liouville's theorem on integral function, Taylor's and Laurent's expansions, Zeroes and poles of analytic functions, Residues and contour integration, Conformal Mapping, Bilinear transformation.

**Special Functions:** Legendre's functions, Rodrigue's formula, generating functions for Legendre's Polynomials and recurrence formulae. Bessel's functions, Recurrence formulae and Bessel's functions of integral order.

### Books Recommended:

1. Complex Variables and Applications, R. V Churchill, Mc-Graw Hill Pub. Company.
2. Theory of functions of complex variable, E.T Copson, Oxford University Press.
3. Advanced Engineering Mathematics, R.K Jain and S.R.K Iyengar



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**BTECH. 5<sup>th</sup>- SEMESTER (Civil)**

<b>Course No.</b>	<b>Course title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
CVT301	Design of Structures-I	2	2	0	4
CVL301	Concrete Laboratory	0	0	2	1
CVT302	Highway Engineering and PMS	3	1	0	4
CVL302	Highway Laboratory	0	0	2	1
CVT303	Geotechnical Engineering-I	2	2	0	4
CVL303	Geotechnical Laboratory-I	0	0	2	1
CVT304	Water Resources Engineering	2	2	0	4
CVT305	<b>Structural Analysis-III</b>	2	1	0	3
	<b>Elective Courses</b>				
CVT307	Architecture and Town Planning	2	1	0	3
	Concrete Technology				
	Engineering Seismology				
<b>Total Lecture Hours and Credits</b>		<b>28</b>			<b>25</b>



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<b>Course Title: DESIGN OF STRUCTURES-I (Code: CVT301)</b>	<b>Syllabus for B.Tech. 5<sup>th</sup> Semester (Civil Engineering)</b>	<b>Total Course Credit: 4</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	End-Term Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	2	0

**Course Objective:** The objective is to equip students with basic understanding of the behavior of the reinforced concrete structures and to develop the skill to analyze and design basic concrete members.

**Course Outcomes:**

**CO1:** To develop basic understanding of reinforced concrete as a construction material.

**CO2:** To develop understanding of various design philosophies and their differences.

**CO3:** To understand behavior of RCC beams.

**CO4:** To understand behavior of RCC members under flexural shear.

**CO5:** To understand behavior of compression members.

**CO6:** To understand behavior of two-way slabs using moment coefficients.

S. No.	Course Contents	Contact Hours
01.	<b>General material properties</b> Properties of Concrete & Reinforcing Steel, Characteristic Strength, Stress Strain Curves, Shrinkage & Creep Phenomenon.	03
02.	<b>Basic design Philosophies</b> Working Stress, Ultimate Load & Limit State Method of Design. Analysis & Design of Structures In Flexure/Torsion By Limit State Method.	03
03.	<b>Design &amp; Analysis of Flexural members</b> Design of singly and doubly reinforced sections: rectangular sections & T sections; codal provisions. Behavior of beam in shear & bond, design for shear, anchorage & slipping of reinforcement. Detailing of reinforcement as per codal provisions with reference to IS 456-2000. Serviceability limit state of deflection and cracking. Calculation of deflection, codal requirements.	18



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04.	<b>Design &amp; analysis of columns</b> Design of columns: short and long column, eccentrically loaded columns using interaction curves	05
05.	<b>Design &amp; Analysis of solid slabs</b> Design of one-way and two-way slabs with and without corners held down. Introduction to design by moment coefficients. Introduction to Masonry retaining walls	07

**References:**

1. Mosley ,W.H Hulse ,R and Bungey. "Reinforced concrete design to EuroCode 2",7<sup>th</sup> Edition,Palgrave Macmillan ,London,2012
2. Wight,J.K," Reinforced Concrete: Mechanics & Design",7<sup>th</sup> Edition,Pearson/Prentice Hall,2015.
3. S Unnikrishna Pillai,Devdas Menon,"Reinforced Concrete Design" 3<sup>rd</sup> Edition, Mcgraw Hill Publication.
4. Kong & Evans, Design of reinforced concrete & Pre-stressed concrete Structures, CRC Press Published, 1987



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<b>Course Title: Concrete Lab.</b> <b>(Code: CVL 301)</b>	<b>Syllabus for B.Tech. 5th Semester</b> <b>(Civil Engineering)</b>	<b>Total Course Credit: 1</b>		
Internal Examination	External Examination	L	T	P
50 Marks	50 Marks	0	0	2

- CO1** To handle concrete and its constituents in laboratory.
- CO2** To design experiments related to testing various aspects of concrete and its constituents.
- CO3** To test concrete and concrete structures for various characteristics/properties and compare the same with those given as per IS codes.
- CO4** To understand how concrete behaves in actual buildings.

**List of Experiments / Objective**

**A) CEMENT: Standard Consistency and setting times**

To determine: i) Standard consistency ii) Initial setting time iii) Final setting time in conformity with IS code 4031.

**Tensile and Compressive strength**

To determine the tensile strength and compressive strength of Cement in accordance with IS code - 4031.

**B) AGGREGATES:**

**Particle size distribution and fineness modulus**

To determine the particle size distribution and fineness modulus of coarse and fine aggregates (IS -460). All the relevant tests for aggregates as per I.S. codes.

**C) CONCRETE:**

**Workability test**

- i) To determine the consistency of fresh concrete by slump test.
- ii) To determine the workability of freshly mixed concrete by the compaction factor test

**Compressive strength of Cement Concrete (Nominal mix)**

To determine the cube strength of concrete for different mixes and different W/C ratios.



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**Flexural Strength of Concrete**

To determine the flexural strength (Modulus of Rupture) of concrete (Nominal Mix)

**Ultimate strength of Beams**

To determine the flexural ultimate strength of

- i) an under reinforced beam
- ii) an over reinforced beam

**Bond strength**

To determine the bond strength between

- i) Mild steel plain bars & concrete
- ii) Tor Steel/cold twisted bars and concrete



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<b>Course Title: Highway Engg. And PMS (Code: CVT302)</b>	<b>Syllabus for B.Tech. 5<sup>th</sup> Semester (Civil Engineering)</b>	<b>Total Course Credit: 4</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	Major Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	2	0

**Course Outcomes:**

**CO1:** To design roads and highway alignment.

**CO2:** To develop geometric design of highways.

**CO3:** To design pavements.

**CO4:** To test properties of road aggregates and bituminous material.

**CO5:** To select materials for cement concrete roads.

**CO6:** To perform pavement management.

<b>S. No.</b>	<b>Course Contents</b>	<b>Contact Hours</b>
01.	<b>INTRODUCTION</b> Scope, History, classification of roads. Comparison with other modes of transportation	04
02.	<b>Alignment design:</b> route survey and highway Location.	03
03.	<b>Geometric design:</b> cross-section elements; sight distances, horizontal and vertical alignment	12
04.	<b>Pavement design:</b> factors affecting pavement design, types of pavements, Empirical methods of flexible pavement design (e.g. C.B.R, group index and Burmister's layer theory), stresses due to load and temperature in rigid pavements, introduction to design methods of rigid pavements.	08
05.	<b>Highway materials and construction:</b> Properties and tests for road aggregates and bituminous materials, design of bituminous concrete mix, methods of preparing sub grade, base course and construction of various types of surface covers, joints in cement concrete roads.	07
06	<b>Pavement management system:</b> basic concept, data requirements & collection methods, maintenance and rehab treatments, priority programming, implementation of PMS.	06



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**References:**

- 1) Khanna, S.K. and Justo, C.E.G. 2002. "Highway Engineering". Nem Chand Brothers, Roorkee.
- 2) Bhanot, K.L.1990. " Highway Engineering", S. Chand and Company (P) Ltd., New Delhi.
- 3) Rao, G.V. 1996. "Principles of Transportation and Highway Engineering", Tata McGraw Hill, New Delhi.
- 4) Pavement Design and Management Guide by Transportation Association of Canada, Ottawa, Ontario, Edn. Dr. Ralph Haas, University of Waterloo.
- 5) Relevant IRC Codes/Specification



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<b>Course Title: Highway Lab.</b> <b>(Code: CVL 302)</b>	<b>Syllabus for B.Tech. 5th Semester</b> <b>(Civil Engineering)</b>	<b>Total Course Credit: 1</b>		
Internal Examination	External Examination	L	T	P
50 Marks	50 Marks	0	0	2

