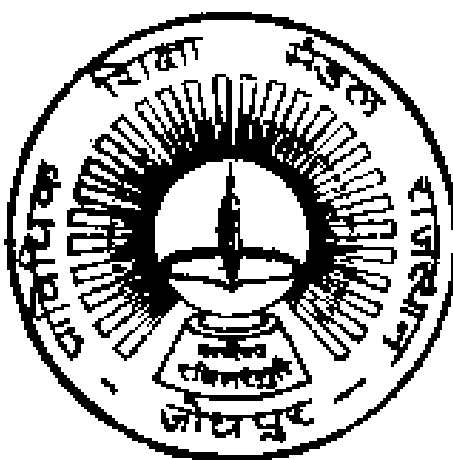


**GOVERNMENT OF RAJASTHAN**  
**BOARD OF TECHNICAL EDUCATION RAJASTHAN**  
**JODHPUR**

**SEMESTER SCHEME-2020-21**

**(SESSION 2021-2022 & ONWARDS)**



**TEACHING AND EXAMINATION SCHEME**  
**AND SYLLABUS**

**CIVIL AND ENVIRONMENTAL ENGINEERING**  
**(CV)**

.....

Board of Technical Education, Rajasthan  
W-6 Residency Road,  
Jodhpur

GOVERNMENT OF RAJASTHAN  
BOARD OF TECHNICAL EDUCATION RAJASTHAN, JODHPUR  
**TEACHING AND EXAMINATION SCHEME**  
**(SEMESTER SCHEME-2021-22)**

**FOR DIPLOMA III SEMESTER (CIVIL AND ENVIRONMENTAL ENGINEERING) (CV)**

SESSION 2022-2023 & ONWARDS

Subject Category	Subject Code	Subjects	Distribution of Time				Distribution of Max. Marks/ Duration							Total Marks	Credits
			Hours per week				End Semester Exam				Internal Assessment				
			L	T	P	Tot	TH	Hrs.	PR	Hrs.	CT	TU/Assi	PR(S)		
PC	CV 3001	Building Materials & Construction	3	--	--	3	60	3	--	--	20	20	--	100	3
PC	CV 3002	Environment & Ecology	2	--	--	2	60	3	--	--	20	20	--	100	2
PC	**CV 3003	Mechanics of Materials	3	--	--	3	60	3	--	--	20	20	--	100	3
PC	CV 3004	Water Quality & Treatment	2	--	--	2	60	3	--	--	20	20	--	100	2
PC	**CV 3005	Concrete Technology	2	--	--	2	60	3	--	--	20	20	--	100	2
PC	**CV 3006	Geotechnical Engineering	3	--	--	3	60	3	--	--	20	20	--	100	3
PC	CV 3007	Building Materials & ConstructionLab	--	--	2	2	--	--	40	3	--	--	60	100	1
PC	CV 3008	Water Quality & Treatment Lab	--	--	2	2	--	--	40	3	--	--	60	100	1
PC	**CV 3009	Mechanics of Materials Lab	--	--	2	2	--	--	40	3	--	--	60	100	1
PC	**CV 3010	Concrete TechnologyLab	--	--	2	2	--	--	40	3	--	--	60	100	1
PC	**CV 3011	Geotechnical Engineering Lab	--	--	2	2	--	--	40	3	--	--	60	100	1
SI	CV 3012	Summer Internship – I (4 weeks after II Sem.)	--	--	--	--	--	--	100	--	--	--	--	100	2
VS	+CV3333	Anandam(Joy of Giving)	--	--	1	1	--	--	--	--	--	--	100	100	2
		Students Centered Activities	0	0	3	3	--	--	--	--	--	--	--	--	--
		Total	15	0	14	29	360	--	300	--	120	120	400	1300	24
Grand Total :														1300	24

- |  |   |
|--|---|
| 1. L : Lecture                                 | 5. PR : Marks for End Semester Exam for Practical                 |
| 2. T : Tutorial                                | 6. CT : Marks for class tests (Internal Assessment)               |
| 3. P : Practical                               | 7. TU/Assi : Marks for tutorials/Assignment (Internal Assessment) |
| 4. TH : Marks for End Semester Exam for Theory | 8. PR(S) : Marks for practical and viva (Internal Assessment)     |

1. +CV 3333 is same in all branches of Engineering

2. \*\*CV 3003, \*\*CV 3005, \*\*CV 3006, \*\*CV 3009, \*\*CV 3010, and \*\*CV 3011 are same as CC/CE 3003, CC/CE 3005, CC/CE 3006, CC/CE 3009, CC/CE 3010 and CC/CE 3011 respectively

Student Centered Activities will be graded as A, B, C & D on the basis of attendance and interest of the student in learning.

GOVERNMENT OF RAJASTHAN  
BOARD OF TECHNICAL EDUCATION RAJASTHAN, JODHPUR  
**TEACHING AND EXAMINATION SCHEME**  
(SEMESTER SCHEME-2021-22)

**FOR DIPLOMA IV SEMESTER (CIVIL AND ENVIRONMENTAL ENGINEERING) (CV)**  
SESSION 2022-2023 & ONWARDS

Subject Category	Subject Code	Subjects	Distribution of Time				Distribution of Max. Marks/ Duration							Total Marks	Credits
			Hours per week				End Semester Exam				Internal Assessment				
			L	T	P	Tot	TH	Hrs	PR	Hrs.	CT	TU/Assi	PR(S)		
PC	**CV 4001	Hydraulics	2	--	--	2	60	3	--	--	20	20	--	100	2
PC	CV 4002	Environment Pollution& Control	2	--	--	2	60	3	--	--	20	20	--	100	2
PC	CV 4003	Surveying	1	--	--	1	60	3	--	--	20	20	--	100	1
PC	CV 4004	Waste Water Treatment	2	--	--	2	60	3	--	--	20	20	--	100	2
PC	*CV 4005	Water Resource Engineering	2	--	--	2	60	3	--	--	20	20	--	100	2
PC	CV 4006	Solid Waste Management	2	--	--	2	60	3	--	--	20	20	--	100	2
PE	CV4007	<b>Programme Elective - I</b> **CV 40071- Construction Management CV 40072–Theory of Structures	3	--	--	3	60	3	--	--	20	20	--	100	3
PC	**CV 4008	Hydraulics Lab	--	--	2	2	--	--	40	3	--	--	60	100	1
PC	CV 4009	Environment Pollution& Control Lab	--	--	2	2	--	--	40	3	--	--	60	100	1
PC	**CV 4010	Building Planning & Drawing Lab	--	--	4	4	--	--	40	3	--	--	60	100	2
PC	CV 4011	Surveying Lab	--	--	2	2	--	--	40	3	--	--	60	100	1
PC	CV 4012	Waste Water Treatment Lab	--	--	2	2	--	--	40	3	--	--	60	100	1
PR	CV4013	Minor Project	--	--	4	4	--	--	40	--	--	--	60	100	2
AU	+CV4222	Essence of Indian Knowledge and Tradition	2	--	--	2	--	--	--	--	--	--	--	--	--
VS	+CV 4444	Anandam(Joy of Giving)	--	--	1	1	--	--	--	--	--	--	100	100	2
		Students Centered Activities	0	0	3	3	--	--	--	--	--	--	--	--	--
		<b>Total</b>	<b>16</b>	<b>--</b>	<b>20</b>	<b>36</b>	<b>420</b>	<b>--</b>	<b>240</b>	<b>--</b>	<b>140</b>	<b>140</b>	<b>460</b>	<b>1400</b>	<b>24</b>
<b>Grand Total :</b>														<b>1400</b>	<b>24</b>

- |  |   |
|--|---|
| 1. L : Lecture                                 | 5. PR : Marks for End Semester Exam for Practical                 |
| 2. T : Tutorial                                | 6. CT : Marks for class tests (Internal Assessment)               |
| 3. P : Practical                               | 7. TU/Assi : Marks for tutorials/Assignment (Internal Assessment) |
| 4. TH : Marks for End Semester Exam for Theory | 8. PR(S) : Marks for practical and viva (Internal Assessment)     |

1. +CV 4222 and +CV4444 are same in all branches of Engineering.

2. \*\*CV4001, \*\*CV 40071, \*\*CV 4008 and \*\*CV4010 are same as CE/CC 4001, CE/CC 40071, CE/CC 4008 and CE/CC 4010 respectively.

3. \*CV 4005 is same as CE 4005.

Student Centered Activities will be graded as A, B, C & D on the basis of attendance and interest of the student in learning.

**Note: Students will go for 6 Weeks Summer Internship in the Summer Vacations after Fourth Semester. The assessment of the Summer Internship will be done in Fifth Semester**

GOVERNMENT OF RAJASTHAN  
BOARD OF TECHNICAL EDUCATION RAJASTHAN, JODHPUR  
**TEACHING AND EXAMINATION SCHEME**  
(SEMESTER SCHEME-2021-22)

**FOR DIPLOMA V SEMESTER (CIVIL AND ENVIRONMENTAL ENGINEERING) (CV)**  
SESSION 2023-2024 & ONWARDS

Subject Category	Subject Code	Subjects	Distribution of Time				Distribution of Max. Marks/ Duration							Total Marks	Credits
			Hours per week				End Semester Exam				Internal Assessment				
			L	T	P	Tot	TH	Hrs.	PR	Hrs.	CT	TU/Assi	PR(S)		
PC	CV 5001	Highway Engineering	3	1	--	4	60	3	--	--	20	20	--	100	4
PC	**CV 5002	Estimating Costing and Valuation	2	--	--	2	60	3	--	--	20	20	--	100	2
OE	+CV5100	<b>Open Elective-I</b> +CV 51001-Economic Policies in India +CV 51002-Engineering Economics & Accountancy	3	--	--	3	60	3	--	--	20	20	--	100	3
PE	CV 5003	<b>Programme Elective - II</b> CV 50031- Design of steel & RCC structure CV 50032-Advance Surveying &Remote Sensing	3	--	--	3	60	3	--	--	20	20	--	100	3
PE	CV5004	<b>Programme Elective - III</b> §CV 50041_Green Building and Energy Conservation CV 50042-Rural Construction Technology	3	--	--	3	60	3	--	--	20	20	--	100	3
PC	CV 5005	Highway Engineering lab	--	--	2	2	--	--	40	3	--	--	60	100	1
PC	**CV 5006	Estimating Costing and Valuation Lab	--	--	2	2	--	--	40	3	--	--	60	100	1
SI	CV 5007	Summer Internship – II(6 weeks after IV Sem)	--	--	--	--	--	--	100	--	--	--	--	100	3
PR	CV 5008	Major Project	--	--	2	2	--	--	--	--	--	--	--	--	--
VS	+CV 5555	Anandam(Joy of Giving)	--	--	1	1	--	--	--	--	--	--	100	100	2
		Students Centered Activities	0	0	3	3	--	--	--	--	--	--	--	--	--
		<b>Total</b>	<b>14</b>	<b>1</b>	<b>10</b>	<b>25</b>	<b>300</b>		<b>180</b>		<b>100</b>	<b>100</b>	<b>220</b>	<b>900</b>	<b>22</b>
<b>Grand Total :</b>														<b>900</b>	<b>22</b>

- |  |   |
|--|---|
| 1. L : Lecture                                 | 5. PR : Marks for End Semester Exam for Practical                 |
| 2. T : Tutorial                                | 6. CT : Marks for class tests (Internal Assessment)               |
| 3. P : Practical                               | 7. TU/Assi : Marks for tutorials/Assignment (Internal Assessment) |
| 4. TH : Marks for End Semester Exam for Theory | 8. PR(S) : Marks for practical and viva (Internal Assessment)     |

- +CV 51001, +CV51002 and +CV 5555 are same in all branches of Engineering
- \*\*CV5002, and \*CV5006, are same as CC/CE5002and CC/CE5006 respectively
- §CV 50041 is same as AR/CC/ CE 50041 ,

Student Centered Activities will be graded as A, B, C & D on the basis of attendance and interest of the student in learning.

**Note:Major Project will be continued and Assesed in VI Semester**

GOVERNMENT OF RAJASTHAN  
BOARD OF TECHNICAL EDUCATION RAJASTHAN, JODHPUR  
**TEACHING AND EXAMINATION SCHEME**  
(SEMESTER SCHEME-2021-22)  
**FOR DIPLOMA VI SEMESTER (CIVIL AND ENVIRONMENTAL ENGINEERING) (CV)**  
SESSION 2023-2024& ONWARDS

Subject Category	Subject Code	Subjects	Distribution of Time				Distribution of Max. Marks/ Duration							Total Marks	Credits
			Hours per week				End Semester Exam		Internal Assessment						
			L	T	P	Tot	TH	Hrs	PR	Hrs	CT	TU/Assi	PR(S)		
HS	+CV 6111	Entrepreneurship and Start-ups	3	1	--	4	60	3	--	--	20	20	--	100	4
OE	+CV 6200	<b>Open Elective-II</b> +CV 62001- Project Management +CV 62002- Renewable Energy Technologies	3	--	--	3	60	3	--	--	20	20	--	100	3
OE	+CV 6300	<b>Open Elective-III</b> +CV 63001- Product Design +CV 63002- Disaster Management	3	--	--	3	60	3	--	--	20	20	--	100	3
AU	+CV 6333	Indian Constitution	2	--	--	2	--	--	--	--	--	--	--	--	--
PC	CV 6001	Industrial waste treatment	3	--	--	3	60	3	--	--	20	20	--	100	3
PE	CV 6002	<b>Programme Elective IV</b> CV 60021-Environmental impact assessment CV 60022-Environmental act and legislation	3	--	--	3	60	3	--	--	20	20	--	100	3
PC	CV 6003	Industrial waste treatment lab	--	--	2	2			40	--	--	--	60	100	1
PR	CV6004	Major Project	--	--	6	6	--	--	40	--	--	--	60	100	4
SE	CV6005	Seminar	1	--	--	1	--	--	--	--	--	--	100	100	1
VS	+CV 6666	Anandam(Joy of Giving)	--	--	1	1	--	--	--	--	--	--	100	100	2
		Students Centered Activities	0	0	3	3	--	--	--	--	--	--	--	--	--
		<b>Total</b>	<b>18</b>	<b>1</b>	<b>12</b>	<b>31</b>	<b>300</b>	<b>--</b>	<b>80</b>	<b>--</b>	<b>100</b>	<b>100</b>	<b>320</b>	<b>900</b>	<b>24</b>
<b>Grand Total :</b>														<b>900</b>	<b>24</b>

- |  |   |
|--|---|
| 1. L : Lecture                                 | 5. PR : Marks for End Semester Exam for Practical                 |
| 2. T : Tutorial                                | 6. CT : Marks for class tests (Internal Assessment)               |
| 3. P : Practical                               | 7. TU/Assi : Marks for tutorials/Assignment (Internal Assessment) |
| 4. TH : Marks for End Semester Exam for Theory | 8. PR(S) : Marks for practical and viva (Internal Assessment)     |

1. +CV 6111, +CV 62001, +CV62002, +CV 63001, +CV63002, +CV 6333 and +CV 6666 are same in all branches of Engineering.

Student Centered Activities will be graded as A, B, C & D on the basis of attendance and interest of the student in learning.

**GOVERNMENT OF RAJASTHAN**  
**BOARD OF TECHNICAL EDUCATION RAJASTHAN JODHPUR**  
**SEMESTER SCHEME-2020-21**



**III SEMESTER**  
(SESSION 2021-2022 & ONWARDS)

**BUILDING MATERIALS & CONSTRUCTION**

Course Code	CV 3001
Course Title	Building Materials & Construction
Number of Credits	3(L-3,T-0,P-0)
Prerequisites	NIL
Course Category	PC

**1. Natural Construction Material**

- 2.1 Stones
  - 2.1.1 Requirement of good building stone
  - 2.1.2 General Characteristic of stone
  - 2.1.3 Quarrying and dressing methods and tools
- 2.2 Timber
  - 2.2.1 Structure of timber
  - 2.2.2 General properties and uses
  - 2.2.3 Different methods of seasoning
  - 2.2.4 Defects
- 2.3 As properties of lime its types & uses
- 2.4 Properties of sand and uses
- 2.5 Classification of coarse aggregate according to size.

**2. Artificial Construction Material**

- 3.1 Bricks
  - 3.1.1 Constituents of brick earth
  - 3.1.2 Conventional bricks
  - 3.1.3 Modular and standard bricks
  - 3.1.4 Special bricks – fly ash bricks
  - 3.1.5 Characteristics of good bricks
  - 3.1.6 Field tests on bricks
  - 3.1.7 Burnt clay bricks
- 3.2 Flouting tiles – types & uses
- 3.3 Cement
  - 3.3.1 Manufacturing process
  - 3.3.2 Types of cement & its uses
  - 3.3.3 Field tests on bricks
- 3.4 Precast concrete blocks
- 3.5 Types of glass

**3. Processed Construction Material**

- 3.1 Pop
- 3.2 Paints
- 3.3 Industrial waste materials – fly ash, blast furnace slag, Granite

**4. Construction of Building Components**

- 4.1 Sub structure
  - 4.1.1 Layout
  - 4.1.2 Earthwork
  - 4.1.3 Foundation
    - 4.1.3.1 Functions
    - 4.1.3.2 Types of foundation
      - 4.1.3.1.1 Shallow
      - 4.1.3.1.2 Stepped
      - 4.1.3.1.3 Wall
      - 4.1.3.1.4 Column
      - 4.1.3.1.5 Isolated and combined
      - 4.1.3.1.6 Raff foundation
      - 4.1.3.1.7 Deep foundation
- 4.2 Construction of Superstructure
  - 4.2.1 Stone masonry
  - 4.2.2 Terms used
  - 4.2.3 Types of stone masonry
  - 4.2.4 Joints & purpose

- 4.2.5 Selection
- 4.2.6 Precaution

- 4.2.1 Brick Masonary
  - 4.2.1.1 Terms used
  - 4.2.1.2 Bonds in brick masonry
  - 4.2.1.3 Junctions in brick masonry& their purpose and procedure
- 4.3 Comparison between stone & brick masonry
- 4.4 Tools & plants required for construction

**5. Various Aspects of Building Construction**

- 5.1 Scaffolding & shoring – Types
- 5.2 Form work – Types
- 5.3 Building Communication & Ventilation

**References :**

1. Duggal S. K. Building Materials, New International.
2. Rangwala, S. C. Engineering Material, Charator Publisher.
3. Ghose, D. N. Construction Material, Tata M. C. Graw Hill.
4. Sushil Kumar, Building Construction, Standard Publication.
5. Punmia B. C. and Jain A. K. Building Construction Firm work Media.

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**ENVIRONMENT & ECOLOGY**

Course Code	CV 3002
Course Title	Environment & Ecology
Number of Credits	2 (L-2,T-0,P-0)
Prerequisites	None
Course Category	PC

**COURSE OBJECTIVES**

Technicians working in industries or elsewhere essentially require the knowledge of environment & ecology so as to enable them to work and produce most efficient, economical and eco-friendly finished products.

1. To understand basic parameters of Environment and Ecology.
2. To recognize various Bio geochemical cycle and different laws.
3. Study of various foot printing and Food chain and web.
4. Study of biomes and biodiversity and various treaty.

**COURSE OUTCOMES**

At the end of the course student will be able to

1. Understand the ecosystem and terminology and solve various engineering problems applying ecosystem knowledge to produce eco – friendly products.
2. Understand the suitable component of Environment and ecology and various population.
3. Understand the uses and effects of various Bio geochemical cycles.
4. Understanding of various Laws and niches in Environment.

**COURSE CONTENT****1. ENVIRONMENT AND ECOLOGY: BASIC UNDERSTANDING****1.1 ENVIRONMENT**

- 1.1.1 Definition
- 1.1.2 Components of Environment
- 1.1.3 Features of Environment
- 1.1.4 Environment Pollution & Types (In Brief)

**1.2 ECOLOGY**

- 1.2.1 Definition
- 1.2.2 Aspects of Ecology
- 1.2.3 Classification of Ecology
- 1.2.4 Population Ecology

**2. ECOSYSTEM**

- 2.1 Definition
- 2.2 Components of Ecosystem
- 2.3 Energy flow in Ecosystem
- 2.4 Bio-geochemical cycles
  - 2.4.1 Carbon Cycle
  - 2.4.2 Water Cycle
  - 2.4.3 Oxygen Cycle
  - 2.4.4 Nitrogen cycle
  - 2.4.5 Sulphur Cycle
  - 2.4.6 Phosphorus Cycle
- 2.5 Leibig's Law of Minimization
- 2.6 Shelford Law of Tolerance

**3. ENVIRONMENTAL COMPLEX**

- 3.1 Food Chain (Definition & Example)
- 3.2 Types of food chain
- 3.3 Food web
- 3.4 Gauss Principle of competitive exclusion, Trophic level, Ten Percent Law

- 3.5 Ecological Niche & Types
- 3.6 Ecological Pyramids & Types
- 3.7 Definition

- 3.7.1 Ecological footprint
- 3.7.2 Carbon footprint
- 3.7.3 Biotic succession

#### 4. BIOSPHERE

- 4.1 Definition
- 4.2 Extent of biosphere
- 4.3 Importance of biosphere
- 4.4 Components of biosphere
- 4.5 Biomes
  - 4.5.1 Definition
  - 4.5.2 Types of biomes
  - 4.5.3 Indian biomes
- 4.6 Ecotone, Eco-line (Definition)

#### 5. Biodiversity

- 5.1 Types of biodiversity
- 5.2 Measuring biodiversity
  - 5.2.1 Alpha diversity
  - 5.2.2 Beta diversity
  - 5.2.3 Gamma diversity
- 5.3 Threats to biodiversity
  - 5.3.1 Cause of biodiversity losses
  - 5.3.2 Effect of loss of biodiversity
- 5.4 Conservation of biodiversity
- 5.5 Biodiversity Treaty

#### REFERENCES:

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2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
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12. Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.

