



**Shivaji University, Kolhapur**  
**Department of Technology**  
**THIRD YEAR B.TECH**  
**Civil Engineering**  
**Curriculum Structure**  
**Semester – V**

Sr. No.	Subject Code	Subject Title	Contact hours			Credits
			L	T	P	
1	CE 311	Design of Steel Structures	3	1	-	4
2	CE 312	Transportation Engineering -I	3	-	-	3
3	CE 313	Geotechnical Engineering- I	3	-	-	3
4	CE 314	Environmental Engineering-I	3	-	-	3
5	CE 315	Construction Management	3	-	-	3
6	CE 316	Laboratory- I Transportation Engineering -I	-	-	2	1
7	CE 317	Laboratory-II Geotechnical Engineering- I	-	-	2	1
8	CE 318	Laboratory-III Environmental Engineering-I	-	-	2	1
9	CE 319	Seminar	-	-	4	2
10	AC 312	Audit Course II Research Methodology	2	-	-	-
<b>Total</b>			17	1	10	21
Total Contact hours per week = 28						

**Semester –VI**

Sr. No.	Subject Code	Subject Title	Contact hours			Credits
			L	T	P	
1	CE 321	Theory of Structure-II	3	1	-	4
2	CE 322	Water Resource Engineering -I	3	-	-	3
3	CE 323	Transportation Engineering –II	3	-	-	3
4	CE 324	Environmental Engineering-II	3	-	-	3
5	CE 325	Geotechnical Engineering- II	3	-	-	3
6	CE 326	Laboratory- I Geotechnical Engineering- II	-	-	2	1
7	CE 327	Laboratory-II Environmental Engineering-II	-	-	2	1
8	CE 328	Laboratory-III Structural Design and Drawing-I	-	-	2	1
9	CE 329	Mini Project	-	-	4	2
10	AC 323	Audit Course III Presentation and Communication Techniques	2	-	-	-
<b>Total</b>			17	1	10	21
Total Contact hours per week = 28						

**Note:** Vacation Field Training of at least 15 days should be completed during third year before the commencement of VII<sup>th</sup> Semester.

**Note:** Tutorials and practical shall be conducted in batches with batch strength not exceeding 18 students.



Shivaji University, Kolhapur  
**Department of Technology**

**Third Year B. Tech (CIVIL ENGINEERING) (Semester V)**

**CE 311 DESIGN OF STEEL STRUCTURE**

**Teaching Scheme: L: 3 hrs/week**

**Credits: 3**

**Unit 1**

**7 hrs**

Introduction to structural design, Structural systems, Role of the designer, Advantages of steel as a structural material, Types of structural steel, Mechanical properties of steel, various rolled steel sections (including cold-formed sections, structural pipe (tubes)) sections and their properties.

Design philosophies: Introduction to working stress method, Limit state method. Introduction to Plastic theory: Plastic hinge concept, Plastic collapse load, Plastic moment, Shape factor, Plastic section modulus, Design of beam.

Types of loads acting on structure, Introduction to IS Codes and specifications: IS 875, IS 800 – 2007.

**Unit 2**

**8 hrs**

Bolted connections: Types of bolts, Behaviour of bolted joints. Strength of joint, efficiency of joint, Analysis and Design of simple connections, Beam to beam, beam to column.

Welded connections: Types and properties of welds, Types of joints, Design of simple connections, Beam to beam, beam to column.

Analysis and design of moment resisting bolted and welded connection

**Unit 3**

**4 hrs**

Tension members: Behaviour, Modes of failure, and Design of single and double angle sections.

**Unit 4**

**8 hrs**

Compression Members: Behaviour, Modes of failure, Classification of cross section, Effective length, slenderness ratio, Design strength, Compression members in trusses. Design of columns subjected to axial load and biaxial bending, Built up column sections, Laced and Battened columns. Column bases: Slab base and Gusseted base

**Unit 5**

**6 hrs**

Design of beams: Laterally restrained and unrestrained simply-supported beams. Design of compound beams and welded plate girder. Curtailment of flange plates.

**Unit 6**

**6 hrs**

**Roof Truss:** Types of steel roof truss and its selection criteria: Calculation of panel point load for Dead load; Live load and wind load as per I.S. 875-1987 Analysis and Design of steel roof truss. Design of purlin as per I.S. Arrangement of members at supports. Design concept of Foot-over Bridge.