- CO1** Conduct tests on aggregate; aggregate gradation, specific gravity, aggregate crushing, aggregate abrasion, aggregate impact: follow standard test procedures, design observation sheet, record observations and analyze, presentation and analysis of test results, derive conclusions
- CO2** Conduct tests on aggregate; soundness, flakiness, elongation, combined flakiness & elongation, deleterious material: follow standard test procedures, design observation sheet, record observations and analyze, presentation and analysis of test results, derive conclusions
- CO3** Conduct tests on coarse and fine aggregate and bitumen; fineness modulus, silica content, organic content, silt content, alkalinity, viscosity; penetration, softening point, flash & fire point, ductility, specific gravity,: follow standard test procedures, design observation sheet, record observations and analyze, presentation and analysis of test results, derive conclusions
- CO4** Conduct tests on modified binders, bituminous Mixes and subgrade soil; elastic recovery, separation difference, Marshall stability, flow value, index properties of soil, CBR of soil, subgrade modulus: follow standard test procedure, design observation sheet, record observations and analyze, presentation and analysis of test results, derive conclusions

<b>Expt. No</b>	<b>Contents</b>
<b>1</b>	Tests on aggregate: Aggregate grading, Specific gravity, crushing, Abrasion, Impact test, Soundness, Flakiness, Elongation, Fineness Modulus, Silica content, Organic content, Silt content, Alkalinity, Deleterious material.
<b>2</b>	Tests on bitumen and bituminous mixes: Viscosity, Penetration, Softening point, Flash & fire point, Ductility, Specific gravity, Elastic recovery, Marshall Stability.
<b>3</b>	Tests on sub-grade: sub-grade modulus, CBR.



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<b>Geotechnical Engineering -I</b> <b>(Code: CVT303)</b>	<b>Syllabus for B.Tech. 4<sup>th</sup> Semester</b> <b>(Civil Engineering)</b>	<b>Total Course Credit: 4</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	End-Term Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	2	0

**Course Objective:** To develop analytical and experimental skills to determine various stresses acting on soil material.

**Course Outcomes:**

**CO1:** To classify soils and understand their index properties.

**CO2:** To analyze flow through soils.

**CO3:** To perform/ demonstrate soil compaction tests.

**CO4:** To determine stress distribution in soils.

**CO5:** To utilize various methods of soil investigation in field and laboratory.

<b>S. No.</b>	<b>Course Contents</b>	<b>Contact Hours</b>
01.	<b>INTRODUCTION:</b> Soil and its formation, various processes and agencies for formation. Types of soils. Three phase soil model, Index properties and classification of soils.	10
02.	<b>SOIL HYDRAULICS:</b> Flow through soils, Darcy's Law. Permeability, factors and determination in the lab/Field. Steady state flow, seepage force, Laplace equation for steady state flow, flownets for homogeneous embankments with and without toe filters.	10
03.	<b>SOIL COMPRESSIBILITY:</b> One dimensional consolidation, Terzaghi's equation, Consolidation test logp curves. Consolidation settlement, Time required for settlement. Compaction, laboratory compaction tests, proctor compaction, compaction curve and control on field compaction.	06  04
04.	<b>EFFECTIVE STRESS:</b> Total and effective stresses, pore water pressure.	02



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05.	<b>STRESS DISTRIBUTION:</b> Stress distribution under concentrated load. Westergard's and Boussineq's method.	04
06.	<b>SOIL INVESTIGATION:</b> Laboratory and Field Investigation. Sub soil exploration, penetration methods, Geophysical methods electromagnetic method, electric resistivity method and Seismic method.	04
07.	<b>CLAY MINERALOGY:</b> Minerals present in clay, dependence of behavior of clay on type 2 of mineral.	

**References:**

1. Alam Singh, Basic Soil Mechanics and Foundations, CBS; 1ST edition 2014.
2. D.W.Taylor, Fundamentals of Soil Mechanics, Literary Licensing, LLC 2013.
3. Karl Terzaghi, Theoretical Soil Mechanics, John Wiley & Sons, Inc, 1943.
4. Terzaghi & Peck, Soil Mechanics in Engineering Practice, 3rd Edition, John Wiley & Sons, Inc, 1996.
5. Withman & Lamb, Soil Mechanics (Series in Soil Engineering), Wiley; 1 edition, 1969.
6. Soil Mechanics by S.B. Saighal
7. Alfreds R. Jumikis, Introduction to Soil Mechanics.
8. Purushothama Raj, Soil Mechanics and Foundation Engineering, Pearson; 1 edition, 2007.
9. C. Venkatramaiah, Geotechnical Engineering, New Age International; Sixth edition, 2018.



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<b>Title: Geotechnical Lab - I (Code: CVL 303</b>	<b>Syllabus for B.Tech. 5th Semester (Civil Engineering)</b>	<b>Total Course Credit: 1</b>		
Internal Examination	External Examination	L	T	P
50 Marks	50 Marks	0	0	2

**COURSE OUTCOMES:**

1. To determine basic soil properties and consistency limits.
2. Draw complete particle size distribution curve of a given soil.
3. Determine Compaction characteristics of a given soil.
4. Determine Permeability of any given soil specimen.

<b>Expt. No.</b>	<b>Name of the Experiment</b>
1	Soil Identification Tests
2	Water Content Determination Test
3	Field Density Measurement
4	Specific Gravity Test
5	Sieve Analysis Test
6	Sedimentation Analysis Test
7	Atterberg And Shrinkage Limits
8	IS Light Heavy Compaction Tests
9	Permeability Tests



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<b>Course Title: WATER RESOURCES ENGINEERING (Code: CVT304)</b>	<b>Syllabus for B.Tech. 5<sup>th</sup> Semester (Civil Engineering)</b>	<b>Total Course Credit: 4</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	End-Term Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	2	0

**Course Objective:** To impart the knowledge for understanding elementary aspects of hydrology and Fluvial Hydraulics for use in the planning, design, and management of water resources projects. Also to impart understanding of introductory aspects of integrated water resources development and management.

**Course Outcomes:**

**CO1:** To perform multiple analysis on precipitation data.

**CO2:** To estimate various components of hydrological cycle such as stream flow, runoff, evapotranspiration and infiltration.

**CO3:** To measure components of hydrological water balance in field.

**CO4:** To perform hydrograph analysis and estimate magnitude of flood.

**CO5:** To determine reservoir capacity and sedimentation.

**CO6:** To perform steady state analysis of groundwater movement.

**CO7:** To determine the technical, social and economic aspects of water resources planning and management.

S. No.	Course Contents	Contact Hours
01.	Definition and scope of hydrology, hydrological cycle, water balance equation.	02
02.	Precipitation, its mechanism, forms, weather systems, Indian scenario, measurement, average precipitation, gauge network adequacy, missing data determination, and consistency.	03
03.	Evaporation: factors affecting, measurement, empirical equations, analytical methods, reservoir evaporation; Evapotranspiration, its measurement, ET equations, potential evapotranspiration.	03
04.	Interception and depression storage.	01
05.	Infiltration, infiltration capacity, measurement, indirect determination, infiltration indices.	03
06.	Streamflow measurement: Direct and indirect methods, depth measurement, velocity measurement, stage-discharge relationship.	03



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07.	Runoff: Factors affecting, runoff characteristics of streams, rainfall-runoff relationships.	02
08.	Hydrographs: Definition, components, base flow separation, effective rainfall, unit hydrograph, its derivation, applications, and limitations.	03
09.	Floods: Rational method, empirical methods, U.H. method, Design flood definition.	02
10.	Flood routing: Reservoir and channel routing.	03
11.	Reservoir Design Studies: Types of reservoirs, storage capacity, fixation of capacity, safe yield, reservoir sedimentation: trap efficiency, capacity-inflow ratio, life of reservoirs.	03
12.	Groundwater: Introduction, types of aquifers, aquifer properties, Darcy's law, Dupuit assumptions, steady one-dimensional aquifer flow, Well Hydraulics: Steady flow to wells in confined and unconfined aquifers.	03
13.	Fluvial Hydraulics: Introduction, properties of sediment particles, brief description of incipient motion, bed load, and suspended load.	03
14.	Water Resources Planning and Development: National water policy, Single and multi-purpose development, Integrated water resources development and management, inter-state and international aspects of river basin development.	02

**References:**

1. Subramanaya, K. "Engineering Hydrology" Tata McGraw Hill, New Delhi, 2001.
2. Linsely, K., Kohler, A. and Paulhus L.H. "Hydrology for Engineers" McGrawHill Book Company Inc. New York, 1975.
3. Rangunath, H.M. "Hydrology Principles Analysis and Design" New Age International (P) Ltd Publishers., New Delhi, 2005.
4. Garde, R.J. and RangaRaju K.G. "Mechanics of sediment transportation and alluvial stream problems". New Age International (P) Ltd. Publishers, New Delhi, 1994.
5. Arora, K.R. "Irrigation Water power and water Resources Engineering". Standard Publishers Distributors, Delhi, 2002.
6. Wilson, E.M. "Engineering Hydrology" ELBS, English Language book Society/Macmillan Education Ltd., London, 1999.
7. Asawa, G.L. Irrigation and Water Resources Engineering, New age International Publishers, 2005.