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**MECHANICS OF MATERIALS**

Course Code	CV 3003 (Same as CC/CE 3003)
Course Title	Mechanics of Materials
Number of Credits	3 (L:3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

**Course Objectives:**

Following are the objectives of this course:

- To learn properties of area and structural material properties.
- To understand the concept of stress and strain.
- To calculate shear force, bending moment for different shapes of structural elements and corresponding stresses.
- To understand the concept of buckling loads for short and long columns.

**Course outcomes:**

After completing this course, student will be able to:

- Articulate practical applications of moment of inertia of symmetrical and unsymmetrical structural sections.
- Analyse structural behaviour of materials under various loading conditions.
- Interpret shear force and bending moment diagrams for various types of beams and loading conditions.
- Determine the bending and shear stresses in beams under different loading conditions.
- Analyse the column for various loading and end conditions.

**Course Content****1. Moment of Inertia****1.1 Moment of inertia (M.I.):****1.1.1 Definition****1.1.2 M.I. of plane lamina****1.1.3 Radius of gyration****1.1.4 Section modulus****1.1.5 Parallel and Perpendicular axes theorems (without derivations)****1.1.6 M.I. of rectangle, square, circle, semi-circle, quarter circle and triangle section (with derivations)****1.2 Moment of inertia of:****1.2.1 Symmetrical and unsymmetrical I-section****1.2.2 Channel section****1.2.3 T-section****1.2.4 Angle section****1.2.5 Hollow sections****1.2.6 Built up sections about centroidal axes and any other reference axis****1.3 Polar Moment of Inertia of solid circular sections****2. Simple Stresses and Strains****2.1 Definition of rigid, elastic and plastic bodies****2.2 Deformation of elastic body under various forces****2.3 Definition of:****2.3.1 Stress****2.3.2 Strain****2.3.3 Elasticity****2.3.4 Hook's law****2.3.5 Elastic limit**

**2.3.6 Modulus of elasticity**

- 2.4 Type of Stresses-Normal, Direct, Bending and Shear
- 2.5 Nature of stresses i.e. Tensile and Compressive stresses.
- 2.6 Standard stress strain curve for steel bar under tension, Yield stress, Proof stress, Ultimate stress, Strain at various critical points, Percentage elongation and Factor of safety
- 2.7 Deformation of body due to axial force, forces applied at intermediate sections, Maximum and minimum stress induced
- 2.8 Composite section under axial loading
- 2.9 Concept of temperature stresses and strain, Stress and strain developed due to temperature variation in homogeneous simple bar (no composite section)
- 2.10 Longitudinal and lateral strain
- 2.11 Modulus of Rigidity, Poisson's ratio, Biaxial and tri-axial stresses, volumetric strain, change in volume, Bulk modulus (Introduction only)
- 2.12 Relation between modulus of elasticity, modulus of rigidity and bulk modulus (without derivation)

**3. Shear Force and Bending Moment**

- 3.1 Types of supports, beams and loads
- 3.2 Concept and definition of shear force and bending moment
- 3.3 Relation between load, shear force and bending moment (with derivation)
- 3.4 Shear force and bending moment diagram for cantilever and simply supported beams subjected to point loads, uniformly distributed loads and couple (combination of any two types of loading), point of contraflexure

**4. Bending and Shear Stresses in beams**

- 4.1 Concept and theory of pure bending, assumptions, flexural equation (with derivation), bending stresses and their nature, bending stress distribution diagram
- 4.2 Concept of moment of resistance and simple numerical problems using flexural equation
- 4.3 Shear stress equation (without derivation)
- 4.4 Relation between maximum and average shear stress for rectangular and circular section
- 4.5 Shear stress distribution diagram
- 4.6 Shear stress distribution for square, rectangular, circle, hollow, square, rectangular, circular, angle sections, channel section, I-section, T-section
- 4.7 Simple numerical problems based on shear equation

**5. Columns**

- 5.1 Concept of compression member, short and long column, Effective length, Radius of gyration, Slenderness ratio, Types of end condition for columns, Buckling of axially loaded columns
- 5.2 Euler's theory, assumptions made in Euler's theory and its limitations, Application of Euler's equation to calculate buckling load
- 5.3 Rankine's formula and its application to calculate crippling load
- 5.4 Concept of working load/safe load, design load and factor of safety

**Suggested learning resources:**

1. Bedi D.S., Strength of Materials, Khanna Publishing House, Delhi, Ed. 2018
2. Timoshenko, S., Strength of Materials, Vol. I, CBS, New Delhi.
3. Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. New Delhi.
4. Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, New Delhi.
5. Punmia B C, Strength of Materials, Laxmi Publications (p) Ltd. New Delhi.
6. Rattan S.S., Strength of Materials, McGraw Hill Education; New Delhi.
7. Bansal R K, Strength of Materials, Laxmi Publications.
8. Subramaniam R, Strength of Materials, Oxford University Press.

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**Water Quality and Treatment**

Course Code	CV 3004
Course Title	Water Quality and Treatment
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To learn water demand & calculation of population forecasting .
- To learn sources of surface and subsurface water .
- To understand quality of drinking water and treatment of water.
- To understand about distribution of water&Plumbing of Building for water supply .
- To Know about rural water supply system .

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Know the different types of water demand and methods to identify population forecasting.
- Know the procedure to identify the sources of surface and subsurface water.
- Know the quality of drinking water.
- Draw labeled layout for water supply scheme.
- Know the procedure of water treatment.
- Know about the waterdistribution&Plumbing work of Building.
- Know about rural water supply system.

**COURSE CONTENT****1. Sources, Demand and Quality of water****1.1 Water supply schemes –**

- 1.1.1 Objectives
- 1.1.2 Components

**1.2 Sources of water:**

- 1.2.1 Surface and Subsurface sources of water
- 1.2.2 Intake Structures
- 1.2.3 Definition and types
- 1.2.4 Factors governing the location of an intake structure

**1.3 Demand of water:**

- 1.3.1 Factors affecting rate of demand
- 1.3.2 Variations of water demand
- 1.3.3 Forecasting of population
- 1.3.4 Methods of forecasting of population
- 1.3.5 Simple problems on forecasting of population
- 1.3.6 Design period
- 1.3.7 Estimating of quantity of water supply required for city or town

**1.4 Quality of water:**

- 1.4.1 Need for analysis of water,
- 1.4.2 Characteristics of water-
  - 1.4.2.1 Physical, Chemical and Biological (only introduction)
  - 1.4.2.2 Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, E coli, B coli index, MPN
  - 1.4.2.3 Sampling of water
  - 1.4.2.4 Water quality standards as per IS 10500

**2. Treatment of water****2.1 Treatment of Water:**

- 2.1.1 Objectives of water treatment,
- 2.1.2 Aeration- objects and methods of aeration

**2.2 Plain sedimentation (No Numerical Problem)**

- 2.2.1
- 2.2.2 Sedimentation with coagulation

- 2.2.3 Types Of Coagulants
- 2.2.4 Jar Test
- 2.2.5 Process Of Coagulation
- 2.2.6 Types Of sedimentation tanks
- 2.2.7 Clariflocculator.
- 2.3 Filtration –
  - 2.3.1 Mechanisation Of Filtration,
  - 2.3.2 Classification Of filters:
    - 2.3.2.1 Slow Sand Filter
    - 2.3.2.2 Rapid Sand Filter
    - 2.3.2.3 Pressure filter
  - 2.3.3 Construction and working of
    - 2.3.3.1 Slow Sand Filter
    - 2.3.3.2 Rapid Sand Filter,
  - 2.3.4 Operational problems in filtration.
  - 2.3.5 Disinfection:
    - 2.3.5.1 Objects,
    - 2.3.5.2 Methods of disinfection
    - 2.3.5.3 Chlorination-
      - 2.3.5.3.1 Application Of Chlorine
      - 2.3.5.3.2 Forms Of Chlorination
      - 2.3.5.3.3 Types Of Chlorination Practices
      - 2.3.5.3.4 Residual Chlorine And Its Importance
      - 2.3.5.3.5 Flow Diagram of water treatment plants.

### 3. Regulatory Valves

- 3.1 Regulatory Valves:
  - 3.1.1 Sluice valve (gate valve)
  - 3.1.2 Reflux valve
  - 3.1.3 Air release valve
  - 3.1.4 Scour valve
  - 3.1.5 Safety valves
  - 3.1.6 Pressure relief valves
  - 3.1.7 Fire hydrants

### 4. Conveyance & Distribution of water

#### 4.1 Conveyance

- 4.1.1 Types of Pipes used for conveyance of water
- 4.1.2 Choice of pipe material
- 4.1.3 Types of joints

#### 4.2 Methods of distribution of water

- 4.2.1 Gravity system
- 4.2.2 Pumping system
- 4.2.3 Combined system

#### 4.3 Service reservoirs - functions and types

#### 4.4 Layouts of distribution of Water-

- 4.3.1 Dead End System
- 4.3.2 Grid Iron System
- 4.3.3 Circular System
- 4.3.4 Radial System

### 5. Rural Water Supply

- 5.1 Issues of rural water supply.
- 5.2 Various techniques for rural water supply
- 5.3 National rural drinking water program
- 5.4 Rural water quality monitoring and surveillance
- 5.5 Operation and maintenance of rural water supplies.
- 5.6 Low Cost water Treatment:

5.6.1 Introduction – Epidemiological aspects of water quality methods for low cost water treatment.

5.6.2 Specific contaminant removal systems.

**SUGGESTED LEARNING RESOURCES**

1. Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
2. Garg, S.K., Environmental Engineering Vol. I and Vol. II, *Khanna Publishers*
3. Birdie, G. S. and Birdie, J. S. Water Supply and Sanitary Engineering, Dhanpat Rai
4. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi
5. Rao, C.S., Environmental Pollution Control Engineering, New Age International
6. Punmia, B C, Environmental Engineering, vol. I and II, Laxmi Publishers
7. Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw
8. Basak N N, Environmental Engineering, McGraw Hill Publishers.

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**CONCRETE TECHNOLOGY**

Course Code	CV 3005 (Same as CC/CE 3005)
Course Title	Concrete Technology
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

**Course Objectives:**

Following are the objectives of this course:

- To know properties of cement, aggregate and water used in concrete.
- To understand different characteristics of concrete.
- To learn about role of admixtures in concrete.

**Course outcomes:**

After completing this course, student will be able to:

- Use different types of cement and aggregates in concrete
- Prepare concrete of desired compressive strength.
- Prepare concrete of required specification.
- Maintain quality of concrete under different conditions.
- Apply relevant admixtures for concreting.

**Course Content:****1. Cement, Aggregates and Water**

- 1.1 Physical properties of OPC and PPC: fineness, standard consistency, setting time, soundness, compressive strength.
- 1.2 Different grades of OPC and relevant BIS codes
- 1.3 Testing of cement: Laboratory tests-fineness, standard consistency, setting time, soundness, compressive strength
- 1.4 Storage of cement and effect of storage on properties of cement
- 1.5 BIS Specifications and field applications of different types of cements: Rapid hardening, Low heat, Portland pozzolana, Sulphate resisting, Blast furnace slag, High Alumina and White cement
- 1.6 Aggregates: Requirements of good aggregate, Classification according to size and shape
- 1.7 Fine aggregates: Properties, size, specific gravity, bulk density, water absorption and bulking, fineness modulus and grading zone of sand, silt content and their specification as per IS383.
- 1.8 Concept of crushed Sand
- 1.9 Coarse aggregates: Properties, size, shape, surface texture, water absorption, soundness, specific gravity and bulk density, fineness modulus of coarse aggregate, grading of coarse aggregates, crushing value, impact value and abrasion value of coarse aggregates with specifications.
- 1.10 Water: Quality of water, impurities in mixing water and permissible limits for solids as per IS:456.

**2. Concrete**

- 2.1 Concrete: Different grades of concrete, provisions of IS456.
- 2.2 Duff Abraham water cement (w/c) ratio law, significance of w/c ratio, selection of w/c ratio for different grades, maximum w/c ratio for different grades of concrete for different exposure conditions as per IS456.
- 2.3 Properties of fresh concrete
  - 2.3.1 Workability: Factors affecting workability of concrete.
- 2.4 Determination of workability of concrete by slump cone, compaction factor, Vee-Bee Consistometer.



- 2.5 Value of workability requirement for different types of concrete works
- 2.6 Segregation, bleeding and preventive measures
- 2.7 Properties of Hardened concrete: Strength, Durability, Impermeability

### 3. Concrete Mix Design and Testing of Concrete

- 3.1 Concrete mix design: Objectives, methods of mix design,
- 3.2 Study of mix design as per IS 10262 (only procedural steps).
- 3.3 Testing of concrete, determination of compressive strength of concrete cubes at different ages, interpretation and co-relation of test results.
- 3.4 Non- destructive testing of concrete: Rebound hammer test, working principle of rebound hammer and factor affecting the rebound index, Ultrasonic pulse velocity test as per IS13311 (part 1 and 2), Importance of NDT tests

### 4. Quality Control of Concrete

- 4.1 Concreting Operations: Batching, Mixing, Transportation, Placing, Compaction, Curing and Finishing of concrete
- 4.2 Formwork for concreting: Different types of form work for beams, slabs, columns, materials used for formwork,
- 4.3 Requirement of good formwork
- 4.4 Stripping time for removal of formworks per IS 456.
- 4.5 Waterproofing: Importance and need of waterproofing
- 4.6 Methods of waterproofing and materials used for waterproofing
- 4.7 Joints in concrete construction: Types of joints, methods for joining old and new concrete
- 4.8 Introduction to water bars
- 4.9 Materials used for filling joints

### 5. Chemical Admixture, Special Concrete and Extreme Weather concreting

- 5.1 Admixtures in concrete: Purpose, properties and application for different types of admixture such as accelerating admixtures, retarding admixtures, water reducing admixtures, air entraining admixtures and superplasticizers.
- 5.2 Special Concrete: Properties, advantages and limitation of following types of Special concrete:
  - 5.2.1 Ready mix concrete
  - 5.2.2 Fibre Reinforced concrete
  - 5.2.3 High performance concrete
  - 5.2.4 Self-compacting concrete
  - 5.2.5 Light weight concrete
- 5.3 Cold weather concreting: effect of cold weather on concrete, precautions to be taken while concreting in cold weather condition
- 5.4 Hot weather concreting: effect of hot weather on concrete, precautions to be taken while concreting in hot weather condition

### Suggested learning resources:

1. Gambhir, M.L., Concrete Technology, Tata McGraw Hill Publishing Co. Ltd., Delhi.
2. Shetty, M.S., Concrete Technology, S. Chand and Co. Pvt. Ltd., Ram Nagar, Delhi.
3. Santhakumar, A. R., Concrete Technology, Oxford University Press, New Delhi.
4. Neville, A. M. and Brooks, J.J., Concrete Technology, Pearson Education Pvt. Ltd.
5. Neville, A. M., Concrete Technology, Pearson Education Pvt. Ltd., New Delhi.
6. Sood, H., Kulkarni P. D., Mittal L. N., Laboratory Manual in Concrete Technology, CBS Publishers, New Delhi.

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**GEOTECHNICAL ENGINEERING**

Course Code	CV 3006 (Same as CC/CE 3006)
Course Title	Geotechnical Engineering
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

**Course Objectives:**

Following are the objectives of this course:

- To understand and determine physical and index properties and classification of soil
- To estimate permeability and shear strength of soil
- To know the load bearing capacity of soil
- To learn various soil stabilization and compaction methods

**Course outcomes:**

After completing this course, student will be able to:

- Identify types of rocks and sub soil strata of earth.
- Interpret the physical properties of soil related to given construction activities.
- Use the results of permeability and shear strength test for foundation analysis.
- Interpret soil bearing capacity results.
- Compute optimum values for moisture content for maximum dry density of soil through various tests.

**Course Content:****1. Overview of Geology and Geotechnical Engineering**

- 1.1 Introduction of Geology, Branches of Geology
- 1.2 Importance of Geology for civil engineering structure and composition of earth
- 1.3 Definition of a rock: Classification based on their genesis (mode of origin), formation
- 1.4 Classification and engineering uses of igneous, sedimentary and metamorphic rocks
- 1.5 Importance of soil as construction material in Civil engineering structures and as foundation bed for structures
- 1.6 Field application of geotechnical engineering for foundation design, pavement design, design of earth retaining structures, design of earthen dam

**2. Physical and Index Properties of Soil**

- 2.1 Soil as a three-phase system
- 2.2 Water content
- 2.3 Determination of water content by oven drying method as per BIS code
- 2.4 Void ratio, porosity and degree of saturation, density index
- 2.5 Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight
- 2.6 Determination of bulk unit weight and dry unit weight by core cutter and sand replacement method
- 2.7 Determination of specific gravity and water content by pycno meter
- 2.8 Consistency of soil, Atterberg limits of consistency: Liquid limit, plastic limit and shrinkage limit, Plasticity index
- 2.9 Particle size distribution test and plotting of curve, Determination of effective diameter of soil, well graded and uniformly graded soils
- 2.10 Plasticity chart
- 2.11 BIS classification of soil.

**3. Permeability and Shear Strength of Soil**

- 3.1 Definition of permeability
- 3.2 Darcy's law of permeability, coefficient of permeability, factors affecting permeability
- 3.3 Determination of coefficient of permeability by constant head and falling head tests
- 3.4 Simple problems to determine coefficient of permeability
- 3.5 Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (No numerical problems)
- 3.6 Shear failure of soil
- 3.7 Concept of shear strength of soil

- 3.8 Components of shearing resistance of soil – cohesion, internal friction
- 3.9 Mohr-Coulomb failure theory  
Strength envelope, strength equation for purely cohesive and cohesion less soils
- 3.10 Direct shear and vane shear test –laboratory methods

#### 4. Bearing Capacity of Soil

- 4.1 Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure
- 4.2 Introduction to Terzaghi's analysis and assumptions
- 4.3 Effect of water table on bearing capacity
- 4.4 Field methods for determination of bearing capacity – Plate load and Standard Penetration Test. Test procedures as per IS:1888&IS:2131
- 4.5 Definition of earth pressure, Active and Passive earth pressure for no surcharge condition, coefficient of earth pressure
- 4.6 Rankine's theory and assumptions made for non-cohesive Soils

#### 5. Compaction and stabilization of soil

- 5.1 Concept of compaction, Standard and Modified proctor test as per BIS code
- 5.2 Plotting of Compaction curve for determining: Optimum moisture content (OMC), maximum dry density (MDD), Zero air voids line
- 5.3 Factors affecting compaction
- 5.4 Field methods of compaction – rolling, ramming and vibration
- 5.5 Suitability of various compaction equipments-smooth wheel roller, sheep foot roller, pneumatic tyred roller, Rammer and Vibrator
- 5.6 Difference between compaction and consolidation
- 5.7 Concept of soil stabilization, necessity of soil stabilization, different methods of soil stabilization
- 5.8 California bearing ratio (CBR) test - Meaning and Utilization in Pavement Construction
- 5.9 Necessity of site investigation and soil exploration: Types of exploration, criteria for deciding the location and number of test pits and bores
- 5.10 Field identification of soil – dry strength test, dilatancy test and toughness test.

#### Suggested learning resources:

1. Punmia, B.C., Soil Mechanics and Foundation Engineering, Laxmi Publication, Delhi.
2. Murthy, V.N.S., A text book of soil mechanics and foundation Engineering, CBS Publishers & Distributors Pvt. Ltd., NewDelhi.
3. Ramamurthy, T.N. & Sitharam, T.G., Geotechnical Engineering(Soil Mechanics), S Chand and Company LTD., NewDelhi.
4. Raj, P. Purushothama, Soil Mechanics and Foundation Engineering, Pearson India, New Delhi.
5. Kasamalkar, B. J., Geotechnical Engineering, Pune Vidyarthi Griha Prakashan, Pune.
6. Arora K R, Soil Mechanics and Foundation Engineering, Standard Publisher.

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**BUILDING MATERIALS & CONSTRUCTION LAB**

Course Code	CV 3007
Course Title	Building Materials & Construction Lab
Number of Credits	1(L-0,T-0,P-2)
Prerequisites	Nil
Course Category	PC

**LIST OF PRACTICAL'S**

1. Identify various sizes of available coarse aggregate from sample of 10 kg. in laboratory and prepare report.
2. Identify the available construction material in the laboratory on the basis of their sources.
3. Identify the grain distribution pattern in given sample of track wood in laboratory and draw various patterns.
4. Select first class, second class and third class bricks from the stake of bricks and prepare report on the basis of its properties.
5. Measure dimension of 10 bricks and find avg. dimension and weight perform field tests.
6. Identify different type of flooring tiles such as vitrified tiles, ceramic tiles, glazed tiles, mosaic tiles, anti skid tiles, squared tiles, paving blocks and prepare report about specification.
7. Prepare the cement mortar of proportion 1:3 or 1:6 using artificial sand as a special proceed construction material.
8. Identify various types of foundation by visiting at least 3 construction sites in different locations in the city and prepare report consisting photographs & samples.
9. Visit 3 different sites in the city for different types of masonry works and prepare report consisting photographs and samples.