**Reference Books**

1. Bhavikatti S.S., “Design of Steel Structures by Limit State Method”, I.K International Publishing House Pvt. Ltd.
2. Duggal S.K., “Limit State Design of Steel Structure”, Tata Mc-Graw Hill Publication
3. Shah V.L. and Gore Veena, “Limit State Design of Steel Structures”, Structures Publications
4. Subramanian N., “Design of Steel Structures”, Oxford University Press.

**I.S. Codes:**

1. IS 800:2007 – Indian Standard code of Practice for use of structural steel in general building construction, BIS – New Delhi
2. I.S. 875 (Part 1-5) - 1987 code of practice of design loads for Buildings and structures.  
Part 1 - Dead load  
Part 2 - Imposed (live) load  
Part 3 - Wind load
3. IS Handbook No. 1- Properties of structural Steel Rolled section.
4. Steel table.



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**Third Year B. Tech (CIVIL ENGINEERING) (Semester V)**

**CE 312 TRANSPORTATION ENGINEERING –I**

**Teaching Scheme: L: 3 hrs/week**

**Credits: 3**

**HIGHWAY ENGINEERING**

**UNIT 1**

**7 hrs**

Introduction, Classification of Roads, Traffic Engineering, Highway alignment and Geometric Design

**UNIT 2**

**6 hrs**

Highway materials, Pavement Design, Highway Drainage

**BRIDGE ENGINEERING**

**UNIT 3**

**7 hrs**

Introduction, Afflux, Bridge superstructures

**UNIT 4**

**6 hrs**

Bridge Economics, Design forces, IRC Loading, Bridge substructure, Bearings

**AIRPORT ENGINEERING**

**UNIT 5**

**7 hrs**

Introduction, Airport planning

**UNIT 6**

**6 hrs**

Airport layout, Runways and Taxiways, Heliport

**Reference Books:**

1. Bindra S. P., “A Course in Highway Engineering”, 1977, 3rd Edition.
2. Khanna S. K., Justo C. E. G., “Highway Engineering”, 8<sup>th</sup> Edition, 2001, Nem Chand and Bros, Roorkee(U.A)
3. Khanna S. K., Justo C. E. G ., “Highway Material Testing”, 8<sup>th</sup> Edition, 2001, Nem Chand and Bros, Roorkee(U.A),
4. O’Flaherty C. A. and Arnold E., “Highways Vol. 2”, London.
5. Rao G.V., “Principles of Transportation and Highway Engineering ”, Tata McGraw Hills Publications, 1996, 1<sup>st</sup> Edition.
6. Wright, Paul H. and Dixon, “Highway Engineering”, John Eiley and Sons Inc., 2002,1st Edition.
7. Yang H. Huang, “Pavement Analysis and Design”, Second Edition, 2008, Pearson Education, Delhi.
8. Alagias, “Elements of Bridge Engineering”, CHB Publications, Latest Edition..
9. Bindra S.P., “Principles and Practice of Bridge Engineering”, Dhanpat Rai Publications, 2006, 8th Edition.
10. Ponnuswamy S, “Bridge Engineering”, Tata McGraw Hill Publishing Co. Ltd., New Delhi, Second Edition, 2008.
11. Victor D. J., “Elements of Bridge Engineering”, Oxford and IBH, 2001, 5th Edition.
12. DeNeufville R. and Odoni A., “Airport Systems: Planning Design and Management”, McGraw-Hill, 2003. □
13. Horonjeff R. and McKelvey F., “Planning and Design of Airports”, 4th Edition, 1994, McGraw-Hill Publications.
14. Khanna S. K. and Arora M. G., “Airport Planning and Design”, Nem Chand and Brothers.
15. Sehgal S. B. and Bhanot K. L., “Textbook of Highway and Airport Engineering”, S. Chand Publishers, 1983, 1st Edition.



Shivaji University, Kolhapur  
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**Third Year B. Tech (CIVIL ENGINEERING) (Semester V)**

**CE 313 GEOTECHNICAL ENGINEERING - I**

**Teaching Scheme: L: 3 hrs/week**

**Credits: 3**

**UNIT 1**

**7 hrs**

**Properties of Soil**

Introduction to Soil Mechanics, major soil deposits of India such as marine deposits, black cotton soils, lateritic soils, alluvial deposits and desert soils. Three phase soil system, particle size and shape, weight volume relationships, index properties of soil - methods of determination and its significance, I.S. classification of soil, field identification of soils. Soil grain and soil aggregate properties of coarse and fine grained soils.