<b>Structural Analysis - III</b> <b>(Code: CVT305)</b>	<b>Contact Hours = 42</b>	<b>Total Course Credit: 3</b>
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Mid-Term	Class Assessment	End-Term	L	T	P
30 Marks	10 Marks	60 Marks	2	1	0

**Course Objective:** To learn the method of drawing influence lines for determinate and indeterminate structures. The students are expected to analyze the arches and suspension bridges and learn the plastic analysis of beams and rigid frames.

**Course Outcomes:**

**CO1:** Draw influence lines for statically determinate structures and calculate critical stress resultants.

**CO2:** Understand Muller-Breslau principle and draw the influence lines for statically indeterminate beams.

**CO3:** Analyze three hinged, two hinged and fixed arches.

**CO4:** Analyze the suspension bridges with stiffening girders.

**CO5:** Understand the concept of Plastic Analysis and the method of analyzing beams and frames.

S. No.	Contents	Contact Hours
01.	<b>Influence Line Diagrams for Determinate Structures:</b> Influence lines for reactions in statically determinate beams, Girders with floor systems, Trusses: ILD for deflections. Calculation of critical stress resultants due to concentrated and distributed moving loads – absolute maximum bending moment – influence lines for member forces in pin jointed plane frames. Muller-Breslau Principle	10
02	<b>Arches</b> – Types of arches – Analysis of three hinged, two hinged and fixed arches – Parabolic and circular arches – Rib shortening and temperature effects.	8
03.	<b>Cables and Suspension Bridges:</b> Statics of a suspension cable. Analysis of cables and suspension bridges with and without stiffening girders. Influence lines for three hinged stiffening girders.	8
04.	<b>Plastic Analysis:</b> Plastic theory, Plastic Section Modulus, Shape factor and Moment of resistance, Plastic hinge and Mechanism – Collapse load – Static and Kinematic methods- Upper and Lower Bound Theorems – Plastic Analysis of Indeterminate beams and frames including Gable Frames. Plastic moment distribution for multi-storey and multi-bay frames.	10
05.	<b>Influence Line Diagrams for Indeterminate Structures:</b> - Influence lines for shear force, bending moment and support reaction components of beams, arches. Development of force envelope.	6



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**Textbooks:**

1. Hibbeler, R. C. (2002). *Structural Analysis*, Pearson Education (Singapore) Pt. Ltd., Delhi
2. Leet, K. M. and Uang, C-M. (2003). *Fundamentals of Structural Analysis*, Tata McGraw-Hill Publishing Company Limited, New Delhi.
3. V.K. Manicka Selvam: *Fundamentals of Limit Analysis of Structures (A Course in Plastic Analysis of Structures)*, Dhanpat Rai Publications.

**References:**

1. C. S. Reddy, 'Basic Structural Analysis', Tata McGraw Hill, New Delhi.
2. C.K. Wang, 'Intermediate Structural Analysis', Tata McGraw Hill, New Delhi.
3. Junnarkar.S.B. and Shah.H.J, "Mechanics of Structures", Vol II, Charotar Publishing House, New Delhi 2016.



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<b>Concrete Technology (Code: CVT307)</b>	<b>Syllabus for B.Tech. 3rd Year (5th Semester) (Civil Engineering)</b>	<b>Total Course Credit: 3</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	Major Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	1	0

**Course Objective:** To impart understanding of various aspects related to ingredients and properties of concrete and concrete mix design.

**Course Outcomes:**

- CO1:** Understand properties and role of ingredients like cement, aggregate etc. to produce better quality concrete  
**CO2:** Understand the behavior of fresh and hardened concrete.  
**CO3:** Apply design mix to produce concrete with adequate strength  
**CO4:** Understand the need for special concrete

S. No.	Course Contents	Contact Hours
01.	Cement: Its Basic Chemistry, Types of Portland cement	05
02.	Normal aggregates and their properties	05
03.	Fresh Concrete and its properties. Strength of Concrete: Water/Cement ratio-Gel/Space Ratio, Influence of Temperature on Strength of Concrete and Bond between concrete and Reinforcement, Mixing, handling, placing, and Concrete. Elasticity, Shrinkage and Creep of Concrete	18
04.	Mix Design: IS method	05
05.	Special Concretes	05

**References:**

- 1) Neville, A.M. "Properties of Concrete. Pearson Publishers, New Delhi, 2004
- 2) Shetty, M.S. "Concrete Technology" S.Chand & Company New Delhi, 2002
- 3) Gambhir, M.L. "Concrete Technology" TaTa McGraw Hill New Delhi, 1995
- 4) Neville, A.M. and Brookes, J.J. "Concrete Technology", Pearson. 1994



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<b>Course Title: ENGINEERING SEISMOLOGY (Code: CVT307)</b>	<b>Syllabus for B.Tech. 5<sup>th</sup> Semester (Civil Engineering)</b>	<b>Total Course Credit: 3</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	End-Term Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	1	0

**Course Objective:** To impart the basic understanding of earthquakes, physics of the earth's interior from a practical side, to foresee the potential consequences of strong earthquakes on urban areas and civil infrastructure and how to do more efficient hazard management and mitigation. This module will communicate how science can enhance community resilience and has relevance far beyond any site for earth sciences, earthquake engineering, preparedness, mitigation, emergency response, decision-making, and public policy.

**Course Outcomes:**

- CO1:** Properties of the Earth's interior, physical characteristics of seismic sources, Estimation of seismic hazard and risk
- CO2:** Effects of earthquakes on humans, objects and surroundings.
- CO3:** Information on the soil structure and properties at the construction site, as well as on the path between epicentre and the site
- CO4:** Parameters needed in order to construct seismically safe and sound structures.

S. No.	Course Contents	Contact Hours
01.	Engineering Seismology, Seismology and Seismic Exploration (Definitions). Introduction to Seismic Hazard and Earthquake Phenomenon. Global seismicity - Analysis of earthquake focal mechanisms.	06
02.	Seismotectonic and Seismic Zoning of India. Micro-zonation. Mechanism of Faulting. Earthquake Prediction.	07
03.	Site Response to Earthquakes: Local geology and soil conditions. Site investigations and soil tests. Dynamic design criteria for a given site.	08
04.	Earthquake Monitoring and Seismic Instrumentation. The Seismograph - Principles of Seismometer. Location of the epicenter of an earthquake. Earthquake size and intensity. Energy released in an earthquake.	08



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05.	Earthquake: Risk and Preparedness. Earthquake: Social Consequences; Codes and Public Policy.	08
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**References:**

1. Bolt, B.A., W.H. Freeman, Earthquake, New York, 1993.
2. Kearey P and Brooks, An Introduction to Geophysical by Exploration, M. Blackwell Publishers Oxford, 1991.
3. Robinson, E.S and Coruch, Basic Exploration Geophysics, C. John Wiley & Sons, 1998.
4. Walker, B.S., Earthquake Time-Life Books Inc., Alexandria, Virginia, 1982.
5. Bott, M.H.P., Edward Arnold, The Interior of the Earth. London, 1982.
6. Flower, C.M.R, The Solid Earth: An Introduction to Global Geophysics., Cambridge University Press, 1990.
7. Lay, T. and Wallace, T.C, Modern Global Seismology., Academic Press, San Diego, 1995.



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**B.TECH. 6<sup>th</sup> SEMESTER (Civil)**

Course No.	Course title	L	T	P	C
CVT350	<b>Design of Structures-II</b>	2	2	0	4
CVL350	Structural Engineering Lab.-II	0	0	2	1
CVT351	Traffic Engineering and Road Facilities	2	2	0	4
CVL351	Traffic Engineering Laboratory	0	0	2	1
CVT352	Geotechnical Engineering-II	2	2	0	4
CVL352	Geotechnical Laboratory-II	0	0	2	1
CVT353	Irrigation and Hydraulic Structures	2	1	0	3
CVT1453	Industrial Training & Presentation	0	0	0	1
	<b>Elective Courses</b>				
CVT/MAT	Water Shed Management	2	1	0	3
	Operations Research				
	<b>Numerical Methods in Civil Engineering</b>				
CVT354	Computer Aided Design	2	1	0	3
	Disaster Management				
	Applied Hydrology				
	<b>Advanced Structural Analysis</b>				
Total Lecture Hours and Credits		27			25



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<b>Design Of Structures -II</b> (Code: CVT350)	<b>Syllabus for B.Tech. 6<sup>th</sup> Semester</b> (Civil Engineering)	<b>Total Course Credit: 4</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	Major Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	2	0

**Course Objective:** This course is designed to introduce the behavior and design of structural steel members according to the limit states design concept. Students are expected to obtain basic knowledge about the design and failure mode of structural steel members after finishing this course.