**References :**

1. Sood H. Laboratory Manual on Testing of Engineering Materials, New Age Publishers, New Delhi
2. S. K. Sharma, Civil Engineering Construction Materials, Khanna Publishing House.
3. Sharma C. P. Engineering Materials, PHI Vearing, New Delhi.
4. S. P. Arora and Bindra, Building Construction, Dhanpat Rai Publication.
5. Mantri S. A to Z Building Construction, Satya Prakashan, New Delhi.

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**Water Quality & Treatment Lab**

Course Code	CV 3008
Course Title	Water Quality & Treatment Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To learn the tests for measuring quality of drinking water.
- To understand the plotting of water supply scheme highlighting different features.

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Perform various tests to assess quality of water.
- Estimate dissolved solids as per BIS codes.
- Draw line diagram of water pipeline system for a locality.

**LIST OF PRACTICAL TO BE PERFORMED**

1	Determine pH value of given sample of water.
2	Determine the turbidity & conductivity of the given sample of water.
3	Determine hardness of water by E.D.T.A method
4	Determine residual chlorine in a given sample of water.
5	Determine suspended, dissolved solids and total solids of given sample of water.
6	Determine the optimum dose of coagulant in a given raw water sample by jar test.
7	Determine the dissolved oxygen in a sample of water.
8	Undertake a field visit to water treatment plant and prepare a report.
9	Draw sketches of various valves used in water supply pipe line

**SUGGESTED LEARNING RESOURCES**

1. Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
2. Garg, S.K., Environmental Engineering Vol. I and Vol. II, *Khanna PIQ publishers*
3. Birdie, G. S. and Birdie, J. S. Water Supply and Sanitary Engineering, Dhanpat Rai
4. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi
5. Rao, C.S., Environmental Pollution Control Engineering, New Age International
6. Punmia, B C, Environmental Engineering, vol. I and II, Laxmi Publishers
7. Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw
8. Basak N N, Environmental Engineering, McGraw Hill Publishers.

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**MECHANICS OF MATERIALS LAB**

Course Code	CV 3009 (Same as CC/CE 3009)
Course Title	Mechanics of Materials Lab.
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

**Course Objectives:**

Following are the objectives of this course:

- To know the procedure for the conduct of tensile and compressive strength.
- To understand the concept of stress and strain through testing of different materials.
- To calculate shear force, bending moment and their corresponding stresses.
- To understand flexural strength and abrasive properties of floor tiles.

**Course outcomes:**

After competing this course, student will be able to:

- Test different Civil engineering materials on Universal Testing Machine.
- Analyse structural behaviour of materials under various loading conditions.
- Interpret shear force and bending moment diagrams for various types of beam sections and different loading conditions.
- Determine bending and shear stresses in beams under different loading conditions.
- Calculate flexural strength of different types of floor tiles.

**List of Practicals to be performed:**

1. Study and understand the use and components of Universal Testing Machine (UTM).
2. Perform Tension test on mild steel as per IS:432(1).
3. Perform tension test on Tor steel as per IS:1608, IS:1139.
4. Conduct compression test on sample test piece using Compression Testing Machine.
5. Conduct Izod Impact test on three metals. e.g. mild steel/ brass/aluminum/ copper /cast iron etc as per IS:1598.
6. Conduct Charpy Impact test on three metals. e.g. mild steel/ brass/aluminum/ copper /cast iron etc as per IS:1757.
7. Determine Water Absorption on bricks per IS:3495 (part II), IS:1077 or tile IS:1237.
8. Determine Compressive strength of dry and wet bricks as per IS:3495(part I), IS:1077.
9. Conduct Abrasion Test on flooring tiles (any one) e.g. Mosaic tiles, Ceramic Tiles as per IS: 13630 (part7), Cement Tile as per IS: 1237.
10. Perform Single Shear and double shear test on any two metals e.g. Mild steel/ brass/aluminium/copper / cast iron etc as per IS:5242.
11. Conduct Compression test on timber section along the grain and across the grain as per IS:2408.
12. Plot Shear force and Bending Moment diagrams for cantilever, simply supported beams.
13. Plot Shear force and Bending Moment diagrams for overhanging beams for different types of loads including moment loading.
14. Conduct Flexural test on timber beam on rectangular section in both orientation as per IS:1708, IS:2408.
15. Conduct Flexure test on floor tiles IS:1237, IS:13630 or roofing tiles as per IS:654, IS:2690.

**Suggested learning resources:**

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1. Bedi D.S., Strength of Materials, Khanna Publishing House, New Delhi (Edition 2018)
  2. Timoshenko, S., Strength of Materials, Vol. I, CBS, New Delhi.
  3. Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. New Delhi.
  4. Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, New Delhi.
  5. Punmia B C, Strength of Materials, Laxmi Publications (p) Ltd. New Delhi.
  6. Rattan S.S., Strength of Materials, McGraw Hill Education; New Delhi.
  7. Bansal R K, Strength of Materials, Laxmi Publications.
  8. Subramaniam R, Strength of Materials, Oxford University Press.

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SEMESTER SCHEME 2020-21

**CONCRETE TECHNOLOGY LAB**

Course Code	CV 3010 (Same as CC/CE 3010)
Course Title	Concrete Technology Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

**Course Objectives:**

Following are the objectives of this course:

- To know properties of cement, aggregate and water used in concrete.
- To understand different characteristics of concrete.
- To learn about role of admixtures in concrete.

**Course outcomes:**

After completing this course, student will be able to:

- Identify different types of cement by performing laboratory tests.
- Know the physical properties of fine and coarse aggregates.
- Prepare concrete of required specification.
- Maintain the quality of concrete applying scientific principles.
- Use relevant admixtures for improving the workability of concrete.

**List of Practical to be performed:**

1	Determine fineness of cement by Blaine's air permeability apparatus Or by sieving.
2	Determine specific gravity, standard consistency, initial and final setting times of cement.
3	Determine compressive strength of cement.
4	Determine silt content in sand.
5	Determine bulking of sand.
6	Determine bulk density of fine and coarse aggregates.
7	Determine water absorption of fine and coarse aggregates.
8	Determine Fineness modulus of fine aggregate by sieve analysis.
9	Determine elongation and flakiness index of coarse aggregates
10	Determine workability of concrete by slump cone test.
11	Determine workability of concrete by compaction factor test.
12	To prepare concrete mix of a particular grade and determine compressive strength of concrete for 7 and 28 days.
13	Demonstration of NDT equipments

**Suggested learning resources:**

1. Gambhir, M.L., Concrete Technology, Tata McGraw Hill Publishing Co. Ltd., Delhi.
2. Shetty, M.S., Concrete Technology, S. Chand and Co. Pvt. Ltd., Ram Nagar, Delhi.
3. Santhakumar, A. R., Concrete Technology, Oxford University Press, New Delhi.
4. Neville, A. M. and Brooks, J.J., Concrete Technology, Pearson Education Pvt. Ltd.
5. Neville, A. M., Concrete Technology, Pearson Education Pvt. Ltd., New Delhi.
6. Sood, H., Kulkarni P. D., Mittal L. N., Laboratory Manual in Concrete Technology, CBS Publishers, New Delhi.

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**GEOTECHNICAL ENGINEERING LAB**

Course Code	CV 3011 (Same as CC/CE 3011)
Course Title	Geotechnical Engineering Lab.
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

**Course Objectives:**

Following are the objectives of this course:

- To understand and determine physical and index properties of soil.
- To estimate the permeability and shear strength of soil.
- To know the procedure for performing C.B.R test.
- To learn various compaction methods for soil stabilization.

**Course outcomes:**

After completing this course, student will be able to:

- Identify types of rocks and sub soil strata of earth.
- Interpret the physical properties of soil related to given construction activities.
- Use the results of permeability and shear strength test for foundation analysis.
- Interpret the soil bearing capacity results.
- Compute optimum moisture content values for maximum dry density of soil through various tests.

**List of Practicals to be performed:**

1. Identification of rocks from the given specimen.
2. Determine water content of given soil sample by oven drying method as per IS: 2720 (Part-II).
3. Determine specific gravity and water content of soil by pycnometer method as per IS 2720 (Part-III).
4. Determine dry unit weight of soil in field by core cutter method as per IS 2720 (Part-XXIX).
5. Determine dry unit weight of soil in field by sand replacement method as per IS 2720 (Part-XXVIII).
6. Determine Plastic and Liquid Limit along with Plasticity Index of given soil sample as per IS 2720 (Part-V).
7. Determine grain size distribution of given soil sample by mechanical sieve analysis as per IS 2720 (Part-IV).
8. Use different types of soil to identify and classify soil by conducting field tests-Through Visual inspection, Dry strength test, Dilatancy test and Toughness test.
9. Determine coefficient of permeability by constant head test as per IS 2720 (Part-XVII).
10. Determine coefficient of permeability by falling head test as per IS 2720 (Part-XVII).
11. Determine shear strength of soil by direct shear test as per IS 2720(Part-XIII).
12. Determine shear strength of soil by vane shear test as per IS 2720(Part-XXX).
13. Determine MDD and OMC by standard proctor test of given soil sample as per IS 2720 (Part-VII).

**Suggested learning resources:**

1. Punmia, B.C., Soil Mechanics and Foundation Engineering, Laxmi Publication
2. Murthy, V.N.S., A text book of soil mechanics and foundation Engineering, CBS Publishers & Distributors Pvt. Ltd., New Delhi.
3. Ramamurthy, T.N. &Sitharam,T.G., Geotechnical Engineering(Soil Mechanics), S Chand and Company LTD., New Delhi.
4. Raj, P. Purushothama, Soil Mechanics and Foundation Engineering, Pearson India
5. Kasamalkar, B. J., Geotechnical Engineering, Pune Vidyarthi Griha Prakashan, Pune.
6. Arora K R, Soil Mechanics and Foundation Engineering, Standard Publisher.

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**GOVERNMENT OF RAJASTHAN**  
**BOARD OF TECHNICAL EDUCATION RAJASTHAN JODHPUR**  
**SEMESTER SCHEME-2020-21**



**IV SEMESTER**  
(SESSION 2021-2022 & ONWARDS)

**HYDRAULICS**

Course Code	CV 4001(Same as CE/CC 4001)
Course Title	Hydraulics
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To understand parameters associated with fluid flow and hydrostatic pressure.
- To know head loss and water hammer in fluid flowing through pipes.
- To learn different types of pumps and their uses.

**COURSE OUTCOMES**

After completing this course, student will be able to:

1. Measure pressure and determine total hydrostatic pressure for different conditions.
2. Understand various parameters associated with fluid flow
3. Determine head loss of fluid flow through pipes.
4. Find the fluid flow parameters in open channels.
5. Select relevant hydraulic pumps for different applications

**COURSE CONTENT****1. Pressure Measurement and Hydrostatic Pressure**

- 1.1. Technical terms used in Hydraulics:
  - 1.1.1. Fluid, Fluid Mechanics
  - 1.1.2. Hydraulics, Hydrostatics and Hydrodynamics
  - 1.1.3. Ideal and Real Fluid
  - 1.1.4. Application of Hydraulics
- 1.2. Physical Properties of Fluid:
  - 1.2.1. Density-Specific Volume
  - 1.2.2. Specific Gravity
  - 1.2.3. Vapour pressure, Surface Tension, Capillarity
  - 1.2.4. Viscosity - Newton's Law of Viscosity, Dynamic and Kinematic viscosity
- 1.3. Various Types of Pressure:
  - 1.3.1. Atmospheric Pressure
  - 1.3.2. Gauge Pressure
  - 1.3.3. Absolute Pressure
  - 1.3.4. Vacuum Pressure
- 1.4. Concept of Pressure Head and its unit
- 1.5. Pascal's law of fluid pressure and its uses
- 1.6. Measurement of Differential Pressure
  - 1.6.1. Manometers
    - 1.6.1.1 Piezometer - its limitation
    - 1.6.1.2 U-tube - simple, differential, inverted
    - 1.6.1.3 Micro-manometers
    - 1.6.1.4 Inclined tube micro-manometers
- 1.1. Variation of Pressure with Depth:
  - 1.1.1. Pressure Diagram
  - 1.1.2. Hydrostatic Pressure
  - 1.1.3. Center of Pressure on immersed surfaces and on tank walls

**2. FLUID FLOW PARAMETERS**

- 2.1 Types of flow
  - 2.1.1 Gravity and Pressure Flow
  - 2.1.2 Laminar, Turbulent
  - 2.1.3 Uniform, Non-uniform
  - 2.1.4 Steady, Unsteady flow
- 2.2 Reynolds Number
- 2.3 Discharge and its unit
- 2.4 Continuity Equation of Flow
- 2.5 Energy of flowing Liquid
  - 2.5.1 Potential
  - 2.5.2 Kinetic
  - 2.5.3 Pressure Energy
- 2.6 Bernoulli's Theorem: Statement, Assumptions, Equation

**3. FLOW THROUGH PIPES**

- 3.1 Major Head Loss in Pipe
  - 3.1.1 Frictional loss and its computation by Darcy's Weisbach Equation
- 3.2 Minor Losses in Pipe
  - 3.2.1 Loss at Entrance, Exit
  - 3.2.2 Sudden Contraction, Sudden Enlargement
  - 3.2.3 Fittings
- 3.3 Flow through Pipes
  - 3.3.1 Pipes in Series
  - 3.3.2 Pipes in Parallel
  - 3.3.3 Dupuit's equation for Equivalent Pipe
- 3.4 Hydraulic Gradient Line and Total Energy Line
- 3.5 Water Hammer in Pipes: Causes and Remedial measures
- 3.6 Discharge measuring device for Pipe Flow: Venturimeter - construction and working
- 3.7 Discharge measurement using Orifice, Hydraulic Coefficients of Orifice

**4. FLOW THROUGH OPEN CHANNEL**

- 4.1 Geometrical properties of channel section
  - 4.1.1 Wetted Area
  - 4.1.2 Wetted Perimeter
  - 4.1.3 Hydraulic Radius for Rectangular and Trapezoidal Channel Section
- 4.2 Determination of discharge by Chezy's equation and Manning's equation
- 4.3 Conditions for Most Economical Rectangular and Trapezoidal Channel Section
- 4.4 Discharge measuring devices:
  - 4.4.1 Triangular Notch
  - 4.4.2 Rectangular Notch
- 4.5 Velocity measurement devices
  - 4.5.1 Current Meter
  - 4.5.2 Floats
  - 4.5.3 Pitot's Tube
- 4.6 Froude Number

**5. HYDRAULIC PUMPS**

- 5.1 Concept of Pump
- 5.2 Types of Pump
  - 5.2.1 Centrifugal
  - 5.2.2 Reciprocating
  - 5.2.3 Submersible
- 5.3 Suction Head, Delivery Head, Static Head, Manometric Head  
Selection and choice of pump

**SUGGESTED LEARNING RESOURCES**

1. Modi, P. N. and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2. S.S. Rattan, Fluid Mechanics & Hydraulic Machines, Khanna Book Publishing Co., New Delhi
3. Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing Company, New Delhi.
4. Khurmi R S, Hydraulics, Fluid Mechanics, Hydraulic machines, S. Chand Publishers
5. Rajput, R K, Fluid Mechanics, S Chand, New Delhi.
6. Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, Oxford University Press, New Delhi.

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(SEMESTER SCHEME-2020-21)

**Environment Pollution & Control**

Course Code	CV 4002
Course Title	Environment Pollution & Control
Number of Credits	2 (L:2, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

**COURSE OBJECTIVES:**

Following are the objectives of this course:

- Impart knowledge on fundamental aspects of air pollution , noise pollution, Hazardous Waste, Soil Pollution.
- Differentiate the solid and hazardous waste based on characterization.

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Identify the air pollutant control devices
- Monitor Air Pollution, Noise pollution, Hazardous Waste Pollution, Soil Pollution.

**COURSE CONTENT****1. Introduction**

- 1.1 Introduction to Environment Pollution
- 1.2 Types of Environment Pollution
- 1.3 Introduction to Water Pollution
- 1.4 Introduction to Waste Water Pollution

**2. Air Pollution**

- 2.1 Define Air pollution
- 2.2 Types and major sources of air pollutants
- 2.3 Air born diseases and their effects on health
- 2.4 Air pollution Control Methods
  - 2.4.1 Particulate control devices
  - 2.4.2 Methods of Controlling Gaseous Emissions
  - 2.4.3 Air quality standards

**3. Noise Pollution**

- 3.1 Define Noise Pollution
- 3.2 Major sources of noise pollution
- 3.3 Effects of noise pollution on health
- 3.4 Noise standards in industrial, commercial, residential and silence zones
- 3.5 Measurement and control methods
  - 3.5.1 Reducing residential and industrial noise
  - 3.5.2 ISO 14000

**4. Hazardous Waste**

- 4.1 Characterization
  - 4.1.1 Nuclear waste
  - 4.1.2 Biomedical wastes
  - 4.1.3 Electronic wastes
  - 4.1.4 Chemical wastes

- 4.2 Treatment and management of hazardous waste listed in 4.1.1 to 4.1.4
- 4.3 Disposal and Control methods

### 5. Soil Pollution

- 5.1 Types and major sources of soil pollutants
- 5.2 Effects of soil pollutants on physico-chemical and biological properties of soil
- 5.3 Landfills
  - 5.3.1 Types of Landfills
  - 5.3.2 Natural attenuation landfill
  - 5.3.3 Containment landfills
  - 5.3.4 Landfill construction, operation and performance monitoring
  - 5.3.5 Environmental monitoring around landfills
- 5.4 Control
  - 5.4.1 Detection, control and remediation of subsurface contamination
  - 5.4.2 Various types of barrier systems
  - 5.4.3 Reclamation of contaminated sites

### SUGGESTED LEARNING RESOURCES

- Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elsevier, 2003.
- Environmental Science and Engineering by J.G. Henry and G.W. Heinke – Pearson Education.
- Environmental Engineering by Mackenzie L Davis & David A Cornwell. McGraw Hill Publishing
- Environmental Pollution and Control by J. Jeffrey Peirce, P Aarne Vesilind, Ruth Weiner Butterworth Heinemann.
- Hazardous Materials and Waste Management by Nicholas P. Cheremisinoff, Paul N. Cheremisinoff Elsevier Science
- Environmental Pollution Control Engineering by C. S. Rao New Age International.
- Soil Pollution From Monitoring to Remediation by Anabela Cachada, Armando C. Duarte, Teresa A.P. Rocha-Santos Elsevier Science
- Air Pollution Control by Sudarshan Prasad Mahajan Teri
- Air Quality Management by Suresh T. Nesaratnam, Shahram Taherzadeh John Wiley & Sons
- Noise Control by Shahram Taherzadeh Wiley
- Environment Pollution: Hazards And Control by R.D. Gupta Concept Publishing Company
- Elements of Environmental Pollution Control by OP Gupta KHANNA PUBLISHING HOUSE
- Environmental Pollution Monitoring and Control by S. M. Khopkar New Age International (P) Limited

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**SURVEYING**

Course Code	CV 4003
Course Title	Surveying
Number of Credits	1 (L: 1, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

**COURSE OBJECTIVES:**

Following are the objectives of this course:

- Able to Perform types of surveying works required.
- To know the type of method and equipments to be used for different surveys
- To know the use and operational details of various surveying equipments.

**Course Outcomes**

After completing this course, student will be able to:

- Select the type of survey required for given situation..
- Prepare plans using Plane Table Surveys.