**UNIT 2**

**6 hrs**

**Permeability and Seepage**

Capillary water. Darcy's law. Factors affecting permeability. Determination of permeability by constant head and falling head method as per IS - 2720, field test as per IS – 5529 (part I)- pumping in test and pumping out test. Permeability of layered soils. Seepage forces. General flow equation. Flow net and its applications, quick sand condition. uplift pressure, exit gradient, failure due to piping. criteria for design of filters.

**UNIT 3**

**7 hrs**

**Compaction**

Soil compaction phenomenon. Factors affecting compaction. Dry density and moisture content relationship. Zero air voids line. Effect of compaction on soil structure. Standard Proctor test and Modified Proctor test as per IS – 2720. Field compaction equipment and methods. Placement water content. Field control of compaction, compaction of cohesive and non-cohesive soils- relative density.

**UNIT 4**

**6 hrs**

**Shear Strength of Soil**

Stress strain curve, Mohr circle of stress, Mohr-coulomb failure criteria, pore pressure, total and effective stress. Peak and residual shear strength. Factors affecting shear strength. Laboratory measurement of shear strength by direct, unconfined and triaxial tests under different drainage conditions. Vane shear test. Shear strength characteristics of sand and clay. Sensitivity and thixotropy of cohesive soils.

**UNIT 5**

**7 hrs**

**Stress Distribution in Soils**

Boussinesq theory- point load, line load, strip load, pressure distribution diagram on a horizontal and vertical plane, pressure bulb, Westergaard's theory, contact pressure, approximate stress distribution method.

**UNIT 6**

**8 hrs**

**a) Lateral Earth Pressure**

Limit analysis and limit equilibrium methods, effect of wall movement on earth pressure, earth pressure at rest, Rankine's State of plastic equilibrium, submerged backfill, backfill with uniform surcharge, backfill with sloping surface, Coulomb's theory.

**b) Stability of Slopes**

Slope classification, slope failure, modes of failure. Infinite slope in cohesive and cohesionless soil, slope stability analysis using Swedish Slip Circle Method.

**Note-** More emphasis would be given on basic fundamentals in the course work.

**REFERENCE BOOKS:**

1. Arora K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors 1989, 2nd Edition.
2. Bowles J. E., "Engineering Properties Of Soils And Their Measurements", Tata McGraw-Hill
3. Coduto D. and Donald P., "Geotechnical Engineering Principle and practice", PHI Publisher
4. Dr. Alam Singh, "Modern Geotechnical Engineering" IBT Publishers, 1992, 3rd Edition.
5. Dr. Kasmalkar B. J., "Geotechnical Engineering"
6. Gulhati S.K. and Datta Manoj, "Geotechnical Engineering", Tata McGraw-Hill, 2005, 1<sup>st</sup> Edition.
7. Lambe and Whitman, "Soil Mechanics" (VI Version), Wiley Eastern Ltd., New Delhi
8. Murthy V. N. S., "Soil Mechanics and Foundation Engineering", Saikripa Technical Consultants, Bangalore
9. Peck R.B. and Hanson W.E. T.H. Thornburn, "Foundation Engineering ", John Wiley
10. Punmia B. C., "Soil Mechanics and Foundation Engineering", Laxmi Publication
11. Purushothma Raj, "Geotechnical Engineering",
12. Ranjan G. and Rao A.S., "Basic and Applied Soil Mechanics",
13. Taylor D.W., "Fundamentals of Soil Engineering", John Wiley and Sons
14. Terzaghi and Peck, "Soil mechanics in Engineering Practice", APH Publisher
15. Venkatramaiah, C., "Geotechnical Engineering" WEL Publishers, 1993, 2nd Edition.



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**Third Year B. Tech (CIVIL ENGINEERING) (Semester V)**

**CE 314 ENVIRONMENTAL ENGINEERING - I**

**Teaching Scheme: L: 3 hrs/week**

**Credits: 3**

**UNIT 1**

**6 hrs**

Air pollution- Definition, sources of air pollution, types and classification of air pollutants, Primary and Secondary air pollutants and their importance, Atmospheric stability, mixing heights, plume types and meteorological parameters.

Effects of air pollution on – Human, Animals, Materials and Vegetation.

Global Effects- Photochemical smog, heat island , ozone depletion, acid rain. Control of air pollution.

**UNIT 2**

**7 hrs**

Sources of water, Factors considered in selection of source of water for treatment plant, Conveyance of raw water-, canals and pipelines, Hydraulics of conduits, Different types of pipes used and their suitability, designing of rising main., intake structure, different types of intake structures.

Quality- Characteristics, Indian standards, Testing of raw water for physical, chemical and bacteriological parameters and their significance.