**Course Outcomes:**

**CO1:** Design of bolted and welded connections; concentric and eccentric

**CO2:** Design of rolled and built-up tension members.

**CO3:** Design of rolled and built-up compression members.

**CO4:** Design of laterally supported and unsupported flexural members

**CO5:** Design of plate girders

**CO6:** Understanding failure modes and application of Limit States Design philosophies of steel design.

S. No.	Course Contents	Contact Hours
01.	<b>General considerations</b> Introduction to structural steel and their design philosophies. Properties, rolled sections.	4
02.	<b>Simple Connections</b> Design of riveted, bolted connections, welded connections: concentric and eccentric connections, load transfer mechanism, failure of joints, prying action, selection of fasteners	6
03.	<b>Tension members</b> Types & design of tension members; Rolled and Built-up sections, types of failures, lug angles, gusset plates.	4
04.	<b>Compression members</b> Effective length, slenderness ratio & types of buckling, design of compression members; Rolled and Built-up sections. design of column bases.	5



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05.	<b>Beams</b> Behaviour of beams in flexure, classification of sections, lateral torsional buckling, shear strength of beams. Design of flexural member, laterally supported, laterally unsupported and built-up beams.	6
06.	<b>Plate Girders</b> Elements & proportioning of plate girder, shear buckling design methods, types & design of stiffeners, curtailment of flanges, design procedure of Plate Girders with special focus on shear buckling & use of web stiffeners.	4

**References:**

- 1) Design of steel structures By Subramanian
- 2) Steel structures – Design & Behaviour By Salmon & Johnson
- 3) Design of steel structures By SK Duggal.
- 4) Design of steel structures By Vizrani and Ratwani



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<b>Structural Engg. Lab - II</b> <b>(Code: CVL - 350)</b>	<b>Syllabus for B.Tech. 6th Semester</b> <b>(Civil Engineering)</b>	<b>Total Course Credit: 1</b>		
Internal Examination	External Examination	L	T	P
50 Marks	50 Marks	0	0	2

- CO1** Ability to demonstrate professional engineering approach, including application of principles and utilization of technical resources such as software's towards solving technical problems requiring civil engineering interventions.
- CO2** Ability to furnish and/or analyse designs and construct structural systems, produce related documents, drawings and reports, and present objective estimates of the related quantities.
- CO3** Ability to conduct field and laboratory investigations pertaining to civil engineering domain, and utilize modern tools and techniques of surveying.
- CO4** To understand the behaviour of structural members

**Name of the experiment:**

<b>Expt. No</b>	<b>Contents</b>
1.	Deflection of curved beams
2.	Behaviour of a portal frame under different load combinations
3.	Deflection of Truss
4.	Behaviour a cantilever beam under symmetrical and un-symmetrical loading
5.	Analysis of an elastically coupled beam
6.	Analysis of a redundant joint
7.	Analysis of two hinged arch



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<b>Traffic Engg. And Road Facilities</b> (Code: CVT351)	<b>Syllabus for B.Tech. 5<sup>th</sup> Semester (Civil Engineering)</b>	<b>Total Course Credit: 4</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	End-Term Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	2	0

**Course Objective:** To impart understanding and knowledge of various aspects of Traffic Engineering and Road Facilities.

**Course Outcomes:**

**CO1:** To understand the various aspects of roads, road characteristics, road capacity

**CO2:** To understand the level of service concept & traffic control devices.

**CO3:** To understand the aspects of traffic flow, fundamental relation of traffic flow, etc.

**CO4:** To understand the intersections and interchanges along with their requirement and design.

S. No	Course Contents	Contact Hours
01.	Components of traffic system-vehicle characteristics; human characteristics, road characteristics & traffic-control devices.	06
02.	Intersections-unsignalized intersections, channelization and roundabouts, interchanges- requirement & design.	10
03.	Traffic signs- role and types, signalized intersections, signal timing design; signal coordination, Parking facilities-parking demand, on-street parking, off-street parking.	14
04.	Traffic flow theory-flow parameters; fundamental relation of traffic flow, road capacity and level of service concept.	10

**References:**

1. CA O'Flaherty, Transport Planning and Traffic Engineering, John Wiley & Sons, Inc., New York; Toronto, 2002.
2. McShane & Roess, Traffic Engineering, Prentice-Hall of India Private Ltd, New Delhi-110001, 1990.
3. Kadiyali & Lal, Principles and Practices of Highway Engineering, Khanna Publishers, Delhi-6, 1996.
4. Chakarborty & Das, Principles of Transportation Engineering, Prentice-Hall of India Private Ltd, New Delhi-110001 .



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5. L. R. Kadiyali, Traffic Engineering and Transport Planning, Khanna Publishers, 2-B, NaiSarak, Delhi- 110006, 1999.

<b>Traffic Engineering Lab- II (Code: CVL 351)</b>	<b>Syllabus for B.Tech. 6th Semester (Civil Engineering)</b>	<b>Total Course Credit: 1</b>		
Internal Examination	External Examination	L	T	P
50 Marks	50 Marks	0	0	2

- CO1** To understand the road user/ driver characteristics in Lab, traffic volume studies in field, intersection volume studies in field: design of questionnaires, data collection, compilation and analysis of field and lab data, presentation of results and derive conclusions
- CO2** To perform small-network volume studies and OD volume studies: design of questionnaires, data collection, compilation and analysis of field and lab data, presentation of results and derive conclusions
- CO3** To understand the traffic speed (spot speed) studies, conduct of travel-time & delay studies, accident studies: design of questionnaires, data collection, compilation and analysis of field and lab data, presentation of results and derive conclusions
- CO4** To understand and perform pedestrian and parking studies: design of questionnaires, data collection, compilation and analysis of field and lab data, presentation of results and derive conclusions.

<b>Expt. No</b>	<b>Contents</b>
1	Study of Road user characteristics
2	Traffic volume studies
3	Intersection volume studies
4	Small-network volume studies
5	OD volume studies
6	Study of traffic speed
7	Speed & delay studies
8	Travel-time studies
9	Accident studies
10	Pedestrian studies



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11	Parking studies
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<b>Geotechnical Engineering - II</b> (Code: CVT352)	<b>Syllabus for B.Tech. 6<sup>TH</sup> Semester</b> (Civil Engineering)	<b>Total Course Credit: 4</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	Major Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	2	0

**Course Outcomes (COs)**

- CO1:** To equip the knowledge of strength and mechanical behaviour of soils.
- CO2:** To understand the concepts of bearing capacity and foundations.
- CO3:** To understand the practical aspects of earth pressure and retaining structures.
- CO4:** To understand the concepts of slope stability along with its practical application

S No	Contents	Contact hours
01	<b>SHEAR STRENGTH:</b> Shear strength concept. Mohr's Coulumb equation. Laboratory determination. Triaxial compression test under different Drainage conditions ,viz undrained, drained and consolidated, direct shear test. Unconfined compression test. Strength envelope.	8
02	<b>BEARING CAPACITY AND FOUNDATIONS:</b> Basic definitions and methods of determination, Prandtl's solution. Terzaghi's solution for ultimate bearing capacity. Size effects. Effects of rigidity of footings. Plate load test. Design principles for footing and rafts. Foundations on clay sand sands Foundations types and applications, Pile foundation types, classification sand determination of load carrying capacity, dynamic and static methods. Pile load test, pile groups efficiency of pile groups.	12
03	<b>EARTH PRESSURE:</b> Lateral earth pressure. Rankine's theory Active and Passive States .Lateral earth pressure under various conditions, like surcharge, sloping backfill and high water table behind the wall. Earth pressure diagrams. Total thrust.	10



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	Tension Cracks.	
04	<b>STABILISATION:</b> Methods of stabilization. Brief introduction to each of the methods of stabilization such as shotcreting, geo reinforcement	05
05	<b>STABILITY OF SLOPES:</b> Infinite slopes, conjugate stresses, stability number Swedish and Friction circle methods. Submergence case, complete draw down case, Steady seepage case.	07

**References:**

1. Ranjan, G and Rao, P., "Basic and Applied Soil Mechanics", New Age International Pvt. Limited, New Delhi, 2002.
2. Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers Distributors, Delhi, 1987.
3. Singh, A., "Basic Soil Mechanics & Foundations", CBS Publishers & Distributors, 2004.
4. Taylor, D.W., "Fundamentals of Soil Mechanics", Wiley, New York, 1948.
5. Bowles, J.E., "Physical and Geotechnical properties of Soils", McGraw Hill Publishers, 1979.
6. Terzaghi, K., "Theoretical Soil Mechanics", Wiley, New York, 1943.
7. Terzaghi, K., Peck, R.B. and Mesri, G., "Soil Mechanics in Engineering Practice", 1996.
8. Jumikis, A.R. "Soil Mechanics", R.E. Krieger Pub. Co., Florida, US, 1984.
9. Purushothama, P. "Geotechnical Engineering", McGraw Hill Education, 1995.
10. Venkataramaiah, C., "Geotechnical Engineering", New Age International Publishers, Daryaganj, New Delhi, 1995.