**COURSE CONTENT****1.Classification of Survey**

- 1.1 Survey – Principles, purpose and use
- 1.2 Types of surveying: Primary and Secondary
- 1.3 Classification of surveying
  - 1.3.1 Plane
  - 1.3.2 Geodetic
  - 1.3.3 Cadastral
  - 1.3.4 Hydrographic
  - 1.3.5 Photogrammetry
  - 1.3.6 Aerial
- 1.4 Scales
  - 1.4.1 Engineer's scale
  - 1.4.2 Representative Fraction (RF) and
  - 1.4.3 Diagonal scale

**2. Chain Surveying :**

- 2.1 Different types of chains
  - 2.1.1 Metric chain
  - 2.1.2 Engineer's chain
  - 2.1.3 Gunter's chain
  - 2.1.4 Revenue chain
- 2.2 Types of Tapes
  - 2.2.1 Linen tapes
  - 2.2.2 Metallic tapes
  - 2.2.3 Invar tapes
  - 2.2.4 Steel band
- 2.3 Ranging rods
- 2.4 Offset rods
- 2.5 Line ranger
- 2.6 Cross staff
- 2.7 Optical square
- 2.8 Arrows



- 2.9 Folding, unfolding, of chains
- 2.10 Testing and adjusting of chains
- 2.11 Ranging
  - 2.11.1 Direct ranging
  - 2.11.2 Indirect ranging
- 2.12 Chaining on plane ground,
- 2.13 Conventional signs in surveying
- 2.14 Recording in field book
- 2.15 Chaining on sloping ground
  - 2.15.1 Direct method
  - 2.15.2 Indirect method
- 2.16 Common errors and precautions
- 2.17 Traversing

### 3. Compass Surveying :

- 3.1 Prismatic compass
- 3.2 Surveyor's compass
- 3.3 Difference in the above two compasses
- 3.4 Definitions
  - 3.4.1 Meridian - magnetic, true, arbitrary
  - 3.4.2 Magnetic dip
  - 3.4.3 Magnetic declination
  - 3.4.4 Fore bearing
  - 3.4.5 Back bearing
- 3.5 Whole circle bearing system
- 3.6 Quadrilateral bearing system
- 3.7 Conversion from whole circle bearing to quadrilateral bearing and vice versa.
- 3.8 Reading the bearing of lines
- 3.9 Computation of internal and external angles
- 3.10 Distribution of instrumental error
- 3.11 Local attraction
- 3.12 Correction of bearings due to local attractions
- 3.13 Traversing with chain and compass
  - 3.13.1 Open traverse
  - 3.13.2 Closed traverse
- 3.14 Booking in field book
- 3.15 Adjustment of error

### 4. Levelling and Contouring

- 4.1 Basic terminologies:
  - 4.1.1 Level surfaces
  - 4.1.2 Horizontal and vertical surfaces
  - 4.1.3 Datum
  - 4.1.4 Bench Marks- GTS, Permanent, Arbitrary and Temporary
  - 4.1.5 Reduced Level
  - 4.1.6 Rise and Fall method
  - 4.1.7 Line of collimation
  - 4.1.8 Station
  - 4.1.9 Back sight, Fore sight, Intermediate sight
  - 4.1.10 Change point
  - 4.1.11 Height of instruments
- 4.2 Types of levels:
  - 4.2.1 Dumpy level
  - 4.2.2 Tilting level
  - 4.2.3 Auto level
  - 4.2.4 Digital level

## 4.3 Types of levelling:

- 4.3.1 Simple levelling
- 4.3.2 Differential levelling
- 4.3.3 Fly levelling
- 4.3.4 Profile levelling
- 4.3.5 Reciprocal Levelling

## 4.4 Contour, contour intervals, horizontal equivalent

## 4.5 Use of contour maps

## 4.6 Characteristics of contours

## 4.7 Methods of Contouring: Direct and indirect

**5. Plane Table Surveying**

## 5.1 Principles of Plane Table Survey

## 5.2 Accessories of Plane Table and their use, Telescopic Alidade

## 5.3 Setting of Plane Table

- 5.3.1 Orientation of Plane Table
- 5.3.2 Back Sighting and Magnetic Meridian Method
- 5.3.3 True Meridian Method

## 5.4 Methods of Plane Table Surveys

- 5.4.1 Radiation
- 5.4.2 Intersection
- 5.4.3 Traversing

## 5.5 Merits and Demerits of Plane Table Survey

**SUGGESTED LEARNING RESOURCES**

1. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune VidyarthiGruhPrakashan, Pune.
2. Basak, N. N., Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd., Noida.
3. Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
4. Saikia, M D.; Das. B.M.; Das. M.M., Surveying PHI Learning Pvt. Ltd., New Delhi.
5. Subramanian, R., Surveying and Levelling, Oxford University Press. New Delhi.
6. Punmia, B.C.; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying Vol. I and Surveying Vol. II, Laxmi Publications Pvt. Ltd., New Delhi.
7. Rao, P.Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning Pvt. Ltd., New Delhi.
8. Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
9. Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Education, Noida.
10. De, Alak, Plane Surveying, S.Chand Publications, New Delhi.

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**WASTE WATER TREATMENT**

Course Code	CV 4004
Course Title	Waste Water Treatment
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To provide a coherent development to the students for the courses in sector of engineering like Waste Water treatment, house drainage etc.
- To analyze the Waste water sources and waste water characteristics.
- To Know about various waste water treatment process.
- To give an experience in the implementation of engineering concepts which are applied in field of waste Water treatment process.
- To present the foundations of many basic Engineering tools and concepts related Environmental Engineering.

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Know the concept of Waste Water treatment, house drainage and building rain age etc.
- Know the sources and characteristics of Waste water.
- Know about the Laying & Maintenance of Sewers.
- Draw labeled layout for Waste water treatment plant.
- Know the procedure of Waste water treatment.

**COURSE CONTENT****1. Sanitation System**

1.1 Necessity of systematic collection and disposal of waste

1.2 Type of Waste:

1.2.1 Dry waste

1.2.2 Semi-liquid waste

1.2.3 Liquid waste

1.3 Terminology related to sanitary engineering

1.3.1 Sewer

1.3.2 Sewerage

1.3.3 Sewage

1.3.4 Sullage

1.3.5 Sludge

1.4 Quantity of Sewage

1.4.1 Domestic sewage

1.4.2 Industrial waste

1.4.3 Storm water

1.4.4 Volume of domestic sewage dry weather flow (D.W.F.) and equivalent DWF

1.4.5 Variation of flow

1.4.6 Limiting velocities

1.4.6.1 Non-silting velocity

1.4.6.2 Non-scouring velocity

1.4.6.3 Self cleansing velocity

1.4.6.4 Transporting velocity

1.5 Depth of flow

**2. Characteristics and Collection of Sewage:****2.1 Characteristics of sewage**

- 2.1.1 B.O.D and its significance
- 2.1.2 C.O.D and its significance
- 2.1.3 Central Pollution Control Board Norms for discharge of treated sewage
- 2.1.4 Objects of sewage treatment

**2.2 Testing of Sewage**

- 2.2.1 Physical test
- 2.2.2 Biological test
- 2.2.3 Chemical test

**2.3 Collection of Sewage:**

- 2.3.1 Separate, combined and partially separate System
- 2.3.2 Stone ware sewers
- 2.3.3 Cast iron sewers
- 2.3.4 Concrete sewers
- 2.3.5 Sewer Joints
- 2.3.6 Different shapes of sewers
  - 2.3.6.1 Components of sewerage systems
  - 2.3.6.2 Systems of layout

**3. Building Drainage & Appurtenances:**

- 3.1 Aims and requirements
- 3.2 Fittings and arrangements in single and multi storied buildings
- 3.3 Different sanitary fitting and their installation
- 3.4 Traps, seal in traps
- 3.5 Gully trap
- 3.6 Intercepting trap
- 3.7 Grease trap
- 3.8 Causes of breaking seal in the traps and precautions
- 3.9 Testing of house drainage system
- 3.10 Septic tank
- 3.11 Soak pit
- 3.12 Manholes
- 3.13 Drop manhole
- 3.14 Inlets
- 3.15 Catch basin
- 3.16 Inverted syphon
- 3.17 Flushing tanks
- 3.18 Ventilating shaft
- 3.19 Lamp holes

**4. Laying & Maintenance of Sewers:**

- 4.1 Setting out alignment
- 4.2 Excavation
- 4.3 Checking the gradient using boning rod
- 4.4 Preparation of bed
- 4.5 Lowering, laying and jointing
- 4.6 Testing
- 4.7 Back filling
- 4.8 Construction of masonry sewers

4.9 Construction of surface drains

4.10 Maintenance of Sewer

- 4.10.1 Inspection of mains
- 4.10.2 Cleaning of sewers
- 4.10.3 Precautions during cleaning operations
- 4.10.4 Maintenance of traps
- 4.10.5 Cleaning of house drainage line
- 4.10.6 Ventilation of sewers
- 4.10.7 Tools and equipment needed for maintenance

**5. Treatment and Disposal**

5.1 Primary treatment

5.2 Secondary treatment

5.3 Function and construction of

- 5.3.1 Screening chambers
- 5.3.2 Grit chambers
- 5.3.3 Clarifier chambers
- 5.3.4 Trickling filters
- 5.3.5 Aeration tank
- 5.3.6 Activated sludge process

5.4 Sludge treatment

5.5 Sludge digestion

5.6 Sludge disposal

**SUGGESTED LEARNING RESOURCES**

1. Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
2. Garg, S.K., Environmental Engineering Vol. II, Khanna Publishers
3. Birdie, G. S. and Birdie, J. S. Water Supply and Sanitary Engineering, Dhanpat Rai
4. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi
5. Rao, C.S., Environmental Pollution Control Engineering, New Age International
6. Punmia, B C, Environmental Engineering, vol. II, Laxmi Publishers
7. Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw
8. Basak N N, Environmental Engineering, McGraw Hill Publishers.

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**WATER RESOURCES ENGINEERING**

Course Code	CV 4005 (Same as CE 4005)
Course Title	Water Resources Engineering
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To learn estimation of hydrological parameters.
- To understand water demand of crops and provisions to meet the same.
- To know planning of reservoirs and dams.
- To design irrigation projects, canals and other diversion works.

**Course Outcomes:**

After completing this course, student will be able to:

1. Estimate hydrological parameters.
2. Estimate crop water requirements of a command area and capacity of canals.
3. Execute Minor and Micro Irrigation Schemes.
4. Select the relevant Cross Drainage works for the specific site conditions.
5. Design, construct and maintain simple irrigation regulatory structures.

**COURSE CONTENT****1. Introduction to Hydrology**

- 1.1 Hydrology: Definition and Hydrological Cycle
- 1.2 Rain Gauge
  - 1.2.1 Symons Rain Gauge
  - 1.2.2 Automatic Rain Gauge
- 1.3 Methods of Calculating Average Rainfall
  - 1.3.1 Arithmetic Mean
  - 1.3.2 Isohyetal
- 1.4 Runoff
  - 1.4.1 Factors affecting Run off
  - 1.4.2 Computation of Run off

**2. Crop Water Requirement and Reservoir Planning**

- 2.1 Irrigation and its Classification
- 2.2 Crop Water Requirement
  - 2.2.1 Cropping Seasons
  - 2.2.2 Crop Period
  - 2.2.3 Base Period
  - 2.2.4 Duty
  - 2.2.5 Delta
  - 2.2.6 CCA
  - 2.2.7 GCA
  - 2.2.8 Intensity of Irrigation
  - 2.2.9 Factors Affecting Duty
  - 2.2.10 Problems on Water Requirement and Capacity of Canal
- 2.3 Methods of Application of Irrigation Water and its Assessment
- 2.4 Surveys for Irrigation Project, Data Collection for Irrigation Project
- 2.5 Silting of Reservoir
  - 2.5.1 Rate of Silting
  - 2.5.2 Factors affecting Silting and Control Measures

**3. Dams and Spillways**

- 3.1 Dams and its Classification
  - 3.1.1 Earthen Dams
  - 3.1.2 Gravity Dams (masonry and concrete)

- 3.2 Earthen Dams
- 3.3 Spillways
  - 3.3.1 Definition
  - 3.3.2 Energy Dissipaters

**4. Minor and Micro Irrigation**

- 4.1 Percolation Tanks – Need, Selection of site
- 4.2 Lift Irrigation Scheme
  - 4.2.1 Components and their Functions
  - 4.2.2 Lay Out
- 4.3 Drip and Sprinkler Irrigation
  - 4.3.1 Need
  - 4.3.2 Components and Layout
- 4.4 Well Irrigation
  - 4.4.1 Types and Yield of Wells
  - 4.4.2 Advantages and Disadvantages of Well Irrigation

**5. Diversion Head Works & Canals**

- 5.1 Weirs
  - 5.1.1 Components
  - 5.1.2 Parts
  - 5.1.3 Types
  - 5.1.4 K.T. Weir: Components and Construction
- 5.2 Diversion Head Works
  - 5.2.1 Layout
  - 5.2.2 Components and their functions
- 5.3 Barrages
  - 5.3.1 Components and their functions
  - 5.3.2 Difference between Weir and Barrage
- 5.4 Canals
  - 5.4.1 Classification according to Alignment and Position in the Canal Network
  - 5.4.2 Cross section of Canal in Embankment and Cutting
  - 5.4.3 Partial Embankment and Cutting
  - 5.4.4 Balancing Depth
- 5.5 Canal lining
  - 5.5.1 Purpose
  - 5.5.2 Material used and its properties
  - 5.5.3 Advantages
- 5.6 Cross Drainage Works
  - 5.6.1 Aqueduct
  - 5.6.2 Siphon Aqueduct
  - 5.6.3 Super Passage
  - 5.6.4 Level Crossing
- 5.7 Canal Regulators
  - 5.7.1 Head Regulator
  - 5.7.2 Cross Regulator
  - 5.7.3 Escape
  - 5.7.4 Falls and Outlets

**SUGGESTED LEARNING RESOURCES**

1. Punmia, B.C., Pande, B, Lal, Irrigation and Water Power Engineering, Laxmi Publications
2. Subramanayan, Engineering Hydrology, McGraw Hill.
3. Mutreja K N, Applied Hydrology, McGraw Hill
4. Sharma, R.K. and Sharma, T.K., Irrigation Engineering, S.Chand
5. Basak, N.N., Irrigation Engineering, McGraw Hill Education
6. Asawa, G.L., Irrigation and water resource Engineering, New Age
7. Dahigaonkar, J.G., Irrigation Engineering, Asian Book Pvt. Ltd., New Delhi.
8. Garg, S K, Irrigation and Hydraulic Structures, Khanna Publishers, Delhi.
9. Priyani V.B., Irrigation Engineering, Charotar Book Stall, Anand.

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(SEMESTER SCHEME-2020-21)



**SOLID WASTE MANAGEMENT**

Course Code	CV 4006
Course Title	SOLID WASTE MANAGEMENT
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To get a broader understanding on various aspects of solid waste management (starting from its generation to processing with options for reuse and recycle, transport, and disposal) practiced in different municipalities.
- This course will also cover many other aspects including recovery of conversion products from solid waste to compost and biogas, incineration and energy recovery, and integrated waste management.

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Identify the different sources of solid waste
- Execute the relevant method of collection and transportation of solid wastes
- Execute the action plan for disposal of solid wastes
- Acquire knowledge on energy productions from waste in the perspectives of sustainable development

**COURSE CONTENT****1. INTRODUCTION**

- 1.1 Generation of solid waste
- 1.2 Classification of solid waste
- 1.3 Characteristics of solid waste
- 1.4 Analysis and processing of solid waste

**2. SOLID WASTE SYSTEM**

- 2.1 collection
- 2.2 storage,
- 2.3 transportation
- 2.4 disposal system

**3. WASTE PROCESSING TECHNIQUES**

- 3.1 Biological reprocessing
- 3.2 Sanitary landfill
- 3.3 Waste to energy
- 3.4 Incineration
- 3.5 Composting

**4. RECOVERY OF RESOURCES**

- 4.1 Conversion products
- 4.2 Energy generation

**5. IMPACT OF SOLID WASTE ON ENVIRONMENT**

- 5.1 Air
- 5.2 Water
- 5.3 Land

**SUGGESTED LEARNING RESOURCES**

1. Manual on Municipal solid waste management, CPHEEO, Ministry of Urban Development GOI.
2. WHO manual on solid waste management.

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(SEMESTER SCHEME-2020-21)

**CONSTRUCTION MANAGEMENT**

Course Code	CV 40071 (Same as CE/CC 40071)
Course Title	Construction Management
Number of Credits	3 (L:3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To understand the contract management and associated labour laws.
- To prepare and understand the principles involved in site layout.
- To know the procedure for scheduling of various activities in construction project.
- To understand the labour laws, procedure for arbitration, settlements.
- To know different safety measures in construction projects.

**COURSE OUTCOMES**

After completing this course, student will be able to:

1. Understand the contract management and associated labour laws.
2. Prepare and understand the nuances of executing the site layout.
3. Prepare networks and bar charts for the given construction project.
4. Understand the intricacies of disputes, related arbitration and settlement laws.

Apply safety measures at construction projects

**COURSE CONTENT****1. Construction Industry and Management**

- 1.1 Organization
  - 1.1.1 Objectives
  - 1.1.2 Principles of Organization
  - 1.1.3 Types of Organization
    - 1.1.3.1 Government/Public
    - 1.1.3.2 Private Construction Industry
  - 1.1.4 Role of Various Personnel in Construction Organization
- 1.2 Agencies associated with Construction Work
  - 1.2.1 Owner,
  - 1.2.2 Promoter
  - 1.2.3 Builder
  - 1.2.4 Designer
  - 1.2.5 Architects
- 1.3 Role of Consultant for Various Activities
  - 1.3.1 Preparation of Detailed Project Report (DPR)
  - 1.3.2 Monitoring of Progress and Quality
  - 1.3.3 Settlement of Disputes

**2. Site Layout**

- 2.1 Principles governing Site Layout
- 2.2 Factors affecting Site Layout
- 2.3 Preparation of Site Layout
- 2.4 Land acquisition procedures and providing compensation

**3. Planning and Scheduling**

- 3.1 Identifying broad activities in construction work & allotting time to it
  - 3.1.1 Methods of Scheduling
  - 3.1.2 Development of Bar Charts
  - 3.1.3 Merits&Limitations of Bar Charts
- 3.2 Elements of Network
  - 3.2.1 Event
  - 3.2.2 activity

- 3.2.3 dummy activities
- 3.2.4 Precautions in drawing Network
- 3.2.5 Numbering the events
- 3.3 CPM networks
  - 3.3.1 Activity Time Estimate
  - 3.3.2 Event Times by Forward & Backward Pass Calculation
  - 3.3.3 Start and Finish Time of Activity
  - 3.3.4 Project Duration
  - 3.3.5 Floats, Types of Floats
    - 3.3.5.1 Free
    - 3.3.5.2 Independent
    - 3.3.5.3 Total Floats
  - 3.3.6 Critical Activities and Critical Path
- 3.4 Purpose of Crashing a Network
  - 3.4.1 Normal Time and Cost
  - 3.4.2 Crash Time and Cost
  - 3.4.3 Cost Slope
  - 3.4.4 Optimization of Cost and Duration
- 3.5 Material Management
  - 3.5.1 Ordering Cost
  - 3.5.2 Inventory Carrying Cost
  - 3.5.3 Economic Order Quantity
- 3.6 Store Management
  - 3.6.1 Various Records related to Store Management
  - 3.6.2 Inventory Control by ABC Technique
  - 3.6.3 Introduction to Material Procurement through Portals (e.g. [www.inampro.nic.in](http://www.inampro.nic.in))
- 4 Construction Contracts and Specifications**
  - 4.1 Types of Construction Contracts
  - 4.2 Contract documents
    - 4.2.1 Specifications
    - 4.2.2 General Special Conditions
  - 4.3 Contract Management
  - 4.4 Procedures involved in Arbitration and Settlement (Introduction only)
- 5 Safety in Construction**
  - 3.1 Safety in Construction Industry
    - 3.1.1 Causes of Accidents
    - 3.1.2 Remedial and Preventive Measures
  - 3.2 Labour Laws and Acts pertaining to Civil construction activities (Introduction only)

**SUGGESTED LEARNING RESOURCES**

1. Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Publishing, New Delhi
2. Gahlot, P.S. and Dhir, B.M Construction planning and management New Age International (P) Ltd. Publishers, New Delhi.
3. Shrivastava, U.K., Construction planning and management, Galgotia Publication Pvt Ltd. New Delhi
4. Mantri, S., The A To Z of Practical Building Construction and its Management, Satya Prakashan New Delhi
5. Khanna, O.P. , Industrial Engineering and management, Dhanpat Rai New Delhi
6. Punmia, B.C. and Khandelwal, K.K., Project Planning and Controlling with PERT And CPM, Laxmi Publications (P)Ltd.
7. Sengupta, B., Guha H., Construction Management and Planning, Tata-McGraw Hill.
8. Harpal, Singh, Construction Management and accounts, Mc-Graw Hill.
9. Sharma, S.C., Industrial Engineering and Management, Khanna Publications, New Delhi

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**THEORY OF STRUCTURES**

Course Code	CV 40072
Course Title	Theory of Structures
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

**COURSE OBJECTIVES:**

Following are the objectives of this course:

- To learn concept of eccentric loading and stresses in vertical members like column, chimneys, dam
- To analyze beams using various methods like slope deflection, three moment, and moment distribution
- To understand different methods of finding axial forces in trusses.

**Course Outcomes**

After completing this course, student will be able to:

1. Analyze stresses induced in vertical member subjected to direct and bending loads.
2. Analyze slope and Deflection in fixed and continuous beams.
3. Analyze continuous beam under different loading conditions using the principles of Three Moments.
4. Analyze continuous beam using Moment Distribution Method under different loading conditions.
5. Evaluate axial forces in the members of simple truss.

**COURSE CONTENT****1. Direct and Bending Stresses in vertical members**

- 1.1 Introduction to axial and eccentric loads
- 1.2 Eccentricity about one principal axis only
  - 1.2.1 Nature of Stresses
  - 1.2.2 Maximum and minimum stresses
  - 1.2.3 Resultant stresses and distribution diagram
  - 1.2.4 Condition for no tension or zero stress at extreme fiber
  - 1.2.5 Limit of Eccentricity
  - 1.2.6 Core of section for rectangular and circular cross sections
  - 1.2.7 Middle Third Rule

**2. SLOPE AND DEFLECTION**

- 2.1 Concept of slope and deflection
- 2.2 Stiffness of beams
- 2.3 Relation among bending moment, slope, deflection and radius of curvature, (no derivation).
- 2.4 Double integration method to find slope and deflection of cantilever and simply supported beams subjected to
  - 2.4.1 Concentrated load and
  - 2.4.2 Uniformly distributed load on entire span.