**UNIT 3**

**7 hrs**

Quantity- Population forecasting, different methods of population forecasting, rate of water consumption for various purposes, factors affecting demand of water, calculation of fire demand.

Water Treatment: Necessity of water treatment processes. Different types of water treatment flow sheets.

Aeration: Principle and Concept, Necessity, Methods,

**UNIT 4**

**7 hrs**

Sedimentation- Theory of sedimentation, types of suspended solids, determination of Settling velocity, Types of sedimentation tanks. Surface Loading, detention time, and design of PST, inlets and outlets arrangements

Theory of chemical coagulation, Factors affecting coagulation, turbidity, rapid mixing, coagulant dosage, characteristics of water, optimum pH, Coagulant aids, choice of coagulants, common coagulants, coagulant aids like Bentonite clay, lime stone, silicates and poly electrolytes,

Rapid mixing-Necessity, gravitational, mechanical, pneumatic devices,

Slow mixing and flocculation, design of flocculation chamber, mean velocity gradient “G” and power consumption, Design of clari-flocculator.



Concept of Plate settler and Tube settler.

**UNIT 5**

**6 hrs**

Filtration: Theory of filtration, Mechanism of filtration, filter materials, Types of filters- Rapid gravity filter, slow sand-filter and pressure filter. Components, materials, underdrainage system, working and cleaning of filters, operational troubles, Design of filters.

Theory of disinfection- Factors affecting efficiency of disinfection. types of disinfectants,

Mathematical relationship governing disinfections variables. Theory of chlorination, break point chlorination, bleaching powder estimation.

Water softening methods- lime-soda , ion exchange method. and Demineralization.

**UNIT 6**

**6 hrs**

System of water supply- Continuous and intermittent system.

Distribution of water- Different distribution systems and their components, layouts, Methods of supply like gravity, pumping and combination, Design of distribution system, ,

determination of Balancing Capacity of ESR.

**Reference Books**

1. Duggal K. N., “Water Supply”, S. Chand and Company, 2007.
2. Fair G. M, Geyer J. C, and Okun D. A, “Water and Waster Water Engineering Vol. I and II”, John Wiley Publication, 1966.
3. Hammer M. J., “Water and Waste Water Technology”, Prentice Hall of India Private Limited, 1996.
4. Garg S. K., “Water Supply Engg”, Khanna Publishers, NewDelhi.
5. Peavy, H. S., Rowe D. R. and Tchobanoglous, “Environmental Engineering”, McGraw-Hill Book Company, 1985.
6. Rao H. V. N. and Rao M. N., “Air Pollution TMH Publications.
7. Stern, “Air Pollution Vol. I – IV”, McGraw Hill.
8. Sharma and Kaur, “Environmental Chemistry”, Goyal Publisher.
9. Steel and McGhee, “Environmental Engineering”, McGraw Hill Publications.
10. Viessman W. and Hammer M. J, “Water Supply and Pollution Control”, Harper Collins College Publishers, 1993.
11. “Manual on Water Supply and Treatment”, Government of India Publication, 1993.



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**Third Year B. Tech (CIVIL ENGINEERING) (Semester V)**

**CE 315 CONSTRUCTION MANAGEMENT**

**Teaching Scheme: L: 3 hrs/week**

**Credits: 3**

**UNIT 1**

**6 hrs**

Time Management

Introduction, steps in Project Management – work break down structure

Bar Chart, Mile stone chart, Gantt Chart

Activity On Arrow and Activity On Node

Introduction to PERT: Concept of probability, normal and Beta Distribution, Central limit theorem. Time estimates and calculations of project duration, critical path, slack, probability of project completion.

**UNIT 2**

**7 hrs**

CPM : Introduction, Time estimates, floats, critical path.

Network compression – Least Cost and optimum duration.

Resource allocation-Smoothening and leveling.

Updating of networks– needs, steps, project duration, calculation for updated network.

**UNIT 3**

**6 hrs**

Resource Management

Men- Resource allocation – smoothening and leveling.

Material Management- definition by international federation of purchasing and material management. Objectives, Role Functions, Qualities of material manager Material forecasting.

Inventory Control- Necessity, Techniques such as ABC, EOQ, HML, VED, SDE, etc. MUSIC-3d role, lead-time, safety stocks, Material Evaluation using differential indices.

**UNIT 4**

**7 hrs**

Financial Management

Objectives, managing working capita, Preparation of cash flow schedule based on funds available and project planning.

Introduction to Engineering economics, importance, demand and supply, types of costs, interest – simple, compound, continuous, effective.