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<b>Geotechnical Engineering Lab-II (Code: CVL -352)</b>	<b>Syllabus for B.Tech. 6th Semester (Civil Engineering)</b>	<b>Total Course Credit: 1</b>		
Internal Examination	External Examination	L	T	P
50 Marks	50 Marks	0	0	2

**COURSE OUTCOMES**

- CO1.** Determine consolidation characteristics of a given soil sample.
- CO2.** Obtain shear strength parameters of different types and/or consistencies of soils and under different drainage conditions.
- CO3.** Perform Standard Penetration test of soil to obtain SPT (N) – value.
- CO4.** Determine allowable soil pressure of soil foundation system by vertical plate load test.

<b>Expt. No.</b>	<b>Name of the Experiment</b>
1	Consolidation Test
2	Direct Shear Test
3	Unconfined Compression Test
4	Unconsolidated Undrained Triaxial Test
5	Vane Shear Test
6	Consolidated Undrained Triaxial Test
7	Standard Penetration Test
8	Plate Load Test



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<b>Irrigation And Hydraulic Structures (Code: CVT353)</b>	<b>Syllabus for B.Tech. 6<sup>th</sup> Semester (Civil Engineering)</b>	<b>Total Course Credit: 3</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	Major Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	1	0

**Course Outcomes:**

**CO1:** To appreciate various methods of irrigation and water application to agricultural fields.

**CO2:** To carry out hydraulic design of irrigation canals, diversion headworks and cross-drainage works.

**CO3:** To appreciate the soil-water- plant relationship and understand the crop water requirements.

**CO4:** To Understand various aspects of water logging of agricultural lands.

S. No.	Course Contents	Contact Hours
01.	<b>INTRODUCTION</b> Present status of irrigation in India, Advantages of irrigation, brief description of Gravity, Lift and Sprinkler irrigation.	04
02.	<b>SOIL-WATER- PLANT RELATIONSHIP. CROP WATER REQUIREMENTS:</b> Soil moisture and crop water relationships, Duty, Delta, Consumptive use, Irrigation requirements, Principal Indian crops, Multiple Cropping, etc.	08
03.	<b>CANAL IRRIGATION:</b> Types of canals, parts of canal irrigation system, channel alignment, assessment of water requirements, estimation of channel losses, Design of channels, Regime and semi theoretical approaches, Canal lining, factors affecting choice of various types of canal linings.	04
04.	<b>DIVERSION HEADWORKS:</b>	04



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	Selection of site and layout, Parts of diversion head works, types of weirs and barrages, Design of weirs on permeable foundations, control of silt entry into canal, Silt excluders and different types of silt ejectors	
05.	<b>CROSS DRAINAGE WORKS:</b> Necessity of cross drainage works, their types and selection, Design of various types of cross drainage works-Aqueduct, Siphon aqueduct, Super passage, Siphon, Level crossing.	06
06	<b>WATER LOGGING:</b> Causes, preventive and curative measures, drainage of irrigated lands, saline and alkaline lands.	04

**References:**

1. Singh Bharat. "Fundamentals of Irrigation Engineering", Nem Chand & Brothers, Roorkee.
2. Varshney, Gupta and Gupta, Irrigation Engineering and Hydraulic Structures". Nem Chand & Brothers, Roorkee.
3. Arora, K.R. Irrigation, water power and Water Resources Engineering", Standard Publishers Distributors, Delhi.
4. Asawa, G.L. "Elementary Irrigation Engineering" New Age International (P) Ltd. Publishers, New Delhi.



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<b>Water Shed Management Structures (Code: CVT 355)</b>	<b>Syllabus for B.Tech. 6<sup>th</sup> Semester (Civil Engineering)</b>	<b>Total Course Credit: 3</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	Major Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	1	3

**Course Outcomes:**

**CO1:** To perform studies related to watershed management.

**CO2:** To prepare pre-feasibility and detailed project reports, etc.

**CO3:** To appreciate the concept of integrated water resources management.

**CO4-** To understand the concepts of renewable energy, biomass, etc.

**CO5-** To equip with the rural technological delivery systems and low cost technology that can be used in the farm.

<b>S. No.</b>	<b>Course Contents</b>	<b>Contact Hours</b>
01.	<b>INTRODUCTION</b> Importance of Water Shed Development for improvement in Environment. Status of Watershed Development in India, Watershed Concepts	04
02.	<b>Land:</b> Survey(layout), Soil and Soil Moisture Conservation, Rainwater Management, Reclamation of saline soils.	08
03.	<b>Water: :</b> Data and Analysis, Integrated Water Resources Management, Conjunctive Use	04
04.	<b>Greenery:</b> Agriculture, Crop Husbandry, Sustainable Agriculture, Biomass, Management, Dryland Agriculture, Irrigation, Pastures and Silvopastures, Horticulture, Social Forestry, Afforestation.	04
05.	<b>Energy:</b> Renewable Resources, Biomass, small hydropower, Ocean Tides and Waves.	06
06	<b>Socioeconomics:</b> Peoples' part, State and Integrated Approach, Sustainable Society, Economics.	04



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07	<b>Appropriate Technology</b> Farm Equipment, Contour Methods, Check Dams, Water Catchment and Harvesting, Low Cost Technology, Rural Technological Delivery Systems.	03
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**References:**

- 1 Murthy, J.V.S. Watershed Management, New Age International Publishers (P) Ltd. India.
- 2 Suresh, R. Watershed Hydrology, Standard Book House, India. .
- 3 Das, Ganshyam. Hydrology and Soil Conservation Engineering, Prentice Hall of India. .



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**B.TECH. 7<sup>th</sup> SEMESTER (Civil)**

Course No.	Course title	L	T	P	C
CVT401	Environmental Engineering-I	2	1	0	3
CVL401	Water Quality Lab	0	0	2	1
CVT402	Structural Dynamics	3	1	0	4
CVT403	Construction Technology & Management	2	1	0	3
CVT404	Design of Structures-III	2	2	0	4
CVT405	Quantity Surveying and Cost Evaluation	2	1	0	3
CVS405	Seminar	0	2	0	2
CVP406	Project Pre-Work	0	0	4	2
<b>Elective courses</b>					
CVT406	Railway and Airport Engineering	2	1	0	3
	Fluvial Hydraulics				
	Advanced Geotechnical Engineering				
<b>Total Lecture Hours and Credits</b>		28			25



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<b>Environmental Engg - I</b> <b>(Code: CVT401)</b>	<b>Syllabus for B.Tech. 7<sup>th</sup> Semester</b> <b>(Civil Engineering)</b>	<b>Total Course Credit: 3</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	Major Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	1	0

**Course Outcomes:**

**CO1:** The various aspects related to liquid, solid and gaseous waste

**CO2** Quantification and projection of waste produced by communities.

**CO3:** Segregation and treatment of various types of wastes produced

**CO4:** Environmental effects of various types of wastes.

S. No.	Course Contents	Contact Hours
01.	<b>Introduction</b> Importance of clean Environment, co-existence, habitat and eco systems. Sources of pollution to Land, Water and Air. General effects of pollution.	08
02	Pollution by sewage. Nature and types of sewages (domestic, Industrial etc)	06
03	Methods of sewage disposal, effects of disposal on land and in water bodies, Self-purification of streams, BOD calculations, Design of sewers, Types of sewers	04
04	Unit operations in Sewage treatment, screening, grit removal, sedimentation, filtration, Activated sludge process. Septic and Imhoff tanks, soakages for isolated systems.	06
05	Solid waste management, Constituents of solid waste, Sanitary land filling, Composting, Incineration	06
06	Air pollution, Air quality standards, measurement of air pollution, factors responsible for pollution, engineering measures to check air pollution.	07