**3. FIXED AND CONTINUOUS BEAM**

- 3.1 Concept of fixity, effect of fixity
- 3.2 Advantages and disadvantages of fixed beam over simply supported beam
- 3.3 Principle of Superposition
- 3.4 Fixed End Moments from first principle for beam subjected to
  - 3.4.1 Point load
  - 3.4.2 UDL over entire span
- 3.5 Application of standard formulae for a fixed beam in finding
  - 3.5.1 End moments
  - 3.5.2 End reactions
  - 3.5.3 Drawing S.F. and B.M. diagrams
- 3.6 Definition, effect of continuity, nature of moments induced due to continuity, concept of deflected shape, practical examples.

**4. ROLLING LOAD AND INFLUENCE LINE**

- 4.1 Introduction to Influence line diagram for simply supported beams
  - 4.1.1 Reaction
  - 4.1.2 Shear force
  - 4.1.3 Bending moment
- 4.2 Drawing of maximum B.M.D. and S.F.D. for simply supported beam for rolling loads of
  - 4.2.1 Single concentrated load
  - 4.2.2 Two point loads
  - 4.2.3 Series of point loads

**5. SIMPLE TRUSSES**

- 5.1 Types of Trusses
  - 5.1.1 Simple
  - 5.1.2 Fink
  - 5.1.3 Compound fink
  - 5.1.4 French Truss
  - 5.1.5 Pratt Truss
  - 5.1.6 Howe Truss
  - 5.1.7 North Light Truss
  - 5.1.8 King Post and Queen Post Truss
- 5.2 Calculate support reactions for trusses subjected to point loads at joints
- 5.3 Calculate forces in members of truss using
  - 5.3.1 Method of Joints

**SUGGESTED LEARNING RESOURCES**

1. Ramamrutham.S, Theory of structures, Dhanpatrai& Sons.
2. Khurmi, R. S. , Theory of Structures, S. Chand and Co., New Delhi.
3. Bhavikatti, S S , Structural Analysis Vol-1, Vikas Publishing House PvtLtd.New Delhi.
4. Junnarkar, S. B., Mechanics of structures, Volume-I and II Charotar Publishing House, Anand.
5. Pandit, G.S. and Gupta, S.P., Theory of Structures, Tata McGraw Hill, New Delhi.
6. Agor R, Structural Analysis, Khanna Publishing House, Delhi.

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**HYDRAULICS LAB**

Course Code	CV 4008(Same as CE/CC 4008)
Course Title	Hydraulics Lab.
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To understand parameters associated with fluid flow and hydrostatic pressure.
- To know head loss and water hammer in fluid flowing through pipes.
- To learn different types of pumps and their uses.

**Course Outcomes**

After completing this course, student will be able to:

1. Measure pressure and determine total hydrostatic pressure for different conditions.
2. Understand various parameters associated with fluid flow.
3. Determine head loss of fluid flow through pipes.
4. Find the fluid flow parameters in open channels.
5. Select relevant hydraulic pumps for different applications.

**LIST OF PRACTICALS TO BE PERFORMED**

1.	Use Piezometer to measure Pressure at a given point.
2.	Use U tube Differential Manometer to measure Pressure Difference between two given points.
3.	Use Reynold's Apparatus to determine type of flow.
4.	Use Bernoulli's Apparatus to apply Bernoulli's Theorem to get Total Energy Line for a flow in a closed conduit of varying cross sections.
5.	Use Friction Factor Apparatus to determine Friction Factor for a given pipe.
6.	Determine Minor Losses in pipe fittings due to Sudden Contraction and Sudden Enlargement.
7.	Determine Minor Losses in pipe fitting due to Bend and Elbow.
8.	Calibrate Venturimeter to find out the discharge in a pipe.
9.	Calibrate the Orifice to find out the discharge through a tank.
10.	Use Current meter to measure the velocity of flow of water in Open Channel.
11.	Use Pitot Tube to measure the velocity of flow of water in Open Channel.
12.	Use Triangular Notch to measure the discharge through Open Channel.
13.	Use Rectangular Notch to measure the discharge through Open Channel.

**SUGGESTED LEARNING RESOURCES**

1. Modi, P.N. and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.
2. S.S. Rattan, Fluid Mechanics and Hydraulic Machines, Khanna Publishing House, Delhi
3. Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, Dhanpat Rai Publishing Company, New Delhi.
4. Khurmi, R S, Hydraulics, Fluid Mechanics, Hydraulic machines, S Chand Publishers, New Delhi.
5. Rajput, R K, Fluid Mechanics, S Chand, New Delhi.
6. Ojha, C S P, Berndtsson, R, and Chandramouli P. N., Fluid Mechanics and Machinery, Oxford University Press, New Delhi.

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**ENVIRONMENT POLLUTION & CONTROL LAB**

Course Code	CV 4009
Course Title	Environment Pollution& Control Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To Gain knowledge of air pollution measurement.
- To Gain knowledge of Noise pollution measurement
- To Gain knowledge municipal solid waste management
- To Gain knowledge Water Treatment Plant
- To Gain knowledge Waste Water Treatment Plant

**Course Outcomes**

After completing this course, student will be able to:

- Measurement of TSP by High Volume Sampler
- Measurement of PM10 and PM2.5
- Measurement of Noise levels at different surroundings
- Know municipal solid waste management
- Know the presence of phosphate, sulphate and chloride in the soil

**LIST OF PRACTICALS TO BE PERFORMED**

1.	Measurement of TSP by High Volume Sampler.
2.	Measurement of PM10 and PM2.5
3.	Measurement of Noise levels at different surroundings
4.	Study visits to municipal solid waste management stations and prepare a report on it.
5.	Visit Water Treatment Plant and prepare a report on it.
6.	Visit Waste Water Treatment Plant and prepare a report on it.
7.	Experiment to test the presence of phosphate, sulphate and chloride in the soil

**SUGGESTED LEARNING RESOURCES**

- Environmental Engineering, by Ruth F. Weiner and Robin Matthews – 4th Edition Elsevier, 2003.
- Environmental Science and Engineering by J.G. Henry and G.W. Heinke – Pearson Education.
- Environmental Engineering by Mackenzie L Davis & David A Cornwell. McGraw Hill Publishing
- Environmental Pollution and Control by J. Jeffrey Peirce, P Aarne Vesilind, Ruth Weiner Butterworth Heinemann.
- Hazardous Materials and Waste Management by Nicholas P. Cheremisinoff, Paul N. Cheremisinoff Elsevier Science
- Environmental Pollution Control Engineering by C. S. Rao New Age International.
- Soil Pollution From Monitoring to Remediation by Anabela Cachada, Armando C. Duarte, Teresa A.P. Rocha-Santos Elsevier Science
- Air Pollution Control by Sudarshan Prasad Mahajan Teri
- Air Quality Management by Suresh T. Nesaratnam, Shahram Taherzadeh John Wiley & Sons
- Noise Control by Shahram Taherzadeh Wiley
- Environment Pollution: Hazards And Control by R.D. Gupta Concept Publishing Company
- Elements of Environmental Pollution Control by OP Gupta KHANNA PUBLISHING HOUSE
- Environmental Pollution Monitoring and Control by S. M. Khopkar New Age International (P) Limited

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**BUILDING PLANNING AND DRAWING LAB**

Course Code	CV 4010 (Same as CE/CC 4010)
Course Title	Building Planning and Drawing Lab
Number of Credits	2 (L: 0, T: 0, P: 4)
Prerequisites	NIL
Course Category	PC

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To learn the basic principles of building planning and drawing.
- To make graphical representation of various components of buildings.
- To draw complete plan and elevation of a building.
- To learn basics of perspective drawings and Computer Aided Drawings.

**LIST OF PRACTICALS / DRAWINGS TO BE COMPLETED**

<b>A. Sketch Book</b>	
1.	Draw various types of lines, graphical symbols for materials, doors and windows, symbols for sanitary, water supply and electrical installations and write abbreviations as per IS 962
2.	Write summary of observations of all technical details from the given drawing (One/Two BHK) obtained from the professional architect or civil engineer (Group activity in four students).
3.	a) Measure the units of existing building (Load Bearing / Frame structure). b) Draw Line Plan of measured existing building at serial no 3a to the suitable scale.
4.	Draw Line Plan to suitable scale (Minimum 1BHK, Staircase, WC and Bathroom) a) Residential Bungalows( Minimum three plans) b) Apartment (Minimum two plans).
5.	Draw line plans to suitable scale for any Five Public Buildings from the following (School Building, Primary Health Centre, Bank, Post Office, Hostel, Restaurant, Community Hall and Library)
6.	Draw the following plans for a Framed Structure (One/Two BHK) from given line plan. a) Developed plan, Elevation b) Section for above developed plan. c) Site plan for above drawings including area statement, schedule of opening and construction notes
<b>B. Full Imperial Size Sheet (A1)</b>	
1.	Draw submission drawing to the scale 1:100 of a single storey load bearing residential building (2BHK) with flat Roof and staircase showing a) Developed plan and elevation b) Section passing through Stair or W.C. and Bath c) Foundation plan and schedule of openings d) Site plan (1:200), area statement, construction notes
2.	Draw submission drawing, to the scale of 1:100, of (G+1) Framed Structure Residential Building (2BHK) with Flat Roof and staircase showing: a) Developed plan b) Elevation c) Section passing through Staircase, WC and Bath d) Site plan (1:200) and area statement e) Schedule of openings and Construction Notes.
3.	Draw the above mentioned drawing at serial number (B-2) using CAD software and enclose the print out. a) Developed plan b) Elevation. c) Section passing through Staircase, WC and Bath d) Foundation plan e) Site plan (1:200), area statement, Schedule of openings and construction notes.
4.	Draw working drawing for above mentioned drawing at serial number (B-2) showing

	a) Foundation plan to the scale 1:50 b) Detailed enlarged section of RCC column and footing with plinth filling c) Detailed enlarged section of RCC Beam, Lintel and Chajjas d) Detailed enlarged section of RCC staircase and slab
5.	Draw two point perspective drawing of small simple objects ,scale 1:50 a) Draw plan, elevation, eye level, picture plane and vanishing points. b) Draw perspective view

**SUGGESTED LEARNING RESOURCES**

1. Shah. M.G. Kale, CM, Patki, S.Y., Building Drawing, Mcgraw Hill Publishing
2. Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd
3. M. G. Shah and C. M. Kale, Principles of Perspective Drawing, Mcgraw Hill
4. Swamy, Kumara; Rao, N, Kameshwara, A ., Building Planning and Drawing, Charotar Publication, Anand.
5. Bhavikatti, S. S., Building Construction, Vikas Publication House Pvt. Ltd., Delhi.
6. Mantri, Sandip, A to Z Building Construction, Satya Prakashan, New Delhi.
7. Singh, Ajit, Working with Auto CAD 2000, Mcgraw Hill Publishing company Ltd.
8. Sane, Y.S., Planning and design of Building, Allied Publishers, New Delhi.

**COURSE OUTCOMES**

After completing this course, student will be able to:

1. Interpret the symbols, signs and conventions from the given drawing.
2. Prepare line plans of residential and public buildings using principles of planning.
3. Prepare working drawing for the given requirement of Load Bearing Structure.
4. Prepare working drawing using CAD for the given requirement of Framed Structure.
5. Draw two-point perspective drawing for given small objects.

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**SURVEYING LAB**

Course Code	CV 4011
Course Title	Surveying Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To understand types of surveying works required
- To know the type of method and equipments to be used for different surveys
- To know the use and operational details of various surveying equipments

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Select the type of survey required for given situation.
- Prepare plans using Plane Table Surveys.

**LIST OF PRACTICALS TO BE PERFORMED**

- Study of
  - Different types of chains and tapes
  - Cross staff
  - Optical square
  - Line ranger
- Use of Chains :
  - Folding and unfolding
  - Ranging and chaining on plane and sloping surface
  - Setting right angles.
  - Setting parallel lines.
  - Taking offsets.
- Chain surveying of small areas
- Study of prismatic compass
- Study of surveyor compass
- Measurements of bearing of lines
- Transverse by compass and adjustment of error
- Study of the component parts and handling of
  - Dumpy level
  - Tilting level
  - Staves
- Temporary adjustments of a dumpy level and a tilting level
- Use of dumpy level and tilting level in differential levelling and levelling for cross section and longitudinal section. Recording in level book and plotting.
- Study of Automatic level.
- Study and use of plane table and its accessories e.g. stand, table, clamping arrangement, sight vane, through compass, plumbing fork, plumb bob, spirit level etc.
- Methods of plane tabling
  - Radiation
  - Intersection
  - Traversing
  - Resection
- Two and three point problems
- Preparation of a plan on area by plane table survey.
- Plotting spot levels of a given area by the grid method and interpolation of contours.
- Preparations of a contoured plan of an uneven area with the help a level and a plane table.

**SUGGESTED LEARNING RESOURCES**

1. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune VidyarthiGruhPrakashan, Pune.
2. Basak, N. N., Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd., Noida.
3. Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
4. Saikia, M D.; Das. B.M.; Das. M.M., Surveying PHI Learning Pvt. Ltd., New Delhi.
5. Subramanian, R., Surveying and Levelling, Oxford University Press. New Delhi.
6. Punmia, B.C.; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying Vol. I and Surveying Vol. II, Laxmi Publications Pvt. Ltd., New Delhi.
7. Rao, P.Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning Pvt. Ltd., New Delhi.
8. Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
9. Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Education, Noida.
10. De, Alak, Plane Surveying, S.Chand Publications, New Delhi.

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(SEMESTER SCHEME-2020-21)

**WASTE WATER TREATMENT LAB**

Course Code	CV 4012
Course Title	Waste Water Treatment Lab
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

**COURSE OBJECTIVES**

Following are the objectives of this course:

To analyze the characteristics of Waste water.

- To Know about various waste water treatment process.
- To give an experience in the implementation of engineering concepts which are applied in field of waste Water treatment process.
- To present the foundations of many basic Engineering tools and concepts related Environmental Engineering.

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Perform various tests to assess quality of Waste water.
- Estimate solids in sewage as per BIS codes.
- Draw line diagram of sewer pipeline system for a locality.

**LIST OF PRACTICALS TO BE PERFORMED:**

1	Determine the pH of the given sample of sewage.
2	Determine Total Solids of the given sewage sample.
3	Determine the Total Dissolved Solids of the given sewage sample.
4	Determine Total Settle-able Solids of the given sewage sample.
5	Determine Total Suspended Solids of the given sewage sample.
6	Determination of chlorides of sewage sample.
7	Determination of Sulphates of sewage sample.
8	Determine the Quantity of Dissolved Oxygen present in the given water sample by Winkler's Method.
9	Determine Biochemical Oxygen Demand exerted by the given wastewater sample.
10	Determine Chemical Oxygen Demand of the waste water sample.
11	To study various Sanitary Fittings

**SUGGESTED LEARNING RESOURCES**

1. Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
2. Garg, S.K., Environmental Engineering Vol. II, *Khanna Publishers*
3. Birdie, G. S. and Birdie, J. S. Water Supply and Sanitary Engineering, Dhanpat Rai
4. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi
5. Rao, C.S., Environmental Pollution Control Engineering, New Age International
6. Punmia, B C, Environmental Engineering, vol. II, Laxmi Publishers
7. Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw
8. Basak N N, Environmental Engineering, McGraw Hill Publishers.

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**ESSENCE OF INDIAN KNOWLEDGE AND TRADITION**

Course Code	CV 4222(Same in All Branches of Engg.)
Course Title	Essence of Indian Knowledge and Tradition
Number of Credits	0 (L-2, T-0, P-0)
Prerequisites	None
Course Category	AU

**COURSE CONTENTS:**

Basic Structure of Indian Knowledge System:

- (i) वेद,
- (ii) उन्नवेद (आयुर्वेद, धनुर्वेद, गन्धर्ववेद, स्थानतत्त्वआदयः)
- (iii) वेदशाखाः (शिक्षा, कलत्र, ननरुत, व्याकरण, ज्योतिषशास्त्रादयः),
- (iv) उन्नथाङ्ग (धर्मशास्त्र, रीतिशास्त्रादयः, नृशास्त्र, तत्त्वशास्त्रादयः)
  - Modern Science and Indian Knowledge System
  - Yoga and Holistic Health care
  - Case Studies.

**REFERENCES /SUGGESTED LEARNING RESOURCES:**

1. V. Sivarama Krishna, " Cultural Heritage of India- Course Material", Bhartiya Vidya Bhavan, Mumbai, fifth Edition, 2014.
2. Swami Jitatanand, " Modern Physics and Vedant", Bhartiya Vidya Bhavan.
3. Fritz of Capra, " The wave of Life".
4. Fritz of Capra, " Tao of Physics".
5. V N Jha, " Tarkasangraha of Annam Bhatta, International" Cinmay Foundation, Velliarnad, Amakum.
6. R N Jha, " Science of Consciousness Psychotherapy and Yoga Practices" VidyandhiPrakasham, Delhi, 2016.

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**GOVERNMENT OF RAJASTHAN**  
**BOARD OF TECHNICAL EDUCATION RAJASTHAN JODHPUR**  
**SEMESTER SCHEME-2020-21**



**V SEMESTER**  
(SESSION 2021-2022 & ONWARDS)

**HIGHWAY ENGINEERING**

Course Code	CV 5001
Course Title	Highway Engineering
Number of Credits	4 (L: 3, T: 1, P: 0)
Prerequisites	NIL
Course Category	PC

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To identify the types of roads as per IRC recommendations.
- To understand the geometrical design features of different highways.
- To perform different tests on road materials.
- To understand importance of traffic engineering

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Identify the types of roads as per IRC recommendations.
- Implement the geometrical design features of different highways.
- Perform different tests on road materials.
- Study of different road characteristic and various theories.

**COURSE CONTENT****1. Overview of Highway Engineering and Alignment**

- 1.1. Role of Transportation in the Development of Nation, Scope and Importance of Roads in India and its Characteristics
- 1.2. Different Modes of Transportation
  - 1.2.1. Landway
  - 1.2.2. Waterway
  - 1.2.3. Airway
  - 1.2.4. Railways
  - 1.2.5. Merits and Demerits of Roadway and Railway
- 1.3. General Classification of Roads and Roads Patterns
- 1.4. Highway Alignment
  - 1.4.1. Definition
  - 1.4.2. Selection and Factor Affecting Road Alignment
  - 1.4.3. Engineering Surveys for Alignment
- 1.5. Road Authorities i.e. MoRTH, IRC, CRRI, NHAI, NHDP

**2. Geometric Design of Highway**

- 2.1. Camber
  - 2.1.1. Definition
  - 2.1.2. Purpose
  - 2.1.3. Types as per IRC recommendations
- 2.2. Kerbs
  - 2.2.1. Road Margin
  - 2.2.2. Road Formation
  - 2.2.3. Right of Way
- 2.3. Design Speed and various factors affecting design speed as per IRC recommendations.



- 2.4. Sight Distance(SD)
  - 2.4.1. Definition
  - 2.4.2. Types as per IRC recommendations
  - 2.4.3. Super Elevation
  - 2.4.4. Definition
  - 2.4.5. Method of providing Super Elevation.
  - 2.4.6. Extra widening of Roads
  - 2.4.7. Curves
  - 2.4.8. Necessity
  - 2.4.9. Types: Horizontal, Vertical Curves, Transition Curves
  - 2.4.10. Gradient
  - 2.4.11. Definition
  - 2.4.12. Types as per IRC recommendations

### 3. Highway Material

- 3.1. Desirable Properties
- 3.2. Types of Road Material and Their Test
  - 3.2.1. Test on Aggregate
    - 3.2.1.1. Crushing Test
    - 3.2.1.2. Impact Test
    - 3.2.1.3. Abrasion Test
    - 3.2.1.4. Flakiness and Elongation Index Test
    - 3.2.1.5. Angularity Number Test
  - 3.2.2. Test on Bitumen
    - 3.2.2.1. Penetration
    - 3.2.2.2. Ductility
    - 3.2.2.3. Flash and Fire Point Test
    - 3.2.2.4. Softening Point Test
- 3.3. Difference between Tar and Bitumen
- 3.4. Emulsion and Cutback
  - 3.4.1. Definition
  - 3.4.2. Types
  - 3.4.3. Uses
  - 3.4.4. Differences between Emulsion and Cutback

### 4. Highway Construction

- 4.1. Pavement
  - 4.1.1. Definition
  - 4.1.2. Types
  - 4.1.3. Different Layer of Pavement and Their Function
- 4.2. Differences between Rigid and Flexible Pavement
- 4.3. Method of Design of Flexible Pavement
  - 4.3.1. Group Index Method
  - 4.3.2. Modified CBR Method
- 4.4. Cement Concrete Road
  - 4.4.1. Method of Construction
  - 4.4.2. Types of Joints
- 4.5. Definition of-
  - 4.5.1. Prime Coat
  - 4.5.2. Task Coat
  - 4.5.3. Seat Coat

### 5. Traffic Engineering

- 5.1. Definition, Objects, Scope

- 5.2. Road User Characteristics
- 5.3. Vehicular Characteristics
- 5.4. PIEV Theory
- 5.5. Traffic Studies
  - 5.5.1. Accident Study
    - 5.5.1.1. Cause of Accident
    - 5.5.1.2. Reporting and Recording of an Accident
    - 5.5.1.3. Collision and Condition Diagram
  - 5.5.2. Parking Study
    - 5.5.2.1. Types of Parking
- 5.6. Traffic Control Device

**SUGGESTED LEARNING RESOURCES**

1. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., Delhi (ISBN: 978-93-82609-858) Edition 2018
2. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Brothers, Roorkee.
3. Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
4. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg, Standard Book House, New Delhi.
5. Sharma, S.K., Principles, Practice and Design of Highway Engineering, S. Chand Publication, New Delhi.
6. Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age International (P) Limited, Publishers, New Delhi.