Value of Money – time and equivalence, tangible and intangible factors, introduction to inflation. Interest factors – Uniform series factors – derivations.

**UNIT 5**

**6 hrs**

Economic comparisons

Discontinuing methods : Present worth method, equivalent annual cost method, capitalized cost method, net present value, internal rate of return

**UNIT 6**

**7 hrs**

Site Layout

Factors affecting, Typical layout few major construction projects.

Safety Engineering

Accident cost, IFR, ISR, injury sources and causes, Effective safety programmes occupational health hazards, Personal protective equipment, Preparation of safety programmes for construction works.

Application of MIS

System Development, Data processing, Flow charting, DBM, Data communication System Developments, Data processing, Application in Civil Engineering Industry.

**Reference Books:**

1. Antill and Woodhead, “C.P.M. in Construction Practice”,
2. Barrie Paulsion, “Professional Construction Management”, McGraw Hill Institution Edition.
3. Gopalkrishnan and Sunderasan, “An Integrated Materials Management”.
4. K.S. Menon, “Purchasing And Inventory Control”, Wheeler Publication.
5. Layland Blank and Torquin, “Engineering Economics”
6. Naik, “Project Management”
7. Pilcher R., “Principles of Construction Management”,
8. Pilcher R., “Project Cost Control in Construction”.
9. Punmia B.C., “CPM PERT”
10. Rustogi, “Material management”,
11. Senagupta, “Construction Management and Planning”, Tata McGraw Hill Publication.
12. Srinath, “CPM PERT”
13. S. Seetharaman, “Construction Management”, Umesh Publications S.B. Nath Market, N. Delhi.
14. Taylor G.A., “Management and Engineering Economics”
15. Zamb L.C., “Inventory Control”

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**Third Year B. Tech (CIVIL ENGINEERING) (Semester V)**

**Laboratory-I**

**CE 316 TRANSPORTATION ENGINEERING-I**



**Teaching Scheme: P: 2hrs/week**

**Credit: 1**

**Note: Perform at least 10 experiments out of the following list:**

1. Aggregate Impact Value
2. Los Angles Abrasion Test
3. Flakiness and Elongation Index
4. Demonstration of Core cutting and grinding machine
5. Bitumen Penetration
6. Softening Point
7. Centrifuge Extraction Test
8. Flash Point and Fire Point Test
9. Ductility test
10. Viscosity of bitumen
11. Specific Gravity of bitumen
12. Marshall Stability Test
13. Demonstration of Benkelman Beam Apparatus
14. Demonstration of NDT Concrete test Hammer

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**Third Year B. Tech (CIVIL ENGINEERING) (Semester V)**

**Laboratory-II**

**CE 317 GEOTECHNICAL ENGINEERING-I**



**Teaching Scheme: P: 2hrs/week**

**Credit: 1**

Laboratory Experiments to be conducted

1. Specific gravity determination by voluminometer / pycnometer / density bottle.
2. Sieve analysis, particle size determination and I. S. classification.
3. Determination of consistency limits and its use in soil classification.
4. Field density test by core cutter, sand replacement method.
5. Determination of co-efficient of permeability by constant head and by variable head method.
6. Direct shear test.
7. Standard proctor test.
8. Unconfined Compression Test

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**Third Year B. Tech (CIVIL ENGINEERING) (Semester V)**

**Laboratory-III**

**CE 318 ENVIRONMENTAL ENGINEERING-I**



**Teaching Scheme: P: 2hrs/week**

**Credit: 1**

**List of Practicals:-**

**(A) Determination of (Any Eight)**

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

**B) Site visit to water treatment plant.**

A report based on the visit to water treatment plant would be submitted and would form a part of the term work.

**C) Design of various components of water treatment plant**

Design of various components of water treatment plant would be carried out based on the theory covered in Environmental Engineering-I.

OR

**C) Study of Software or programming for analysis of water distribution system**

Programmes available for the design of various water treatment plants would be used or Computer Programmes to Design various units of water treatment plant would be written in any suitable programming language.



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**Third Year B. Tech (CIVIL ENGINEERING) (Semester V)**

**CE 319 SEMINAR**

**Teaching Scheme: P: 4hrs/week**

**Credit: 2**

The students shall deliver seminar (of 15 to 20 minutes) and submit the seminar reports to the staff member on technical subjects during the semester. The assessment of the seminar work shall be done by group of 3 faculty members and based on the: -

1. Attendance to the seminar
2. Performance of the seminar delivery
3. Seminar reports and
4. Asking and answering questions during the seminars.