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**References:**

1. Moi P. N., "Waste water Treatment" 2005
2. McGhee, T.J., "Water Supply and Sewerage", McGraw Hill 1991
3. Hammer, M.J. and Hammer M.J., " Water and Waste Water Technology" Prentice Hall of India 2000
4. Nathanson J.A. " Basic Environmental Technology" 5th Ed. 2009
5. Viessman W. and Hammer M.J. " Water Supply and Pollution Control" 6th Ed. Addison Wesley Longman 1999



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<b>Structural Dynamics (Code: CVT402)</b>	<b>Syllabus for B.Tech. 7<sup>th</sup> Semester (Civil Engineering)</b>	<b>Total Course Credit: 4</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	Major Examination	L	T	P
30 Marks	10 Marks	60 Marks	3	1	0

- CO1** Get familiarized with basic principles, terminology etc. of structure dynamics and recognize the properties affecting the dynamic behavior of the structure including appropriate idealization for reliable dynamic analysis.
- CO2** Understand free vibration of single degree of freedom systems particularly the determination of important dynamic properties (natural frequency and damping) and the forced vibration response of single degree of freedom systems under viscous dynamic excitation like harmonic, periodic, step/pulse and generalized type of loading.
- CO3** Learn about some key concepts like natural frequencies, mode shapes and orthogonality relationships of multi degree of freedom systems, understand the free vibration of multi degree of freedom systems and computation of important dynamic properties and understand the forced damped and undamped vibration of multi degree of freedom systems under dynamic excitations using various methods.
- CO4** Learn about Indian Standard Codal provisions for earthquake resistant design of buildings using Equivalent Static Method.

<b>S. No.</b>	<b>Course Contents</b>	<b>Contact Hours</b>
01.	Nature of dynamic loading: Harmonic, earthquake and blast loading,	08
02	Single degree of freedom systems, free vibrations and forced vibrations:	06
03	Harmonic force, Periodic force, Impulse, and General types of loading.	04
04	Multi-degree of freedom systems, numerical techniques for finding natural frequencies and mode shapes, orthogonality relationships of principal modes, Rayleigh's Principal and its application for determination of fundamental frequency. Evaluation of dynamic response by mode superposition method.	06
05	Discussion on Indian standards, codal provisions for earthquake resistant design. Design of buildings (Plane frames only) based on Codal provisions Nature of dynamic loading: Harmonic, earthquake	06



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and blast loading, Single degree of freedom systems, free vibrations and forced vibrations: Harmonic force, Periodic force, Impulse, and General type of loading
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**References:**

1. Structural Dynamics by Anil.K. Chopra 2005
2. Dynamics of Structures ,Clough and Penzien 5<sup>th</sup> Edition
3. Dynamics of structures by Vinod Hosur
4. Structural Dynamics Theory and computation by Mario Paz



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<b>Construction Technology &amp; Management (Code: CVT403)</b>	<b>Syllabus for B.Tech.-7<sup>th</sup>sem (Autumn)</b>	<b>Total Course Credit: 3</b>			
Mid-semester Examination	Continuous Class- Assessment	End-Semester Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	1	0

**Course Objective:** To impart understanding of various aspects of construction equipment, and management of construction projects

**Course Outcomes:**

- CO1-** To understand the various techniques of civil engineering constructions.
- CO2-** To understand the various aspects of construction equipment's.
- CO3-** To develop the skill for the management of construction projects.
- CO4-** To develop the concept of works accounting and leadership organization.

**Details of Course:**

S. No	Contents	Lecture Hours
01.	Construction Management, its necessity; objectives & Functions	03
02.	Construction methods and plant important equipments only	06
03.	Project scheduling: Various techniques namely Bar chart; CPM and PERT.	07
04.	Engineering economics of projects; Depreciation; Sinking Fund; compound interest factors, Selection of most economical alternative by variable cost method/Cost benefit ratio. Owning and Operating cost.	10
05.	Organization of Leadership: Function of project organization. Principles and advantages of good organization. Leadership and motivation	04
06.	Works accounting. Cashbook, Imprest cash, contractors bills, store accounts. Materials at site account. Indent, invoice, Debit & Credit note, suspense head stock, Engineering Statements, Form of agreement.	06

**Books Recommended:**

1. Construction Management by Mahesh Verma
2. Construction of Plant and Equipment by Peurifay
3. CPM & PERT by B.C. Punmia



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4. Project Management by K.N.JHA

<b>Design of Structures III (Code: CVT404)</b>	<b>Syllabus for B.Tech. 7<sup>th</sup> semester (Civil Engineering)</b>	<b>Total Course Credit: 4</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	Major Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	2	0

**Course Outcomes:**

**CO1:** Design RCC footings(Isolated footings and various types of combined footings) and Design of masonry foundations

**CO2:** Design cantilever and counter fort type RCC retaining walls. Design masonry retaining walls.

**CO3:** Design underground, circular and rectangular water tanks with reference to IS: 3370.Design of domes and ring beams.

**CO4:** Design Rectangular, T and I section beams of pre stressed concrete.

S. No.	Course Contents	Contact Hours
01.	Foundations: The design of RCC footings, isolated footings and various types of combined footings, design of masonry foundations	06
02.	Retaining walls: Design of cantilever and counter-fort type RCC retaining walls. Design of masonry retaining walls	05
03.	Water tanks: Design of underground, circular and rectangular water tanks with reference to IS:3370.	06
04.	Pre-stressed concrete: Design of Rectangular, T and I section beams of pre stressed concrete.	10
05.	Domes: Design of domes and ring beams.	04
06.	Works accounting. Cashbook, Imprest cash, contractor's bills, store accounts. Materials at site account. Indent, invoice, Debit & Credit note, suspense head stock, Engineering Statements, Form of agreement.	05

**References:**

- 1) Construction Management by Mahesh Verma
- 2) Construction of Plant and Equipment by Peurifay



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<b>Quantity Surveying &amp; Cost Evaluation</b> (Code: CVT405)	<b>Syllabus for B.Tech. 5<sup>th</sup> Semester</b> (Civil Engineering)	<b>Total Course Credit: 3</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	End-Term Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	1	0

**Course Objective:** To impart understanding of various aspects related to Material/labour analysis and other physical measurements in the field of Civil Engineering.

**Course Outcomes:**

**CO1:** Importance of estimation in civil engineering

**CO2:** Importance of specification in civil engineering

**CO3:** How we can perform estimate of different civil engineering structures

**CO4:** Importance and objective of rate analysis

**CO5:** Importance of road estimate and its cost analysis

S. No.	Course Contents	Contact Hours
01.	<b>Estimate:</b> Importance, Items of a work and their units. Types of estimates, viz. preliminary; approximate; Abstract estimate; Plinth area estimate; detailed estimate; revised estimate; supplementary estimate, bill of quantities and abstract of cost.	04
02.	<b>Analysis of Rates:</b> Preparing analysis of rates, Labour schedule, material schedule & rate schedule. Analysis of rates- of limeconcrete in foundation; Brickwork in foundation superstructure; stone masonry; R.C.C. work; R.B.work; Plastering; pointing; white washing; colour washing; painting; wood work, earth work in foundation; earth work in road; D.P.C.; Steel work for reinforcement; steelwork in trusses; wood work in frames, shutters etc.	08
03.	<b>Specifications:</b> General specifications and detailed specifications, Book of specifications, specifications for earth work in foundation; L.C. in foundation; R.C.C. work; Brick work; R. B. work; Wood work indoors, windows etc. D.P.C. centering and shuttering; earthwork incanal and road.	04
04.	<b>Works Estimate:</b> Estimates of building; Estimates of walls; methods of building estimate; Longwall-shortwall and centreline methods; Estimate of masonry	10



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	platform, estimate of a masonry tank, estimate of roof trusses (wooden/steel) Estimate of a single roomed building; estimate of a two roomed building with C.G.I roof over wooden trusses and over steel truss. estimate of a shop; estimate of a R.C.C. beam, R.C.C. Slab	
05.	<b>Estimate of Road:</b> Methods of estimating; materials for different items of work and labour; methods of estimating earth work; estimate of a metaled road.	04
06.	<b>Valuation &amp; Rent Fixation:</b> Valuation of building-various methods; Rent fixation, plinth area requirement.	04
07.	<b>Introduction to Building Codes:</b> Sanitary fitting; Electrification; in-built furniture, Hazard safety measures in high rise buildings.	02

**References:**

1. Datta, B. N., Estimating and Costing in Civil Engineering (Theory & Practice), UBS Publishers' Distributors Pvt Ltd; 28th Revised Edition 2016.
2. Khanna, P.N. Indian Practical Civil Engineers Handbook by Published by UBS Publishers' Distributors (P) Ltd in 2012.