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**ESTIMATING COSTING AND VALUATION**

Course Code	CV5002 (Same as CC/CE 5002)
Course Title	Estimating Costing and valuation
Number of Credits	2 (L: 2, T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To learn the procedure for estimating and costing of Civil Engineering works.
- To perform rate analysis for different items associated with construction projects.
- To use software for detailed estimate related to civil infrastructural projects.

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Select modes of measurements for different items of works.
- Prepare approximate estimate of a civil engineering works.
- Prepare detailed estimate of a civil engineering works.
- Use relevant software for estimating the quantities and cost of items of works.
- Justify rate for given items of work using rate analysis techniques.

**COURSE CONTENT****1. Fundamentals of Estimating and Costing**

1. Estimating and Costing –
  - 1.1.1 Meaning,
  - 1.1.2 Purpose
  - 1.1.3 Administrative approval
  - 1.1.4 Technical Sanction
  - 1.1.5 Budget provision
- 1.2 Types of estimates with definition & purpose
  - 1.2.1. Approximate estimate
  - 1.2.1 Detailed estimate
- 1.3 Types and Uses of Estimates:
  - 1.3.1 Revised estimate
  - 1.3.2 Supplementary estimate
  - 1.3.3 Repair and maintenance estimate
  - 1.3.4 Renovation estimate.
- 1.4 Roles and responsibility of Estimator.
- 1.5 Checklist of items in load bearing and framed structure.
- 1.6 Standard formats of Measurement sheet, Abstract sheet, Face sheet.
- 1.7 Modes of measurement and desired accuracy in measurements for different items of work as per IS:1200.
- 1.8 Rules for deduction in different category of work as per IS:1200.
- 1.9 Description / specification of items of building work as per PWD /DSR.

**2. Approximate Estimates**

- 2.1 Methods of approximate estimate - Service unit method, Plinth area rate method, Cubical content method, Typical bay method, Approximate quantity method (with simple numericals)

**3. Detailed Estimate**

- 3.1 Detailed Estimate-
  - 3.1.1 Data required for detailed estimate –
    - 3.1.1.1 Civil cost

- 3.1.1.2 GST
- 3.1.1.3 Contingencies
- 3.1.1.4 Supervision charges
- 3.1.1.5 Agency charges
- 3.1.1.6 Procedure for preparation of detailed estimate- Taking out quantities and Abstracting.
- 3.2 Methods of Detailed Estimate-
  - 3.2.1 Unit quantity method
  - 3.2.2 Total quantity method
  - 3.2.3 Long wall and Short wall method, Centre line method.
- 3.3 Bar bending schedule for footing, column, beam, Lintel, chajja and slab elements
- 3.4 Provisions in detailed estimate: contingencies, work charged establishment, percentage charges, water supply and sanitary Charges and electrification charges etc.
- 3.5 Prime cost, Provisional sum, Provisional quantities, Bill of quantities, Spot items or Site items.
- 4. Estimate for Civil Engineering Works**
  - 4.1 Earthwork –
    - 4.1.1 Quantities for roads, Embankment and canal by
      - 4.1.1.1 Mid sectional area method, mean sectional area method
      - 4.1.1.2 Prismoidal and trapezoidal formula method.
  - 4.2 Detailed estimate for septic tank, Community well
  - 4.3 Introduction to use of computer /softwares / programmes for detailed estimate Preparation of Civil Engineering Works.
- 5. Rate Analysis**
  - 5.1 Rate Analysis:
    - 1.1.1 Definition
    - 1.1.2 Purpose
    - 1.1.3 Importance
  - 5.2 Lead (Standard and Extra), lift, overhead charges, water charges and contractors' profit.
  - 5.3 Procedure for rate analysis.
  - 5.4 Task work- Definition, types. Task work of different skilled labour for different items.
  - 5.5 Categories of labours, their daily wages, types and number of labours for different items of work.
  - 5.6 Transportation charges of materials –
    - 5.6.1 Lead and Lift
    - 5.6.2 Hire charges of machineries and equipments
  - 5.7 Preparing rate analysis of different items of work pertaining to buildings and roads.

**SUGGESTED LEARNING RESOURCES**

1. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors Pvt. Ltd. New Delhi.
2. Peurifoy, Robert L. Oberlender, Garold, Estimating construction cost (fifth edition), McGraw Hill Education, New Delhi.
3. Rangwala, S.C., Estimating and Costing, Charotar Publishing House PVT. LTD., Anand.
4. Birdie, G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd. New Delhi.
5. Patil, B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.
6. Chakraborti, M., Estimating and costing, specification and valuation in civil engineering, Monojit Chakraborti, Kolkata.
7. PWD Schedule of Rates.
8. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates.
9. Manual of Specifications and Standards for DBFOT projects, EPC works.

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**ECONOMIC POLICIES IN INDIA**

Course Code	CV 51001 (Same in All Branches of Engineering)
Course Title	Economic Policies in India
Number of Credits	3 (L:3, T:0, P:0)
Prerequisites	NIL
Course Category	OE

**COURSE LEARNING OBJECTIVES:**

The objective of this course is to familiarize the students of different streams with the basic concepts, structure, problems and issues concerning Indian economy.

**COURSE OUTCOMES:**

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

CO1	Understand Indian economics policy, planning strategies
CO2	It will enable to students to comprehend theoretical and empirical development across countries and region for policy purposes
CO3	Development Economics as a discipline encompasses different approaches to the problems of unemployment, poverty, income generation, industrialization from different perspectives
CO4	Able to identify the problems and capable to decide the application for future development
CO5	Analyze economic issues and find solutions to complex economic problems and take correct economic judgment

**COURSE CONTENTS:****1. BASIC FEATURES AND PROBLEMS OF INDIAN ECONOMY:**

- 1.1. Economic History of India;
- 1.2. Nature of Indian Economy
- 1.3. Demographic features and Human Development Index,
- 1.4. Problems of Poverty, Unemployment, Inflation, income inequality, Black money in India.

**2. SECTORAL COMPOSITION OF INDIAN ECONOMY:**

- 2.1. Issues in Agriculture sector in India,
- 2.2. land reforms
- 2.3. Green Revolution
- 2.4. agriculture policies of India,

**3. INDUSTRIAL DEVELOPMENT,**

- 3.1. Small scale and cottage industries,
- 3.2. Industrial Policy,
- 3.3. Public sector in India
- 3.4. Service sector in India.

**4. ECONOMIC POLICIES:**

- 4.1. Economic Planning in India,
- 4.2. Planning commission v/s NITI Aayog,
- 4.3. Five Year Plans,
- 4.4. Monetary policy in India,
- 4.5. Fiscal Policy in India,
- 4.6. Centre state Finance Relations,
- 4.7. Finance commission in India
- 4.8. LPG policy in India

**5. EXTERNAL SECTOR IN INDIA**

- 5.1. India's foreign trade value composition and direction,
- 5.2. India Balance of payment since 1991,
- 5.3. FDI in India,
- 5.4. Impact of Globalization on Indian Economy,
- 5.5. WTO and India.

**REFERENCE BOOKS:**

1. Dutt Rudder and K.P.M Sunderam (2017). Indian Economy .S Chand &Co.Ltd. New Delhi.
2. Mishra S. K & V. K Puri (2017). Indian Economy and Its Development Experience. Himalaya Publishing House.
3. Singh, Ramesh, (2016): Indian Economy, Tata-McGraw Hill Publications, New Delhi.
4. Dhingra, I.C., (2017): March of the Indian Economy, Heed Publications Pvt. Ltd.
5. Karam Singh Gill, (1978): Evolution of the Indian Economy, NCERT, NewDelhi
6. Kaushik Basu (2007): The Oxford Companion to Economics of India ,Oxford University Press.

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**ENGINEERING ECONOMICS & ACCOUNTANCY**

Course Code	CV 51002 (Same in All Branches of Engineering)
Course Title	Engineering Economics & Accountancy
Number of Credits	3 (L:3,T:0,P:0)
Prerequisites	NIL
Course Category	OE

**COURSE OBJECTIVES**

- To acquire knowledge of basic economics to facilitate the process of economic decision making.
- To acquire knowledge on basic financial management aspects.
- To develop the basic skills to analyze financial statements.

**COURSE OUTCOMES:**

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

CO1	Understand the macro-economic environment of the business and its impact on enterprise
CO2	Understand cost elements of the product and its effect on decision making
CO3	Prepare accounting records and summarize and interpret the accounting data for managerial decisions
CO4	Understand accounting systems and analyze financial statements using ratio analysis
CO5	Understand the concepts of financial management and investment

**COURSE CONTENTS****1. INTRODUCTION:**

- 1.1. Managerial Economics;
- 1.2. Relationship with other disciplines;
- 1.3. Firms: Types, objectives and goals;
- 1.4. Managerial decisions;
- 1.5. Decision analysis.

**2. DEMAND & SUPPLY ANALYSIS:**

- 2.1. Demand;
  - 2.1.1. Types of demand;
  - 2.1.2. Determinants of demand;
  - 2.1.3. Demand function;
  - 2.1.4. Demand elasticity;
  - 2.1.5. Demand forecasting;
- 2.2. Supply;
  - 2.2.1. Determinants of supply;
  - 2.2.2. Supply function;
  - 2.2.3. Supply elasticity.

**3. PRODUCTION AND COST ANALYSIS:**

- 3.1. Production function;
- 3.2. Returns to scale;
- 3.3. Production optimization;
- 3.4. Least cost input; Iso quants;
- 3.5. Managerial uses of production function;
- 3.6. Cost Concepts;
  - 3.6.1. Cost function;

- 3.6.2. Types of Cost;
- 3.6.3. Determinants of cost;
- 3.6.4. Short run and Long run cost curves;
- 3.6.5. Cost Output Decision;
- 3.6.6. Estimation of Cost.

**4. PRICING:**

- 4.1. Determinants of Price;
- 4.2. Pricing under different objectives and different market structures;
- 4.3. Price discrimination;
- 4.4. Pricing methods in practice;
- 4.5. Role of Government in pricing control.

**5. FINANCIAL ACCOUNTING (ELEMENTARY TREATMENT):**

- 5.1. Balance sheet and related concepts;
- 5.2. Profit & Loss Statement and related concepts;
- 5.3. Financial Ratio Analysis;
- 5.4. Cash flow analysis;
- 5.5. Funds flow analysis;
- 5.6. Comparative financial statements;
- 5.7. Analysis & Interpretation of financial statements;
- 5.8. Investments;
- 5.9. Risks and return evaluation of investment decision;
- 5.10. Average rate of return;
- 5.11. Payback Period;
- 5.12. Net Present Value;
- 5.13. Internal rate of return,

**REFERENCE BOOKS:**

- 1. McGuigan, Moyer and Harris, 'Managerial Economics; Applications, Strategy and Tactics', Thomson South Western, 10<sup>th</sup> Edition, 2005.
- 2. Prasanna Chandra. 'Fundamentals of Financial Management', Tata Mcgraw Hill Publishing Ltd., 4<sup>th</sup> edition, 2005.
- 3. Samuelson. Paul A and Nordhaus W. D., 'Economics', Tata Mcgraw Hill Publishing Company Limited, New Delhi, 2004.
- 4. Paresh Shah, 'Basic Financial Accounting for Management', Oxford University Press, New Delhi, 2007.
- 5. Salvatore Dominick, 'Managerial Economics in a global economy'. Thomson SouthWestern, 4<sup>th</sup> Edition, 2001.

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**DESIGN OF STEEL AND RCC STRUCTURES**

Course Code	CV 50031
Course Title	Design of Steel and RCC Structures
Number of Credits	3 (L:3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To learn the concept of limit state design for tension and compression steel members.
- To learn the concept of limit state design of steel beams.
- To understand design of RCC elements.
- To know the design of short and long RCC columns.

**COURSE OUTCOMES**

After completing this course, student will be able to perform:

- Design of steel tension and compression member.
- Design of steel I and Channel sections.
- Design of singly and doubly reinforced RCC beam.
- Design of RCC beam for shear and development length.
- Design of short and long RCC columns.

**COURSE CONTENT****1. Design of Steel Tension and Compression Members (Limit State Method)**

- 1.1 Types of sections used for Tension members.
- 1.2 Introduction to Strength of tension member by- yielding of section, rupture of net cross-section and block shear.
- 1.3 Design of axially loaded single angle and double angle tension members with bolted and welded connections.
- 1.4 Types of sections used as compression member, Calculation of effective length, Radius of gyration and slenderness ratio, Permissible values of slenderness ratio as per IS 800, Design compressive stress.
- 1.5 Introduction to built up sections, lacing and battening (Meaning and purpose), Diagrams of single and double lacing and battening system. (No numerical problems).
- 1.6 Design of axially loaded single and double angle struts connected by bolted and welded connections with gusset plate.

**2. Design of Steel beams (Limit State Method)**

- 2.1 Standard beam sections, Bending stress calculations
- 2.2 Design of laterally restrained simple I section beams
- 2.3 Check for shear and deflection as per IS 800.

**3. Design of Reinforced Concrete Beams by Limit State Method**

- 3.1 Concept of Limit state, Stress block diagram, Introduction to singly and doubly reinforced sections, IS 456
- 3.2 Design of singly reinforced beam, concept of under reinforced, over reinforced and balanced section, Simple numerical problem on ultimate moment of resistance and design of beam section
- 3.3 Design of doubly reinforced sections, stress and strain diagrams, depth of neutral axis, simple numerical problems on ultimate moment of resistance of reinforced beam, Calculation of  $A_{st}$  and  $A_{sc}$ .

**4. Shear, Bond and Development length in Design of RCC member**

- 4.1 Nominal shear stress in RCC section, Design shear strength of concrete, Design of shear reinforcement, Minimum Shear Reinforcement, Provisions of IS 456, forms of shear reinforcement
- 4.2 Types of bond, Bond stress, check for bond stress, Determination of Development length in tension and compression members and check as per code provisions, Anchorage value of 90° hook, Lapping of bars.
- 4.3 Simple numerical problem on: Shear reinforcement, Adequacy of section for shear.
- 4.4 Introduction to serviceability limit state check

**5. Design of axially loaded RCC Column**

- 5.1 Definition and classification of column, Limit state of compression members, Effective length of column.
- 5.2 Provisions of IS 456 for minimum steel, cover, maximum steel, spacing of ties etc.
- 5.3 Design of axially loaded short column - Square, Rectangular, and Circular only.

**SUGGESTED LEARNING RESOURCES**

1. Shah, V. L., and Gore, V., Limit State Design of Steel Structures, Structures Publications, Pune.
2. Dayarathnam P., Design of Steel Structures, S. Chand and Company, Delhi.
3. Subramanian N., Design of Steel Structures, Oxford University Press.
4. Sairam, K.S., Design of Steel Structures, Pearson Publication, Chennai, Delhi.
5. Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune, 2014.
6. Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co., New Delhi.
7. Krishna Raju, and N. Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International, Mumbai.
8. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill Publications, New Delhi.
9. Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Private Limited, Delhi.

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**Advance Surveying and Remote Sensing**

Course Code	CV 50032
Course Title	Advance Surveying and Remote Sensing
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

**COURSE OBJECTIVES:**

Following are the objectives of this course:

- To know methods of Plane Surveying and Theodolite Surveying and their uses
- To learn Tacheometric Surveying and Curve Setting
- To understand the principles of Electronic Distance Measurement Equipment and Total Station and their use.
- To know the concept of Remote Sensing, GPS and GIS

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Prepare plans using Plane Table Surveys.
- Prepare plans using Theodolite Surveys.
- Find distances and elevations using Tachometer.
- Prepare plans using Total Station instrument.
- Locate coordinates of stations using GPS.

**COURSE CONTENT****1. Theodolite Surveying**

- 1.1 Types and uses of Theodolite
- 1.2 Components of Transit Theodolite and their functions
- 1.3 Reading the Vernier of Transit Theodolite
- 1.4 Technical Terms
  - 1.4.1 Swinging
  - 1.4.2 Transiting
  - 1.4.3 Face left
  - 1.4.4 Face right
- 1.5 Fundamental Axes of Transit Theodolite and their Relationship
- 1.6 Temporary Adjustment of Transit Theodolite
- 1.7 Measurement of Horizontal Angle by
  - 1.7.1 Direct
  - 1.7.2 Repetition Method
  - 1.7.3 Errors Eliminated by Method of Repetition
- 1.8 Measurement of Magnetic Bearing of a line
  - 1.8.1 Prolonging and ranging a line,
  - 1.8.2 Deflection Angle.
  - 1.8.3 Measurement of Vertical Angle
- 1.9 Theodolite traversing by

- 1.9.1 Included Angle method
- 1.9.2 Deflection Angle Method
- 1.10 Checks for open and closed traverse
- 1.11 Calculations of Bearing from Angles
- 1.12 Traverse Computation
  - 1.12.1 Latitude, Departure
  - 1.12.2 Consecutive Coordinates, Independent Coordinates
- 1.13 Balancing the Traverse by
  - 1.13.1 Bowditch's Rule
  - 1.13.2 Transit Rule
  - 1.13.3 Gale's Traverse Table Computation

## **2. Tacheometric Surveying and Curve setting**

- 2.1 Principles of Tacheometry
  - 2.1.1 Tacheometer and its component parts
  - 2.1.2 Anallatic lens
- 2.2 Tacheometric formula for horizontal distance with telescope horizontal and staff vertical
- 2.3 Field method for determining constants of Tacheometer
- 2.4 Determining horizontal and vertical distances with Tacheometer by
  - 2.4.1 Fixed hair method and
  - 2.4.2 Staff held vertical
- 2.5 Limitations of Tacheometry
- 2.6 Types of curves used in roads and railway alignments
- 2.7 Designation of curves
- 2.8 Setting simple circular curve by
  - 2.8.1 Offsets from long chord
  - 2.8.2 Rankine's method of deflection angles

## **3. Advanced Surveying Equipments**

- 3.1. Principle of Electronic Distance Meter (EDM)
  - 3.1.1 Its component parts and their Functions
  - 3.1.2 Use of EDM
- 3.2 Use of
  - 3.2.1 Micro Optic Theodolite
  - 3.2.2 Electronic Digital Theodolite
- 3.3 Use of Total Station
  - 3.3.1 Use of function keys
  - 3.3.2 Measurements of Horizontal angles, Vertical Angles
  - 3.3.3 Distances and Coordinates using Total Station
  - 3.3.4 Traversing, Profile Survey and Contouring with Total Station

## **4 Remote Sensing, GPS and GIS**

- 4.1 Remote Sensing
- 4.2 Overview
  - 4.2.1 Remote Sensing System
  - 4.2.2 Applications of Remote Sensing in Civil engineering
  - 4.2.3 Land use / Land cover
  - 4.2.4 Mapping, Disaster Management
- 4.3 Use of Global Positioning System (G.P.S.) instruments
- 4.4 Geographic Information System (GIS)
  - 4.4.1 Overview

- 4.4.2 Components
- 4.4.3 Applications
- 4.4.4 Name of common Softwares for GIS
- 4.5 Introduction to Drone Surveying

**SUGGESTED LEARNING RESOURCES**

1. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune VidyarthiGruhPrakashan, Pune.
2. Basak, N. N., Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd., Noida.
3. Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
4. Saikia, M D.; Das. B.M.; Das. M.M., Surveying PHI Learning Pvt. Ltd., New Delhi.
5. Subramanian, R., Surveying and Levelling, Oxford University Press. New Delhi.
6. Punmia, B.C.; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying Vol. I and Surveying Vol. II, Laxmi Publications Pvt. Ltd., New Delhi.
7. Rao, P.VenugopalaAkella, Vijayalakshmi, Textbook of Surveying, PHI Learning Pvt. Ltd., New Delhi.
8. Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
9. Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Education, Noida.
10. De, Alak, Plane Surveying, S.Chand Publications, New Delhi.

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**GREEN BUILDING AND ENERGY CONSERVATION**

Course Code	CV 50041 Same as AR /CC/CE 50041
Course Title	Green Building and Energy Conservation
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To know various aspects of green buildings
- To use different steps involved in measuring environmental impact assessment.
- To relate the construction of green building with prevailing energy conservation policy and regulations.
- To know and identify different green building construction materials.
- To learn different rating systems and their criteria.

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Identify various requirements for green building.
- Use different steps in environmental impact assessment.
- Relate the construction of green building with prevailing energy conservation policy and regulations.
- Supervise the construction of green building construction using green materials.
- Focus on criteria related to particular rating system for assessment of particular Green building.