The staff member/members shall guide the students in:

1. Selecting the seminar topic.
2. Information retrieval (literature survey)
  - a) Source of Information i.e. names of the journals, reports, books etc.
  - b) Searching for the information i.e. referring to chemical abstracts etc.
3. Preparing the seminar report
4. Delivering the seminar



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**Third Year B. Tech (CIVIL ENGINEERING) (Semester V)**

**AUDIT COURSE II**

**AC 312 RESEARCH METHODOLOGY**

<b>Teaching Scheme: P: 2hrs/week</b>	<b>No Credits</b>
<b>UNIT 1 Introduction to Research Methodology</b>	<b>4 hrs</b>
Objective of Research, Types of Research, Research Methods and Methodology, Scientific method of Research, Research Process	
<b>UNIT 2 Research Problem</b>	<b>4 hrs</b>
Research Problem and Selection of Research Problem, Need for defining the Problem, Techniques for defining a Problem, Development of hypothesis	
<b>UNIT 3 Research Design</b>	<b>4 hrs</b>
Meaning and Need of Research Design , Features of a good Research Design, Types of Research Design-Exploratory, Descriptive and Experimental Research	
<b>UNIT 4 Referencing Information Sources</b>	<b>4 hrs</b>
Using secondary sources of information: using an Encyclopedia, bibliography card, Translation card catalogue information, periodic indexes and usage, compiling a preliminary bibliography; Referencing documentation sources: styles of footnotes, endnotes etc., model bibliography entries	
<b>UNIT 5 Sampling Design</b>	<b>4 hrs</b>
Census and Sample survey, Implication of Sample design, Steps in Sampling Characteristics of a good Sample design, Types of Sample design	
<b>UNIT 6 Scaling Techniques and Data Collection</b>	<b>3 hrs</b>
Attitude Measurement and Measurement in Research, Measurement Scales, Scaling, Scale Classification Bases, Concept of important Scaling Techniques; Data Collection: Primary and Secondary data, Observation Method, Survey Method, Collection of data through Questionnaire and Schedule distinction, Selection of appropriate method of Data Collection	
<b>UNIT 7 Processing Operations and Report Writing</b>	<b>3 hrs</b>



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Processing Operations, Problem in Processing, Types of Analysis, Application of some Multivariate tools of data analysis

Report Writing: Writing and Formulating of Reports, Steps in Report Writing, Types of Report

### **References Books:**

1. Bhattachary D.K., “Research Methodology”, Excel Books
2. Goodday and Hack, “Research Methodology”
3. Kothari C.R., “Research Methodology”, New Age International (P) Ltd.



Shivaji University, Kolhapur  
**Department of Technology**

**Third Year B. Tech (CIVIL ENGINEERING) (Semester VI)**

**CE 321 THEORY OF STRUCTURES – II**

**Teaching Scheme: L: 3 hrs/week**

**Credits: 4**

**: T: 1 hrs/week**

**UNIT 1**

**9 hrs**

Analysis of indeterminate Structures by Displacement Methods

A) Slope deflection method

B) Moment distribution method

Applications to non sway and sway frames

**UNIT 2**

**8 hrs**

Flexibility method of analysis: Matrix Formulation, Application to beams, pin-jointed plane trusses, and rectangular plane frames.

**UNIT 3**

**9 hrs**

Stiffness methods of analysis: Formulation of stiffness matrix. Applications to beams, pin jointed plane trusses and rigid jointed rectangular plane frames.

**UNIT 4**

**9 hrs**

**Influence lines**

Basic Concept of Influence lines, construction of Influence line diagrams for support reactions, SF and BM at a given section of beam. Application of Muller-Breslau's principle, Maximum Influence at a point due to series of concentrated load, Absolute Maximum shear and moment, Influence lines for trusses.

**UNIT 5**

**8 hrs**

Arches – Linear, Parabolic arch. Three hinged and two hinged arches, Influence Lines

**UNIT 6**

**9 hrs**

Approximate methods of analysis of multistoried, multi bay rigid jointed frames.