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<b>Railway &amp; Airport Engineering (Code: CVT-406)</b>	<b>Syllabus for B.Tech.-4th Year (7th Semester)</b>	<b>Total Course Credit: 3</b>			
Mid-Term Examination	Continuous Internal Assessment	End semester examination	L	T	P
30 Marks	10 Marks	60 Marks	3	1	0

**Course Outcomes:**

**CO1:** Able to understand the transport system of the country.

**CO2:** Knowledge about various aspects of railway design

**CO3:** Able to understand various aspects of airport system and airport pavement design.

**CO4:** Understanding of Railway planning, design, construction and maintenance and planning and design principles of Airports

S. No	Topic	Lecture Hours
1.	Importance of transportation systems. History of railways and its development, development of Indian Railways. Surveys for Route location.	06
2.	Permanent way and it's component parts, Formation, Ballast, Sleepers, Rails. Gauge problem, Creep and Tilt in Rails. Track resistance and tractive effort, super-elevation near branching of curves; gradients. Track fittings and fastenings. Points and crossings. Station Platforms- Various types of yards and sidings. Signals.	06
3.	Classification of airports; planning, Surveys and site selection of airports. Runway Length, Patterns and orientation-wind rose diagram. Width and grades of runway; Taxiways and aprons. Difference between Highway and airport pavements; Introduction to various design methods. Airport DrainagE	08

**Books Recommended:**

1. Satish Chandra, M. M. Agarwal, "Railway Engineering", Oxford University Press (Latest Edition).
2. S. Ponnuswamy, "Railway Transportation- Engineering, Operation and Management", Narosa Publishing House, New Delhi (Latest Edition).
3. Rangawala, S.C, "Railway Engineering", Charotar Publishers, Anand (Latest Edition).
4. Arora, S.P. and Saxena, "Railway Engineering", Dhanpat Rai Publishers, New Delhi (Latest Edition).



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5. Khanna, Arora and Jain, "Airport Planning and Design", Nem Chand and Brothers, Roorkee (Latest Edition).
6. Horren Jeff. "Airport Planning and Design"



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**B TECH. 8<sup>th</sup> SEMESTER (Civil):**

Course No.	Course title	L	T	P	C
CVT450	Hydropower Engineering	2	2	0	4
CVT451	<b>Bridge Engineering</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
CVP452	Project*	0	5	10	10
<b>ELECTIVE COURSES</b>					
CVT454	Rock Mechanics and Tunneling Technology	2	1	0	3
	Transportation Planning and Economics				
	<b>Non-Conventional Energy</b>				
CVT455	Ground Improvement Techniques	3	1	0	4
	Earthquake Resistant Design				
	Environmental Engineering-II				
Total Lecture Hours and Credits		30			25

\*The evaluation will be done as per statutes.



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<b>Hydropower Engineering (Code: CVT450)</b>	<b>Syllabus for B.Tech. 8<sup>th</sup> Semester Engineering) (Civil</b>	<b>Total Course Credit: 4</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	Major Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	2	0

**Course Outcomes:**

**CO1:** Analyze and perform hydro power potential assessment studies.

**CO2** Understand various types of hydro power developments.

**CO3:** Develop a knowledge related to various hydropower structures viz., canals, tunnels, penstocks, dams, spillways, etc.

**CO4:** Appreciate and have basic knowledge about power house details - pertinent structures,

Transmission systems, and economic feasibility of hydropower plants.

S. No.	Course Contents	Contact Hours
01.	<b>Introduction</b> Introduction and historical Development, Hydropower development Power equation, Assessment of potential, Comparison of Hydropower plant and nuclear power plant	02
02	<b>Classification</b> High, medium and low Head schemes, Run off river plants, Storage power station Tidal power plant, Recent experiences, Underground Power plant. Pumped Storage Schemes, Various hydropower systems. Power demand, Role of Hydropower grid.	04
03	<b>Water Conveyance System</b> Introduction to Power Canals, Power canals, Alignment Design of Power Canals Flumes, Covered conduits and Tunnels Penstocks, Types of penstocks	02
04	<b>Dams</b> Arch dam and classification with example Buttress dam, types Design: basic principles Design of gravity dams, Numerical questions for design of gravity dam Construction of Gravity Dams Details of construction of Gravity Dams	03



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05	<b>Embankment Dams</b> Introduction to embankment dams Types of embankment dams, considerations for embankment dam Introduction to Earthen dams. Rock fill dams, types of rock fill dams. Design considerations for embankment dams. Design of embankment dams	04
06	<b>Spillway</b> Introduction, uses of spillway. Types of spillway, spillway as gate. Conditions for spillway. Design of silting basin. Numerical questions	05
07	<b>Power House Details</b> Forebay, intake of a power house with general Introduction Layout of a power house, site selection for a power house. Hydropower units arrangement, underground power station	03
08	<b>Transmission system</b> Introduction to transmission system Importance and use of transmission system	04

**References:**

1. Arora, K.R. "Irrigation water power and Water Resources Engineering", Standard Publisher Distributors, Delhi. 2002
2. Dandekar, M.M. "Water Power Engineering" , Vikas Publishing House Gaziabad, U.P. India 1985



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<b>Bridge Engineering (Code: CVT451)</b>	<b>Syllabus for B.Tech. 8<sup>th</sup> Semester (Civil Engineering)</b>	<b>Total Course Credit: 4</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	Major Examination	L	T	P
30 Marks	10 Marks	60 Marks	3	1	0

**Course Outcomes:**

**CO1:** Classify different types of bridges and demonstrate fundamental knowledge of design of bridges and understand hydrologic and hydraulic aspects of waterway bridges.

**CO2:** Use influence lines to calculate maximum effects (forces) due to standard moving vehicle loads prescribed in IRC Codes. Select an appropriate load system as per IRC-6 and evaluate design forces and moments in bridges.

**CO3:** Design the slab culvert

**CO4:** Design the Truss type bridges including cross beams and stringers.

**CO5:** Design Plate Girder Bridges both composite and non-composite.

**CO6:** Design slabs for all types of bridges.

S. No.	Course Contents	Contact Hours
01.	<p><b>Introduction</b></p> <p>Historical evolution of bridges. Types of bridges. Modern trends in bridge engineering.</p> <p>Bridge loading standards</p> <p>Evolution of bridge loading standards. Indian Roads Congress bridge loading standards. Impact factors. Comparative analysis of highway loading standards. Indian Railway bridge loading standards. Track load and wheel load.</p> <p>Influence line diagrams</p> <p>Introduction to influence line diagrams</p> <p>Use of influence line diagrams to calculate effect of moving loads on the bridge.</p> <p>Influence line diagram and IRC codes.</p> <p>Evaluation of design loads and moment forces in bridges.</p>	08



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02	<b>Slab culvert</b> Introduction to slab culvert. General features of slab culvert. Design coefficients for flexural members. Analysis of slab decks. Design aids and tables for R/C bridge deck slabs. Design of R/C slab culvert for IRC class AA loads. Analysis and design of skew slab culvert.	10
03	<b>Steel Truss Bridges</b> Introduction to steel truss. General features of steel trussed bridges. Types of trusses. Analysis of truss frames. Design features of trusses. Design examples of truss bridges.	10
04	<b>Plate girder bridges.</b> Introduction to plate girder bridges. General features of plate girder bridges. Composite plate girder bridges and design principles. Design examples of plate girder bridges. Non composite plate girder bridges. Design principles. Design examples of non-composite plate girder bridges.	06

**References:**

1. Design of Bridges N. Krishna Raju Oxford and IBH Publishing House
2. Essentials of Bridge Engineering Johnson Victor, D. Oxford and IBH Publishing House
3. Design of Highway Bridges Barker RM & Puckett JA WILEY
4. Bridge Engineering Ponnuswamy, S McGraw Hill



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<b>Course Title: Rock Mechanics and Tunneling Technology (Code: CVT454)</b>	<b>Syllabus for B.Tech. 8<sup>th</sup> Semester (Civil Engineering)</b>	<b>Total Course Credit: 3</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	Major Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	1	0

### Course Outcomes:

**CO1-** Predict and validate the long-term strength and behavior of fractured rock

**CO2-** Concerned with the stability of engineering structures.

**CO3-** Influence of geological conditions on design and construction of tunnels.

**CO4-** The designing, planning, construction, maintenance and safety of tunnels.

S. No.	Course Contents	Contact Hours
01.	<b>Rock Mechanics</b> Introduction to rock mechanics and rock engineering.	06
02	Physical and Mechanical Properties of Rocks. Laboratory Testing.	03
03	Foundations and slope stability: foundations on discontinuous rock, slope instability basic mechanisms.	03
04	Rock reinforcement and rock support: underlying principles, similarities and differences. Rock Bolting.	03
05	Introduction to tunneling: Fundamental definitions, tunneling art and engineering, historical development, Classification of tunnels.	05
06	Geological aspects of tunneling: Geological investigation, evaluation and appreciation, importance of geological knowledge, aim of geological investigation, principal elements of exploration program, Influence of geological conditions on design and construction of tunnels.	08
07	Methods of Tunneling in soft and hard rock. Lining of tunnels. Tunnel supports.	05

### References:

1. Brown, E.T.; Analytical and Computational Methods in Engineering Rock Mechanics, CBS Publishers and Distributors, New Delhi.
2. Goodman, P.E.; Introduction to Rock Mechanics, John Wiley & Sons.