**COURSE CONTENT****1. Introduction to Green Building and Design Features**

- 1.1 Definition of Green Building, Benefits of Green building, Components/features of Green Building, Site selection, Energy Efficiency, Water efficiency, Material Efficiency, Indoor Air Quality.
- 1.2 Site selection strategies, Landscaping, building form, orientation, building envelope and fenestration, material and construction techniques, roofs, walls, fenestration and shaded finishes, advanced passive heating and cooling techniques, waste reduction during construction

**2. Energy Audit and Environmental Impact Assessment (EIA)**

- 2.1 Energy Audit:
  - 2.1.1 Meaning
  - 2.1.2 Necessity
  - 2.1.3 Procedures
  - 2.1.4 Types,
  - 2.1.5 Energy Management Programs
- 2.2 Environmental Impact Assessment(EIA):
  - 2.2.1 Introduction
  - 2.2.2 EIA regulations
  - 2.2.3 Steps in environmental impact assessment process
  - 2.2.4 Benefits of EIA
  - 2.2.5 Limitations of EIA
  - 2.2.6 Environmental clearance for the civil engineering projects

**3. Energy and Energy conservation**

- 3.1 Renewable Energy Resources:
  - 3.1.1 Solar Energy
  - 3.1.2 Wind Energy
  - 3.1.3 Ocean Energy
  - 3.1.4 Hydro Energy
  - 3.1.5 Biomass Energy

### 3.2 Non-renewable Energy Resources:

- 3.2.1 Coal,
- 3.2.2 Petroleum,
- 3.2.3 Natural Gas,
- 3.2.4 Nuclear Energy,
- 3.2.5 Chemical Sources of Energy,
- 3.2.6 Fuel Cells,
- 3.2.7 Hydrogen,
- 3.2.8 Biofuels.

### 3.3 Energy conservation:

- 3.3.1 Introduction, Specific objectives, present scenario, Need of energy conservation, LEED India Rating System and Energy Efficiency.

## 4. Green Building

### 4.1 Principles

- 4.1.1 Principles and planning of Green building

### 4.2 Features

- 4.2.1 Salient features of Green Building,
- 4.2.2 Environmental design (ED) strategies for building construction.

### 4.3 Process:

- 4.4.1 Improvement in environmental quality in civil structure

### 4.4 Materials:

- 4.4.1 Green building materials and products

- 4.4.1.1 Bamboo
- 4.4.1.2 Rice husk ash concrete
- 4.4.1.3 plastic bricks
- 4.4.1.4 Bagasse particle board
- 4.4.1.5 Insulated concrete forms

- 4.4.2 reuse of waste material

- 4.4.2.1 Plastic
- 4.4.2.2 rubber
- 4.4.2.3 Newspaper wood
- 4.4.2.4 Nontoxic paint
- 4.4.2.5 Green roofing

## 5. Rating System

- 5.1 Introduction to(LEED) criteria,
- 5.2 Indian Green Building council (IGBC) Green rating,
- 5.3 Green Rating for Integrated Habitat Assessment. (GRIHA) criteria
- 5.4 Heating Ventilation Air Conditioning (HVAC) unit in green Building
- 5.5 Functions of Government organization working for Energy conservation and Audit(ECA)-
- 5.6 National Productivity council(NPC)
- 5.7 Ministry of New and Renewable Energy (MNRE)
- 5.8 Bureau of Energy Efficiency (BEE)

## SUGGESTED LEARNING RESOURCES

1. Kibert, C.J., Sustainable construction: Green Building design and Delivery, John Wiley Hoboken, New Jersey.
2. Chauhan, D S Sreevastava, S K., Non-conventional Energy Resources, New Age International Publishers, New Delhi.
3. O.P. Gupta, Energy Technology, Khanna Publishing House, New Delhi
4. Jagadeesh, K S, Reddy Venkatta Rama &Nanjunda Rao, K S., Alternative Building Materials and Technologies, New Age International Publishers, Delhi.
5. Sam Kubba., Handbook of Green Building Design and Construction, Butterworth-Heinemann.
6. Means R S, Green Building - Project Planning and Cost Estimating, John Wiley & Sons
7. Sharma K V, Venkateshaiah P., Energy Management and Conservation, IK International.

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**RURAL CONSTRUCTION TECHNOLOGY**

Course Code	CV 50042
Course Title	Rural Construction Technology
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

**Course Objectives:**

Following are the objectives of this course:

- To learn development and planning of low cost housing infrastructure.
- To know about different government schemes for Rural Development.
- To understand techniques for rural road construction as per IRC stipulations.
- To learn rural irrigation techniques and watershed management.

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Plan low cost housing using rural materials.
- Make use of relevant government schemes for construction of roads and housing.
- Use guidelines for rural road construction.
- Implement different irrigation systems for rural areas.
- Identify the need of watershed management in rural areas.

**COURSE CONTENTS****1. Rural Development and Planning**

- 1.1 Scope
- 1.2 Development Plans
- 1.3 Various approaches to Rural Development Planning
- 1.4 Significance of Rural Development
- 1.5 Rural development programme/projects

**2. Rural Housing**

- 2.1 Low cost construction material for housing
- 2.2 Composite material
  - 2.2.1 Ferro-cement & Fly Ash
  - 2.2.2 Autoclaved Calcium Silicate Bricks
  - 2.2.3 Soil-Stabilized un-burnt Brick
- 2.3 Plinth Protection of Mud Walls
- 2.4 Water-Proof and Fire-retardant Roof Treatment for Thatch Roofs
- 2.5 Pre-cast Stone Masonry
- 2.6 Rat-trap Bond for Walls
- 2.7 Panels for Roof
- 2.8 Ferro-Cement Flooring/Roofing units
- 2.9 Biomass - Types of fuels such as
  - 2.9.1 Firewood
  - 2.9.2 Agricultural Residues
  - 2.9.3 Dung Cakes
- 2.10 Renewable Energy and Integrated Rural Energy Program
  - 2.10.1 Objectives
  - 2.10.2 Key elements
  - 2.10.3 Implementation
  - 2.10.4 Financial Provisions
  - 2.10.5 Sources of Renewable Energy



2.11 Working of Gobar Gas and Bio Gas Plants.

### 3. Water Supply and Sanitation for Rural Areas

- 3.1 Sources of Water: BIS & WHO Water Standards.
- 3.2 Quality, Storage and Distribution for Rural Water Supply Works
- 3.3 Hand Pumps
  - 3.3.1 Types
  - 3.3.2 Installation
  - 3.3.3 Operation
  - 3.3.4 Maintenance of Hand Pumps
- 3.4 Conservation of water
  - 3.4.1 Rainwater Harvesting
  - 3.4.2 Drainage in Rural Areas
- 3.5 Construction of Low Cost Latrines
  - 3.5.1 Two Pit Pour Flush Water Seal
  - 3.5.2 Septic Tank etc.
- 3.6 Low Cost Community and Individual Garbage Disposal Systems
- 3.7 Ferro-Cement Storage Tanks

### 4. Low Cost Rural Roads

- 4.1 Broad categories of Pavement Layers
- 4.2 Types of Granular Sub-Bases and Bases
- 4.3 Guidelines for Surfacing of Rural Road as per relevant IRC codes
- 4.4 Pradhan Mantri Gram Sadak Yojna (PMGSY) - Highlights of Scheme

### 5. Low Cost Irrigation

- 5.1 Design consideration and construction of
  - 5.1.1 Tube-Well
  - 5.1.2 Drip Irrigation System
  - 5.1.3 Sprinkler Irrigation System
- 5.2 Watershed and Catchment Area Development – Problems and Features of Watershed Management
- 5.3 Watershed Management Structures
  - 5.3.1 K. T. Weir
  - 5.3.2 Gabion Structure
  - 5.3.3 Cement Plug
  - 5.3.4 Contour Bunding
  - 5.3.5 Farm Pond
  - 5.3.6 Bandhara System

### SUGGESTED LEARNING RESOURCES

1. Madhov Rao A G, and Ramachandra Murthy, D S, Appropriate Technologies for low cost Housing Oxford and IBH Publishing Co. Pvt. Ltd.
2. CBRI, Roorkee, Advances in Building Materials and Constriction.
3. Desai, Vasant, Rural Development in India: Past, Present and Future : a Challenge in the Crisis, Himalaya Publishing House, Delhi.
4. Rastogi, A.K. Rural Development Strategy, Wide Vision, Jaipur.
5. Singh, Katar, Rural Development Principles, Policies and Management, Sage Publications India Pvt Ltd.
6. Gaur, Keshav Dev, Dynamics of Rural Development, Mittal Publications, Delhi.
7. Document Published by Ministry of Rural development, Govt. of India, Ministry of Rural development.

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**HIGHWAY ENGINEERING LAB**

Course Code	CV 5005
Course Title	Highway Engineering Lab
Number of Credits	1 (L: 0,T: 0,P:2)
Prerequisites	Nil
Course Category	PC

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To identify the types of roads as per IRC recommendations.
- To understand the geometrical design features of different highways.
- To perform different tests on road materials.

**COURSE OUTCOMES**

After completing this course, student will be able to:

1. Identify the types of roads as per IRC recommendations.
2. Implement the geometrical design features of different highways.
3. Perform different Tests on road materials.

**LIST OF PRACTICALS TO BE PERFORMED:**

1.	Modified Proctor Test
2.	Flakiness and Elongation Index of Aggregates.
3.	CBR Test.
4.	Aggregate Impact Test.
5.	Los Angeles Abrasion Test.
6.	Aggregate Crushing Test.
7.	Softening Point Test of Bitumen.
8.	Penetration Test of Bitumen.
9.	Flash and Fire Point Test of Bitumen.
10.	Ductility Test of Bitumen.

**SUGGESTED LEARNING RESOURCES**

1. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-82609-858) Edition 2018
2. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Brothers, Roorkee.
3. Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
4. Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
5. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg, Standard Book House, Delhi.
6. Sharma, S.K., Principles, Practice and Design of Highway Engineering,, S.Chand
7. Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age International (P) Limited, Publishers, New Delhi.
8. Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications, Hyderabad.

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**ESTIMATION, COSTING AND VALUATION LAB**

Course Code	CV 5006 (Same as CC/CE 5006)
Course Title	Estimating Costing and Valuation lab.
Number of Credits	1 (L: 0, T: 0, P: 2)
Prerequisites	NIL
Course Category	PC

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To learn the procedure for estimating and costing of Civil Engineering works.
- To perform rate analysis for different items associated with construction projects.
- To use software for detailed estimate related to civil infrastructural projects.

**COURSE OUTCOMES**

After completing this course, student will be able to:

- Select modes of measurements for different items of works.
- Prepare approximate estimate of a civil engineering works.
- Prepare detailed estimate of a civil engineering works.
- Use relevant software for estimating the quantities and cost of items of works.
- Justify rate for given items of work using rate analysis techniques.

**LIST OF PRACTICAL TO BE PERFORMED**

1	Prepare the list of items to be executed with units for detailed estimate of a given structure from the given drawing.
2	Prepare a report on market rates for given material, labour wages, hire charges of tools & equipments required to construct the given structure as mentioned in at Serial number 1 above.
3	Study of items with specification given in the DSR ( for any ten item)
4	Recording in Measurement Book (MB) for any four items
5	Prepare bill of quantities of given item from actual measurements. (any four items).
6	Prepare approximate estimate for the given civil engineering works.
7	Calculate the quantity of items of work from the given set of drawings using standard measurement sheet for load bearing residential structure using description of item from DSR (1BHK Building with staircase).
8	Prepare detailed estimate from the given set of drawings using "standard measurement and abstract format" for RCC framed structure using description of item from DSR along with face sheet and prepare quarry chart, lead statement ( G+1 Building) .
9	Calculate the reinforcement quantities from the given set of drawings for a room size of 3 m X 4 m with bar bending schedule (footing, column, beam, lintel with chajja, slab)
10	Prepare rate analysis for the given five item of works.
11	Prepare detailed estimate of road of one kilometre length from the given drawing.
12	Prepare detailed estimate of small Septic tank from the given set of drawings.
13	Prepare detailed estimate of well from the given set of drawing.
14	Use the relevant software to prepare detailed estimate of a Road.
15	Use the relevant software to prepare detailed estimate of a residential building.

**SUGGESTED LEARNING RESOURCES**

1. Datta, B.N., Estimating and Costing in Civil engineering, UBS Publishers Distributors
2. Peurifoy, Robert L. Oberlender, Garold, Estimating construction cost (fifth edition), McGraw Hill Education,, New Delhi.
3. Rangwala, S.C., Estimating and Costing, Charotar Publishing House, Anand.
4. Birdie, G.S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd. Delhi.
5. Patil, B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.

6. Chakraborti, M., Estimating and costing, specification and valuation in civil engineering, Monojit Chakraborti, Kolkata.
7. PWD Schedule of Rates.
8. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates.
9. Manual of Specifications and Standards for DBFOT projects, EPC works.

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SEMESTER SCHEME 2020-21

**GOVERNMENT OF RAJASTHAN**  
**BOARD OF TECHNICAL EDUCATION RAJASTHAN JODHPUR**  
**SEMESTER SCHEME-2020-21**



**VI SEMESTER**  
(SESSION 2021-2022 & ONWARDS)

**ENTREPRENEURSHIP AND START-UPS**

Course Code	CV 6111(Same in All Branches of Engg.)
Course Title	Entrepreneurship and Start-ups
Number of Credits	4 (L- 3,T-1, P-0)
Prerequisites (Course code)	NIL
Course Category	HS

**COURSE OBJECTIVES:**

- Acquiring Entrepreneurial spirit and resourcefulness.
- Familiarization with various uses of human resource for earning dignified means of living.
- Understanding the concept and process of entrepreneurship-its contribution and role in the growth and development of individual and the nation.
- Acquiring entrepreneurial quality, competency, and motivation.
- Learning the process and skills of creation and management of entrepreneurial venture.

**COURSE OUTCOME:**

Upon completion of the course, these students will be able to demonstrate knowledge of the following topics:

- Understanding the dynamic role of entrepreneurship and small businesses
- Organizing and Managing a Small Business
- Financial Planning and Control
- Forms of Ownership for Small Business
- Strategic Marketing Planning
- New Product or Service Development
- Business Plan Creation

**COURSE CONTENTS:****1. INTRODUCTION TO ENTREPRENEURSHIP AND START-UPS**

- 1.1. Definitions, Traits of an entrepreneur, Intrapreneurship, Motivation
- 1.2. Types of Business Structures,
- 1.3. Similarities / differences between entrepreneurs and managers.

**2. BUSINESS IDEAS AND THEIR IMPLEMENTATION**

- 2.1. Discovering ideas and visualizing the business
- 2.2. Activity map
- 2.3. Business Plan

**3. IDEA TO START-UP**

- 3.1. Market Analysis– Identifying the target market,
- 3.2. Competition evaluation and Strategy Development,
- 3.3. Marketing and accounting,
- 3.4. Risk analysis

**4. MANAGEMENT**

- 4.1. Company's Organization Structure,
- 4.2. Recruitment and management of talent.
- 4.3. Financial organization and management

**5. FINANCING AND PROTECTION OF IDEAS**

- 5.1. Financing methods available for start-ups in India
- 5.2. Communication of Ideas to potential investors– Investor Pitch
- 5.3. Patenting and Licenses

**6. EXIT STRATEGIES FOR ENTREPRENEURS ,BANKRUPTCY, AND SUCCESSION ANDHARVESTING STRATEGY****SUGGESTED LEARNING RESOURCES:**

S.No.	Title of Book	Author	Publication
1.	The Startup Owner's Manual: The Step by-Step Guide for Building a Great Company	Steve Blank and Bob Dorf	K & S Ranch ISBN-978-0984999392
2.	The Lean Startup: How Today's Entrepreneurs Use Continuous Innovation to Create Radically Successful Businesses	Eric Ries	Penguin UK ISBN-978-0670921607
3.	Demand: Creating What People Love Before They Know They Want It	Adrian J. Slywotzky with Karl Weber	Headline Book Publishing ISBN-978-0755388974
4.	The Innovator's Dilemma: The Revolutionary Book That Will Change the Way You Do Business	Clayton M. Chris Tensen	Harvard business ISBN:978-142219602

**SUGGESTED SOFTWARE/LEARNING WEBSITES:**

- <https://www.fundable.com/learn/resources/guides/startup>
- <https://corporatefinanceinstitute.com/resources/knowledge/finance/corporatehstructure/>
- <https://www.finder.com/small-business-finance-tips>
- <https://www.profitbooks.net/funding-options-to-raise-startup-capital-for-your-business/>

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**PROJECT MANAGEMENT**

CourseCode	CV 62001(Same in All Branches of Engg.)
CourseTitle	Project Management
NumberofCredits	3(L:3,T:0,P:0)
Prerequisites	NIL
CourseCategory	OE

**COURSE OBJECTIVES**

- To develop the idea of project plan, from defining and confirming the project goals and objectives, identifying tasks and how goals will be achieved.
- To develop an understanding of key project management skills and strategies.

**COURSE OUTCOMES**

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

CO1	Understand the importance of projects and its phases.
CO2	Analyze projects from marketing, operational and financial perspectives.
CO3	Evaluate projects based on discount and non-discount methods.
CO4	Develop network diagrams for planning and execution of a given project.
CO5	Apply crashing procedures for time and cost optimization.

**COURSE CONTENTS****1. CONCEPT OF A PROJECT:**

- 1.1. Classification of projects
- 1.2. Importance of project management
- 1.3. The project Life cycle
- 1.4. Establishing project priorities (scope-cost-time)
- 1.5. Project priority matrix
- 1.6. Work break down structure.

**2. CAPITAL BUDGETING PROCESS:**

- 2.1. Planning -Analysis-Selection-Financing-Implementation-Review.
- 2.2. Generation and screening of project ideas
- 2.3. Market and demand analysis
- 2.4. Demand forecasting techniques.
- 2.5. Market planning and marketing research process
- 2.6. Technical analysis

**3. FINANCIAL ESTIMATES AND PROJECTIONS:**

- 3.1. Cost of projects
- 3.2. Means of financing
- 3.3. Estimates of sales and production-cost of production
- 3.4. Working capital requirement and its financing
- 3.5. Profitability project , cash flow statement and balance sheet.
- 3.6. Breakeven analysis.

**4. BASIC TECHNIQUES IN CAPITAL BUDGETING:**

- 4.1. Non discounting and discounting methods
- 4.2. pay-back period
- 4.3. Accounting rate of return
- 4.4. Net present value
- 4.5. Benefit cost ratio
- 4.6. Internal rate of return.
- 4.7. Project risk.



- 4.8. Social cost benefit analysis and economic rate of return.
- 4.9. Non-financial justification of projects.

**5. PROJECT ADMINISTRATION:**

- 5.1. Progress payments,
- 5.2. Expenditure planning,
- 5.3. Project scheduling and network planning,
- 5.4. Use of Critical Path Method (CPM),
- 5.5. Schedule of payments and physical progress,
- 5.6. time-cost trade off.
- 5.7. Concepts and uses of PERT
- 5.8. Cost as a function of time,
- 5.9. Project Evaluation and Review Techniques
- 5.10. Cost mechanisms.
- 5.11. Determination of least cost duration.
- 5.12. Post project evaluation.
- 5.13. Introduction to various Project management softwares.

**REFERENCE BOOKS**

- 1. Project planning, analysis, selection, implementation and review –Prasannachandra–Tata McGraw Hill
- 2. Project Management – the Managerial Process– Clifford F. Gray & Erik W. Larson–McGrawHill
- 3. Project management- David I Cleland- McGraw Hill International Edition, 1999
- 4. Project Management– Gopala krishnan– Mcmillan India Ltd.
- 5. Project Management- Harry – Maylor – Peason Publication

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**RENEWABLE ENERGY TECHNOLOGIES**

CourseCode	CV 62002 (Same in All Branches of Engg.)
CourseTitle	Renewable Energy Technologies
NumberofCredits	3 (L:3,T:0,P:0)
Prerequisites	NIL
CourseCategory	OE

**COURSE LEARNING OBJECTIVES**

- To understand present and future scenario of world energy use.
- To understand fundamentals of solar energy systems.
- To understand basics of wind energy.
- To understand bio energy and its usage in different ways.
- To identify different available non-conventional energy sources.

**COURSE OUTCOMES**

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

CO1	Understand present and future energy scenario of the world.
CO2	Understand various methods of solar energy harvesting.
CO3	Identify various wind energy systems.
CO4	Evaluate appropriate methods for Bio energy generations from various Bio wastes.
CO5	Identify suitable energy sources for a location.

**COURSE CONTENTS****1. INTRODUCTION:**

- 1.1. World Energy Use;
- 1.2. Reserves of Energy Resources;
- 1.3. Environmental Aspects OF Energy Utilisation;
- 1.4. Renewable Energy Scenario in India and around the World;
- 1.5. Potentials; Achievements/ Applications;
- 1.6. Economics of renewable energy systems.

**2. SOLAR ENERGY:**

- 2.1. Solar Radiation;
- 2.2. Measurements of Solar Radiation;
- 2.3. Flat Plate and Concentrating Collectors;
- 2.4. Solar direct Thermal Applications;
- 2.5. Solar thermal Power Generation
- 2.6. Fundamentals of Solar Photo Voltaic Conversion;
- 2.7. Solar Cells;
- 2.8. Solar PV Power Generation;
- 2.9. Solar PV Applications.