(i) Portal method (ii) Cantilever method

**References Books:**

1. Pandit-Gupta, “Matrix Methods of Structural Analysis”, Tata McGraw Hill Publication
2. Pandit and Gupta, “Theory of Structures”, Tata McGraw Hill Publication
3. Negi and Jangid, “Structural Analysis”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2004, 2<sup>nd</sup> Edition.
4. Vazirani and Ratwani, “Analysis of Structures (Vol. II)”, Khanna Publication, Delhi, 2002, 17<sup>th</sup> Edition.
5. Reddy C. S., “Basic Structural Analysis”, Tata McGraw Hill Publication Company Ltd., 2001, 2<sup>nd</sup> Edition.
6. Pandit and Gupta, “Structural Analysis - Matrix Approach”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2004, 4<sup>th</sup> Edition.
7. Gere and Weaver, “Matrix Analysis of Structures”, , CBS Publishers, New Delhi, 1990, 3<sup>rd</sup> Edition.
8. Junnarkar S.B., “Mechanics of Structures (Vol. II)”, Charator Book Publishing House.
9. West H.H. and Geschwindner L.F., “Fundamentals of Structural Analysis”, Wiley, 2007, 2<sup>nd</sup> Edition.
10. Hibbeler R.C., “Structural Analysis”, Pearson Education India, 2005, 5<sup>th</sup> Edition.
11. Norris C.H., Wilbur J.B. and Utku S., “Elementary Structural Analysis”, McGraw-Hill, 1990.
12. Timoshenko and Young, “Theory of Structures”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1965, 2<sup>nd</sup> Edition.
13. Thadani B.N., “Modern Methods in Structural Mechanics - I”, Asia Publishing House, New Delhi, 1964.
14. Wang C. K., “Indeterminate Structural Analysis”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 1960.



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**Third Year B. Tech (CIVIL ENGINEERING) (Semester VI)**

**CE 322 WATER RESOURCE ENGINEERING - I**

**Teaching Scheme: L: 3 hrs/week**

**Credits: 4**

**T: 1 hr/week**

**UNIT 1 Precipitation**

**6 hrs**

Introduction to Hydrology, Hydrological cycle and application of hydrology.

Precipitation, Types of Precipitation, measurement, analysis of Precipitation data, mass rainfall curves, intensity-duration curves, and concept of depth area duration analysis, frequency analysis. Elementary concepts of evaporation, transpiration, evapotranspiration and infiltration.

**UNIT 2 Stream flow measurement**

**7 hrs**

Selection of site, various methods of discharge measurements

Runoff- Factors affecting runoff, rainfall-runoff relationships, runoff hydrograph, unit hydrograph theory, S-curve hydrograph, synthetic unit hydrograph, use of unit hydrograph.

Floods- Estimation of peak flow, rational formula and other methods, flood frequency analysis, Gumbells method, Design floods.

**UNIT 3 Irrigation**

**6 hrs**

Definition, functions, advantages and necessity. Water requirement of crops, Soil classification, soil moisture and crop water relationship, factors governing consumptive use of water, principal Indian crops, their season and water requirement, agriculture practices. Cropping pattern, calculations of canal capacities.

**UNIT 4 Reservoir planning**

**7 hrs**

Types of developments: Storage and diversion works Purpose : Single and multipurpose, Investigation for locating reservoir, selection of site, estimation of required storage, mass curves, reservoir sedimentation, flood routing, height of dam , reservoir operation, economics of reservoir planning, Benefit-cost ratio.

**UNIT 5 Ground water hydrology**

**7 hrs**

Occurrence and distribution of ground water, specific yield of aquifers, movements of ground water, Darcy's law, permeability, safe yield of basin. Hydraulics of well under steady flow condition in confined and unconfined aquifers, specific capacity of a well, well irrigation: tube wells, open wells.

**UNIT 6**

**6 hrs**

**Water logging and drainage**

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

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

Application of water- Water management and distribution, warabandi, rotational application.

Various Methods of Assessment of canal Revenue

**Reference Books:**

1. Asawa, G.L., "Irrigation Engineering", New Age International Publishers
2. Birdie G.S. and Das, "Irrigation Engineering", Dhanpat Rai Publishing Company (P) Ltd. Delhi
3. Basak N.N., "Irrigation Engineering", Tata McGraw-Hill Publishing Co.
4. Dilip Kumar Majumdar, "Irrigation Water Management (Principles and Practices)", Prentice Hall of India (P), Ltd.
5. Dr. Modi P.N., "Water Recourses Engineering and Water Power Engineering".
6. Dr. Punmia B.C, Dr. Pande, "Irrigation Water Power Engineering".
7. Holy Milos, "Irrigation Structures", C.B.I.P.
8. Michael, "Irrigation theory and Practice", Vikas Publication House.
9. Murthy JVS, "Watershed Management in India", Wiley eastern, Delhi
10. Subramanyam K., "Engineering hydrology", Tata McGraw Hill P. N. Modi, "Irrigation, water resources and water power Engineering", Standard book House.
11. Gerg S.K., "Irrigation Engineering", , Khanna publisher, Delhi
12. Sharma R.K., "Hydrology and Water Recourses", Dhanpatrai and sons Delhi
13. Sing Jaspal, Acharya M.S, "Water management", Himanshu Publication.
14. Varshney, "Theory Design of Irrigation Structures", Vol. I, II, III, Gupta Nemechand and brothers.