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3. Design and Construction of Tunnels: Analysis of Controlled Deformations in Rock and Soils(ADECO-RS) by Pietro Lunardi
4. Tunneling and Tunnel Mechanics: A Rational Approach to Tunneling by D. Kolymbas.
5. Introduction to Tunnel Construction (Applied Geotechnics) by David Chapman, Nicole Metje and Alfred Stärk.
6. Tunneling to the Center of the Earth: Stories (P.S.) by Kevin Wilson.  
Quantum Theory of Tunneling by Mohsen Razavy.



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<b>Transportation Planning &amp; Economics (Code: CVT454)</b>	<b>Syllabus for B.Tech. 8<sup>th</sup> Semester (Civil Engineering)</b>	<b>Total Course Credit: 3</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	Major Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	1	0

**Course Outcomes:**

**CO1-** To get to understand the basics and scope of transportation planning and transportation economics, transportation planning issues.

**CO2-** To learn about Public Transportation: public transport modes, desirable characteristics of public transport systems, transit system operations, route development, stopping policy, stop location, scheduling, capacity of transit systems, socially optimal pricing

**CO3-** To understand transport planning process, transportation and land use, transport planning strategies, transport planning models, travel demand analysis, operational transportation and land use models.

**CO4-** To learn transport economics and finance: pavement economics- construction cost; maintenance cost and vehicle operation cost, economic evaluation of highway projects- different methods; comparison of evaluation techniques, freight transport-trends and economic growth.

S. No.	Course Contents	Contact Hours
01.	<b>Transportation Planning</b> Scope Of Transportation Planning Scope Of Transportation Economics Transportation Planning Issues	03
02	<b>Public Transportation</b> Public Transportation: public transport modes Desirable Characteristics Of Public Transport Systems, Transit System Operations Route Development, Stopping Policy, Stop Location, Scheduling Travel Demand Analysis, Operational Transportation And Land Use Models	08
03	<b>Transport Analysis And Forecasting</b>	12



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	Transport Planning Process. Transportation And Land Use. Transport Planning Strategies. Travel Demand Analysis. Growth Factor Models. Synthetic Models-1 Synthetic Models-2	
04	<b>Transport Economics And Finance</b> Construction Cost; Maintenance Cost And Vehicle Operation Cost Economic Evaluation Of Highway Projects- Basic Principles; Time Value Of Money. Net Present Value (NPV) Method; Benefit-Cost (B/C) Ratio Method Internal Rate Of Return (IRR) Method. Freight Transport-Trends And Economic Growth	12

**References:**

1. Transport Planning and Traffic Engineering by CA O'Flaherty, John Wiley & Sons, Inc., New York; Toronto
2. Transportation Engineering and Planning by Papacostas&Prevedouros, Prentice-Hall of India Private Ltd, New Delhi-110001
3. Principles of Transportation Engineering by Chakarborty& Das, Prentice-Hall of India Private Ltd, New Delhi-110001
4. Urban Transportation Planning by Meyer & Miller, McGraw Hill, New Delhi.



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<b>Course Title: Ground Improvement Techniques (Code: CVT455)</b>	<b>Syllabus for B.Tech. 8<sup>th</sup> Semester (Civil Engineering)</b>	<b>Total Course Credit: 4</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	Major Examination	L	T	P
30 Marks	10 Marks	60 Marks	2	2	0

**Course Outcomes:**

**CO1:** The various aspects related to liquid, solid and gaseous waste

**CO2** Quantification and projection of waste produced by communities.

**CO3:** Segregation and treatment of various types of wastes produced

**CO4 :**Environmental effects of various types of wastes.

S. No.	Course Contents	Contact Hours
01.	<b>Introduction</b> Soil Types, Soil Investigation & Classification, Ground Modification/Stabilization, Need for Engineered Ground Improvement, Classification of Ground Improvement Techniques, Suitability, Feasibility and Desirability of Ground Improvement Techniques, Current & Future Developments	08
02	<b>Ground Improvement Techniques Mechanical Modification:</b> Introduction to Mechanical Modification, Principles of Soil Densification, Properties of Compacted Soil, Compaction Control, Specification of Compaction, Requirements, Types of Compaction Equipment	06
03	<b>Hydraulic Modification:</b> Objectives & Techniques, Dewatering Systems, Soil-Water Relationships, Single & Multiple Well Formulas, Drainage of Slopes, Filtration & Seepage Control, Pre loading & Vertical Drains, Electro kinetic Dewatering & Stabilization.	07
04	<b>Chemical Modification/Stabilization:</b> Effect of various admixtures on Engineering Properties of Soils such as: Cement, Lime, Fly ash, Bitumen, Cement Lime Fly ash. Other chemical additives such as NaCL, CaCL <sub>2</sub> , CaSO <sub>4</sub> , Ca (OH) <sub>2</sub> , NaOH etc., Grouting- Applications to Embankments, Foundations & Sensitive Soils, Admixtures in Pavement Design.	06



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05	<b>Thermal Modification:</b> Thermal Properties of Soils, Heat Treatment of Soils, Ground Freezing, Strength & Behaviour of Frozen Ground. Modification By Inclusions & Confinement: Evolution of Soil Reinforcement, Applications of Geosynthetics Material in Civil Engineering, Soil Nailing, Soil Anchors, Soil Confinement by Formwork.	06
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**References:**

1. Methods of Treatment of Unstable Ground : Belt - Butterworths, 1975
2. Engineering Principles of Ground Modification: Manfred, R. H.
3. Engineering Treatment of Soils : Bell, F. G
4. Geosynthetics for Soil Improvement : ASCE, GST No. 18, New York
5. Grouting Theory & Practice : Nonveiller, E
6. Soil Stabilization : Ingles, O. G. & Metcalf, J. B.



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<b>Earthquake Resistant Design (Code: CVT455)</b>	<b>Syllabus for B.Tech. 8<sup>th</sup> Semester Engineering</b> (Civil)	<b>Total Course Credit: 4</b>			
Midterm Examination	Class Assessment (Assignments, interaction, tutorials, viva etc.)	Major Examination	L	T	P
30 Marks	10 Marks	60 Marks	3	1	0

**Course Outcomes:**

**CO1** Introduction to some important definitions/ concepts, terminology, etc. about Engineering seismology such as origin of earthquakes, propagation of seismic waves, key ground motion characteristics in the form of response spectrum and Design response spectrum.

**CO2** Response of building structures under ground motion followed by computation of seismic forces on buildings based on various methods (equivalent static method, dynamic analysis (i.e. Modal analysis) also called response spectrum method) as per IS 1893 code.

**CO3** Seismic design and detailing of RCC elements as per IS 13920 code.

**CO4** Seismic design of brick masonry buildings as per IS- 4326 code and repair of buildings as per IS-13935.

S. No.	Course Contents	Contact Hours
01.	Introduction to Earthquakes, Acceleration time history, Response Spectrum, Design Spectra.	08
02	Response of buildings subjected to ground motion based on modal analysis.	06
03	Seismic design of R.C.C Structures (upto 2-Storey Buildings) based on Codal provisions IS:1893.	07
04	Seismic design of brick masonry structures based on Codal provisions.	06
05	Detailing of R.C.C. Elements as per IS:13920. Repair and seismic strengthening of buildings IS:13935	06

**References:**

1. Earthquake Resistant Design of buildings Manish Shirkhinde and Pankaj Agarwal
2. Earthquake Resistant Design and risk reduction David. J. Dowrick
3. Earthquake Resistant Design by James .M.Kelly
4. Earthquake resistant design of structures by S.K Duggal.



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