**3. WIND ENERGY:**

- 3.1. Wind Data and Energy Estimation;
- 3.2. Types of Wind Energy Systems;
- 3.3. Performance; Site Selection;
- 3.4. Details of Wind Turbine Generator;
- 3.5. Safety and Environmental Aspects.

**4. BIO-ENERGY:**

- 4.1. Bio mass direct combustion;

- 4.2. Bio mass gasifiers;
- 4.3. Bio gas plants;
- 4.4. Digesters;
- 4.5. Ethanol production;
- 4.6. Bio diesel;
- 4.7. Cogeneration;
- 4.8. Bio mass Applications.

#### 5. OTHER RENEWABLE ENERGY SOURCES:

- 5.1. Tidal energy;
- 5.2. Wave Energy;
- 5.3. Open and Closed OTEC Cycles;
- 5.4. Small Hydro Geothermal Energy;
- 5.5. Hydrogen and Storage;
- 5.6. Fuel Cell Systems;
- 5.7. Hybrid Systems.

#### REFERENCE BOOKS

1. Non-Conventional Energy Sources, Rai. G. D., Khanna Publishers, New Delhi, 2011.
2. Renewable Energy Sources, Twidell, J.W. & Weir, A., EFN SponLtd.,UK,2 006.
3. Solar Energy, Sukhatme. S. P., Tata Mc Graw Hill Publishing CompanyLtd. ,New Delhi, 1997.
4. Renewable Energy, Power for a Sustainable Future, Godfrey Boyle, Oxford University Press, U.K., 1996.
5. Fundamental of Renewable Energy Sources, G N Tiwari and M K Ghoshal, Narosa, New Delhi, 2007.
6. Renewable Energy and Environment A Policy Analysis for India ,NHRavindranath, U K Rao, B Natarajan, P Monga, Tata McGraw Hill.
7. Energy and The Environment, R A Ristinen and J JKraushaar, second edition, John Willey & Sons, New York, 2006.
8. Renewable Energy Resources, J W T widell and A D Weir, ELBS, 2006.

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**PRODUCT DESIGN**

CourseCode	CV 63001(Same in All Branches of Engg.)
CourseTitle	Product Design
NumberOfCredits	3 (L:3,T:0,P:0)
Prerequisites	NIL
CourseCategory	OE

**COURSE OBJECTIVES**

- To acquire the basic concepts of product design and development process
- To understand the engineering and scientific process in executing a design from concept to finished product
- To study the key reasons for design or redesign.

**COURSE OUTCOMES**

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

CO1	Understand the basic concepts of product design and development process.
CO2	Illustrate the methods to define the customer needs.
CO3	Describe an engineering design and development process.
CO4	Understand the intuitive and advanced methods used to develop and evaluate a concept.
CO5	Apply modelling and embodiment principles in product design and development process.

**COURSE CONTENTS****1. DEFINITION OF A PRODUCT**

- 1.1. Types of product;
- 1.2. Levels of product;
- 1.3. Product-market mix;
- 1.4. New product development (NPD) process;
- 1.5. Idea generation methods;
- 1.6. Creativity;
  - 1.6.1. Creative attitude;
  - 1.6.2. Creative design process;
- 1.7. Morpho logical analysis;
- 1.8. Analysis of inter-connected decision areas;
- 1.9. Brain storming.

**2. PRODUCT LIFECYCLE;**

- 2.1. The challenges of Product development;
- 2.2. Product analysis;
- 2.3. Product characteristics;
- 2.4. Economic considerations;
- 2.5. Production and Marketing aspects;
- 2.6. Characteristics of successful Product development;
- 2.7. Phases of a generic product development process;
- 2.8. Customer need identification;
- 2.9. Product development practices and industry-product strategies.

**3. PRODUCT DESIGN**

- 3.1. Design by evolution;
- 3.2. Design by innovation;
- 3.3. Design by imitation;
- 3.4. Factors affecting product design;
- 3.5. Standards of performance and environmental factors;
- 3.6. Decision making and iteration;
- 3.7. Morphology of design (different phases);

- 3.8. Role of aesthetics in design.

#### 4. INTRODUCTION TO OPTIMIZATION IN DESIGN

- 4.1. Economic factors in design;
- 4.2. Design for safety and reliability;
- 4.3. Role of computers in design;
- 4.4. Modeling and Simulation;
- 4.5. The role of models in engineering design;
- 4.6. Mathematical modeling;
- 4.7. Similitude and scale models;
- 4.8. Concurrent design;
- 4.9. Six sigma and design for six sigma;
- 4.10. Introduction to optimization in design;
- 4.11. Economic factors and financial feasibility in design;
- 4.12. Design for manufacturing;
- 4.13. Rapid Proto typing (RP);
- 4.14. Application of RP in product design;
- 4.15. Product Development versus Design.

#### 5. DESIGN OF SIMPLE PRODUCTS DEALING WITH VARIOUS ASPECTS OF PRODUCT DEVELOPMENT;

- 5.1. Design Starting from need till the manufacture of the product

#### REFERENCE BOOKS

- 1.Product Design and Development, Karl T.Ulrich and Steven D.Eppinger, TataMc Graw–Hill edition.
- 2.Engineering Design– George E. Dieter.
- 3.An Introduction to Engineering Design methods Vijay Gupta.
- 4.Merie Crawford: New Product management, McGraw-Hill Irwin.
- 5.Chitale A K and Gupta R C,“ Product Design and Manufacturing”, Prentice Hall of India, 2005.
- 6.Kevin Otto and Kristin Wood, Product Design, Techniques in Reverse Engineering and New Product Development, Pears on education.

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**DISASTER MANAGEMENT**

Course Code	CV 63002 (Same in All Branches of Engg.)
Course Title	Disaster Management
Number of Credits	3 (L: 3, T: 0 ,P :0)
Prerequisites	NIL
Course Category	OE

**COURSE OBJECTIVES**

Following are the objectives of this course:

- To learn about various types of natural and man-made disasters.
- To know pre and post-disaster management for some of the disasters.
- To know about various information and organizations in disaster management in India.
- To get exposed to technological tools and their role in disaster management.

**COURSE OUTCOMES:**

- After completing this course, student will be:
- Acquainted with basic information on various types of disasters
- Knowing the precautions and awareness regarding various disasters
- Decide first action to be taken under various disasters
- Familiarised with organization in India which are dealing with disasters
- Able to select IT tools to help in disaster management

**COURSE CONTENTS****1. UNDERSTANDING DISASTER**

- 1.1. Understanding the Concepts and definitions of Disaster,
- 1.2. Hazard,
- 1.3. Vulnerability,
- 1.4. Risk,
- 1.5. Capacity–Disaster and Development,
- 1.6. Disaster management.

**2. TYPES, TRENDS, CAUSES, CONSEQUENCES AND CONTROL OF DISASTERS**

- 2.1. Geological Disasters (earth quakes, land slides,tsunami, mining);
- 2.2. Hydro-Meteorological Disasters (floods, cyclones, lightning, thunder-storms, hailstorms, avalanches, droughts, cold and heat waves)
- 2.3. Biological Disasters (Epidemics, Pestattacks,Forestfire);
- 2.4. Technological Disasters (chemical, industrial, radiological, nuclear)
- 2.5. Manmade Disasters (building collapse, rural and urban fire, road and rail accidents, nuclear, radiological, chemicals and biological disasters)
- 2.6. Global Disaster Trends
- 2.7. Emerging Risks of Disasters
- 2.8. Climate Change and Urban Disasters.

**3. DISASTER MANAGEMENT CYCLE AND FRAME WORK**

- 3.1. Disaster Management Cycle
- 3.2. Paradigm Shift in Disaster Management.
- 3.3. Pre-Disaster
- 3.4. Risk Assessment and Analysis,
- 3.5. Risk Mapping,
- 3.6. Zonation and Microzonation,
- 3.7. Prevention and Mitigation of Disasters,
- 3.8. Early Warning System
- 3.8.1. Preparedness,

- 3.8.2. Capacity Development;
- 3.8.3. Awareness.
- 3.9. During Disaster
  - 3.9.1. Evacuation
  - 3.9.2. Disaster Communication
  - 3.9.3. Search and Rescue
  - 3.9.4. Emergency Operation Centre
  - 3.9.5. Incident Comm and System
  - 3.9.6. Relief and Rehabilitation
- 3.10. Post-disaster
  - 3.10.1. Damage and Needs Assessment,
  - 3.10.2. Restoration of Critical Infra structure
  - 3.10.3. Early Recovery Reconstruction and Redevelopment;
  - 3.10.4. IDNDR, Yokohama Stretegy, Hyogo Frame-work of Action.

#### 4. DISASTER MANAGEMENT IN INDIA

- 4.1. Disaster Profile of India
- 4.2. Mega Disasters of India and Lessons Learnt.
- 4.3. Disaster Management Act 2005
- 4.4. Institutional and Financial Mechanism,
- 4.5. National Policy on Disaster Management,
- 4.6. National Guidelines and Plans on Disaster Management;
- 4.7. Role of Government (local, state and national),
- 4.8. Non-Government and Inter Governmental Agencies

#### 5. APPLICATIONS OF SCIENCE AND TECHNOLOGY FOR DISASTER MANAGEMENT

- 5.1. Geo informatics in Disaster Management (RS, GIS, GPS and RS).
- 5.2. Disaster Communication System (Early Warning and Its Dissemination).
- 5.3. Land Use Planning and Development Regulations,
- 5.4. Disaster Safe Designs and Constructions,
- 5.5. Structural and Non Structural Mitigation of Disasters
- 5.6. S & T Institutions for Disaster Management in India

#### REFERENCES

- 1.Publications of National Disaster Management Authority (NDMA) on Various Templates and Guide lines for Disaster Management
- 2.Bhandani, R. K., An over view on natural & man-made disasters and their reduction, CSIR, New Delhi
- 3.Srivastava, H. N., and Gupta G. D. , Management of Natural Disasters in developing countries, Daya Publishers, Delhi
- 4.Alexander, David, Natural Disasters, Kluwer Academic London
- 5.Ghosh, G .K. ,Disaster Management, APH Publishing Corporation
- 6.Murthy, D. B. N., Disaster Management: Text & Case Studies, Deep & Deep Pvt. Ltd.

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**INDIAN CONSTITUTION**

CourseCode	CV 6333(Same in All Branches of Engg.)
CourseTitle	Indian Constitution
NumberofCredits	0 (L:2,T:0;P:0)
Prerequisites(Coursecode)	None
CourseCategory	AU

**COURSE CONTENT****1. THE CONSTITUTION –**

- 1.1. Introduction
- 1.2. The History of the Making of the Indian Constitution
- 1.3. Preamble and the Basic Structure, and its interpretation
- 1.4. Fundamental Rights and Duties and their interpretation
- 1.5. State Policy Principles

**2. UNION GOVERNMENT**

- 2.1. Structure of the Indian Union
- 2.2. President– Role and Power
- 2.3. Prime Minister and Council of Ministers
- 2.4. Lok Sabha and Rajya Sabha

**3. STATE GOVERNMENT**

- 3.1. Governor– Role and Power
- 3.2. Chief Minister and Council of Ministers
- 3.3. State Secretariat

**4. LOCAL ADMINISTRATION**

- 4.1. District Administration
- 4.2. Municipal Corporation
- 4.3. Zila Panchayat

**5. ELECTION COMMISSION**

- 5.1. Role and Functioning
- 5.2. Chief Election Commissioner
- 5.3. State Election Commission

**SUGGESTED LEARNING RESOURCES:**

S.No.	Title of Book	Author	Publication
1.	Ethics and Politics of the Indian Constitution	Rajeev Bhargava	Oxford University Press, New Delhi, 2008
2.	The Constitution of India	B.L.Fadia	Sahitya Bhawan; New edition(2017)
3.	Introduction to the Constitution of India	D DBasu	Lexis Nexis; Twenty-Third 2018 edition

**SUGGESTED SOFTWARE / LEARNING WEBSITES:**

1. <https://www.constitution.org/cons/india/const.html>
2. <http://www.legislative.gov.in/constitution-of-india>
3. <https://www.sci.gov.in/constitution>
4. <https://www.toppr.com/guides/civics/the-indian-constitution/the-constitution-of-india/>

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**INDUSTRIAL WASTE TREATMENT**

Course Code	CV 6001
Course Title	Industrial Waste Treatment
Number of Credits	3 (L: 3 T: 0, P: 0)
Prerequisites	NIL
Course Category	PC

**Course objective**

- To learn about various industrial effluents.
- To know the various type of industries.
- Determination of BOD, COD, DO
- Determination of solids

**Course outcome**

- 1 BOD, COD of streams calculations
- 2 Calculate quantity of solids
- 3 Learn about industrial waste management
- 4 Visit different industries

**1. Introduction**

- 1.1 Types of industries & industrial pollution – solid, liquid, gases.
- 1.2 Characteristics of industrial waste.
- 1.3 Effect of industrial waste on
  - 1.3.1 Streams
  - 1.3.2 Sewer
  - 1.3.3 Land
  - 1.3.4 Sewage treatment plant
  - 1.3.5 Human health
- 1.4 Environmental legislation related to prevention & control of industrial effluent
- 1.5 Clean up Goals

**2. Industrial Waste Water Treatment**

- 2.1 Introduction
- 2.2 Sources
- 2.3 Methods of treatment
  - 2.3.1 Equalization
  - 2.3.2 Neutralization
  - 2.3.3 Physical treatment
  - 2.3.4 Chemical treatment
  - 2.3.5 Biological treatment
- 2.4 Flow charts of certain Indian industries
  - 2.4.1 Dairy
  - 2.4.2 Distillery
  - 2.4.3 Fertilizer plant
  - 2.4.4 Oil Refineries
  - 2.4.5 Paper pulp mills
  - 2.4.6 Sugar mill
  - 2.4.7 Textiles

**3. Industrial Solid Waste Management**

- 3.1 Classification
- 3.2 Storage Transportation & Disposal

- 3.3 Methods of treatment
- 3.4 Existing Legislation to manage solid waste
- 3.5 Environmental impact of solid waste

#### 4. Hazardous Waste

##### 4.1 Biomedical waste

- 4.1.1 Biomedical waste and their impact on human health and environment
- 4.1.2 Legislative laws on management of Biomedical wastes in India
- 4.1.3 Collection & treatment
  - 4.1.3.1 Colour coding
  - 4.1.3.2 Collection of Sharp Waste
  - 4.1.3.3 Labelling & identification
  - 4.1.3.4 Storage
  - 4.1.3.5 Transportation to treatment & Disposal sites
  - 4.1.3.6 Treatment & Disposal

#### 5. E-Waste

- 5.1 Definition & E-Waste components
- 5.2 Quantity – E-Waste Data
- 5.3 Waste Electrical & Electronic Equipment (WEEE)
- 5.4 Environmental Impact
- 5.5 Basel Convention – e waste recycling sites
- 5.6 Consumer awareness efforts

#### SUGGESTED LEARNING RESOURCES

- 1. Environmental Engineering (Vol. II) S. K. Garg Khann Publishers, New Delhi
- 2. Shad T. T. "Industrial Pollution Prevention" Springer
- 3. Rao M. N. & Dutta A. K. "Wastewater Treatment", Oxford – 1 BH Publications
- 4. Pat wardhan A. D., "Industrial Wastewater Treatment" Prentice Hall of India, New Delhi

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**ENVIRONMENTAL IMPACT ASSESSMENT**

Course Code	CV 60021
Course Title	Environmental Impact Assessment
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

**COURSE OBJECTIVES:**

Following are the objectives of this course:

- To study the importance of EIA
- To know the role of public in EIA studies
- To understand the phenomena of impacts on the environment
- Know the impact quantification of various projects on the environment

**COURSE OUTCOMES:**

After completing this course, student will be able to:

- Identify the objectives and scope of EIA
- Illustrate the necessity of public participation in EIA studies
- Explain the phenomena of Impacts on environment

**COURSE CONTENTS****1. Introduction and overview of EIA**

- 1.1 Concept of EIA
- 1.2 Utility of EIA
- 1.3 Scope of EIA

**2. EIA methodologies**

- 2.1 Preliminary assessment
- 2.2 Quantification
- 2.3 Comparison of alternatives and comprehensive EIA's using checklist, matrices and network methods

**3. Prediction and assessment of impact on:**

- 3.1 Air
- 3.2 Water
- 3.3 Noise
- 3.4 Land

**4. Environmental management plan**

- 4.1 Plan for mitigation of adverse impact on environment
- 4.2 Options for mitigation of impact on water, air, land
- 4.3 Addressing the issues related to project affected people

**5. EIA reporting**

- 5.1 Objectives of environmental audit
- 5.2 Evaluation of audit data
- 5.3 Preparation of audit report

**SUGGESTED LEARNING RESOURCES**

1. Canter L.W., EIA, 2<sup>nd</sup> ed., McGraw Hill, 1997
2. Kulkarni, V. and Ramchandra, T.V. , “Environmental Management”, TERI Press 2009
3. United Nations Environment Programme (UNEP) EIA Manual

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SEMESTER SCHEME 2020-21

**ENVIRONMENTAL ACT AND LEGISLATION**

Course Code	CV 60022
Course Title	Environmental Act and Legislation
Number of Credits	3 (L: 3, T: 0, P: 0)
Prerequisites	NIL
Course Category	PE

**COURSE OBJECTIVES:**

The various objective of this course are:

- To learn the basic principles of environmental Laws so that the scientific gains can be put into use within the parameters of a legal system.
- To introduce the laws and policies both at the national and international level related to environment.
- To obtain the fundamental knowledge and skills to understand environmental problems and issues.

**COURSE OUTCOME:**

After completing this course students would be able to

- Understand the basic principles of environmental Laws.
- Understand the laws and policies both at the national and international level related to environment.
- Recognise the various issues regarding the environmental problems and issues.

**COURSE CONTENT****1. Introduction to environmental laws**

- 1.1 Environmental Protection: Issues & Problems
- 1.2 Key International Efforts for Environmental protection
- 1.3 Sustainable Development: Essential features and Legal Implications
- 1.4 UN Framework Convention on Climate Change, 1992
- 1.5 Kyoto Protocol, 1997

**2. Environmental protection and the law**

- 2.1 Environment (Protection) Act, 1986: Salient Features.
- 2.2 Prevention, Control & abatement of environmental pollution under EPA
- 2.3 Hazardous wastes (Management, Handling and Transportation) Rules, 2008
- 2.4 Public Liability Insurance Act, 1991. (Note: Only relevant provision of the above Acts)

**3. Pollution abatement and the law**

- 3.1 Water ((Prevention & Control of Pollution) Act, 1974: Salient Features
- 3.2 Air (Prevention & Control of Pollution) Act, 1981.
- 3.3 Noise pollution (Regulation and Control) Rules, 2000 (Note: Only relevant provisions of the above Acts)

**4. Natural resource conservation and the law**

4.1 Wildlife (Protection) Act, 1972: Salient Features

4.2 Protected Areas and Trade & Commerce under WPA

4.3 National Forest Policy

4.4 Forest Conservation Act, 1986

4.5 Biological Diversity Act, 2002 (Note: Only relevant provisions of the above Acts)

## **5. Judicial activism and environmental protection**

5.1 Indian Constitution and Environmental Protection

5.2 Judicial Response towards Environmental Protection

5.3 Public Nuisance under IPC (Sections 268,277,278,284, 290,291) 5.4 Sections 133-143 of Criminal Procedure Code, 1973.

5.5 Role of NGO's for the promotion and protection of Environment.

## **SUGGESTED LEARNING RESOURCES**

1. Diwan,P. (1997). Environmental Administration - Law & Judicial Attitude, Vol. I, II. Deep & Deep Pub. New Delhi.
2. Divan, S.andRoscencranj, A. (2001). Environmental Law & Policy in India. Oxford Pub. New Delhi.
3. Lal, S. (1990). Commentaries on Water, Air pollution & Environment (protection) Law. Law Pub. Pvt. Ltd. India.
4. Leelakrishnan, P. (1999). Environmental Law in India. Butterworths Publications, N.Delhi.
5. Singh, G. (1995). Environmental Law: International & National Perspectives.

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**INDUSTRIAL WASTE TREATMENT LAB**

Course Code	CV 6003
Course Title	Industrial Waste Treatment Lab
Number of Credits	1 (L: 0,T: 0,P:2)
Prerequisites	Nil
Course Category	PC

**Course Objectives**

- To learn about various industrial effluents.
- To know the various type of industries.
- Determination of BOD, COD, DO.
- Determination of solids.

**Course outcomes**

- BOD, COD of streams calculations.
- Calculate quantity of solids.
- Learn about industrial waste management.
- Visit different industries.

**LIST OF PRACTICAL TO BE PERFORMED**

1	Determination of solids
2	Determination of BOD, COD, DO
3	Determination of iron & manganese
4	Determination of sulphate & sulphides
5	Visit to textile industry & make a flow chart of it
6	Visit to paper & pulp industry & make a flow chart of it
7	Visit to steel industry & make a flow chart of it

**References :**

1. Environmental Engineering (Vol. II) S. K. Garg Khanna Publishers, New Delhi
2. Shad T. T. "Industrial Pollution Prevention" Springer
3. Rao M. N. & Dutta A. K. "Wastewater Treatment", Oxford – 1 BH Publications
4. Patwardhan A. D., "Industrial Wastewater Treatment" Prentice Hall of India, New Delhi

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