Shivaji University, Kolhapur  
**Department of Technology**

**Third Year B. Tech (CIVIL ENGINEERING) (Semester VI)**

**CE 323 TRANSPORTATION ENGINEERING - II**

**Teaching Scheme: L: 3 hrs/week**

**Credits: 3**

**RAILWAY ENGINEERING**

**UNIT 1**

**4 hrs**

Introduction

History of Indian Railways, Component parts of railway track, recent development in railways specifically w.r.t. track structure, Organizational structure of Indian railways, railway lines classification based on speeds such as A,B,C,D,E,Q,R and S routes.

Permanent way Component Parts

Types of rail sections, Coning of wheels, Rail creep, Rail defects, Rail joints, welding of rails, short welded rail (SWR), long welded rail (LWR) and continuously welded rail (CWR), sleepers requirement, Sleeper density, spacing, and types, Rail fittings, Elastic fastenings, bearing plates, anti-creep devices, check and guard rails, Ballast requirements and specification,

Formation, Different cross sections of Track in cutting and embankment, suitability of drainage.

**UNIT 2**

**4 hrs**

Geometric Design

Necessity, types of Gradients, curves, Grade Compensation on curves, Alignment, Super elevation, Equilibrium cant; and cant deficiency, speed on curves, safe speed on curves using

Indian railway formula only for fully transitioned curves. gauge widening.

Points, crossing and turnouts

Functions, various types of track junction and their configurations, Listing of types of Turnouts.

Signaling and Interlocking

Objects, classification, control of train movements and monitoring, types of signals, principal of interlocking, Modernization in Railways and railway tracks, High speed tracks.

**TUNNELING**

**UNIT 3**

**9 hrs**

General Introduction about Tunnels

## Shivaji University, Kolhapur – Syllabus w. e. f. 2014-15

Advantages and disadvantages of tunnel with respect to open cuts. Geotechnical Exploration for tunnels and its importance.

Tunnel surveying

Surface surveys, Transferring centerline, Setting out and Transfer of Levels. Underground. Criteria for Selection of size and shape of tunnels, Factors affecting the methods of Tunneling.

Driving Tunnels in Soft ground

General, Characteristics of soft ground, Needle beam method, and 'NATM' method of Tunneling

### **UNIT 4**

**9 hrs**

Driving tunnels in hard ground

Sequence of operation and typical distribution of time for each operations, Meaning of the term 'Faces of Attack', Drill blast method of tunneling for hard strata, Different patterns of drilling.

Blasting and explosives

Meaning of the terms, types of explosives, method of blasting in brief.

Ventilation

Meaning of the term, requirements a ventilating system, Methods of ventilation with advantages and disadvantages. Lighting and aspects of drainage in brief. Method of supporting roof consisting of shot creating. Cement grouting, rock bolting, Cast in-situ and precast lining.

### **DOCKS AND HARBOUR**

#### **UNIT 5**

**6 hrs**

Introduction, Definition of the terms associated with docks and harbour, Requirements of harbour and port, classification of harbours with examples. Factors affecting growth of port, Major Ports in India and abroad, Planning a Port, Selection of ideal location of harbour, Introduction to dredging

#### **UNIT 6**

**7 hrs**

Breakwater and materials of construction for breakwater, Introduction to design of break waters, Dock, Bulkhead and Sea Walls, Design Considerations and Construction Materials, Revetments, Water front structures, Wharves, Jetty, Dolphins, Different types of dock fenders, Uses of wet docks and Dry/ Repair docks. Port facilities, Transit sheds and warehouses.

**Reference Books**

1. Arora S. P. and Saxena S. C., “A Textbook of Railway Engineering”, Dhanpat Rai Publicatins Pvt. Ltd, 2006, 7th Edition.
2. Rangwala S. C., “Principles of Railway Engineering”, CBS Publishers, 1965, 2<sup>nd</sup> Edition.
3. Saxena S.C., Arora, “A Textbook of Railway Engineering”, Dhanpat Rai and Sons, Delhi.
4. Mundrey J.S., “Railways Track Engineering”, Tata Mcgraw Hill, New Delhi.
5. Saxena Subhash C., “Tunnel Engineering”, Dhanpat Rai and Sons, New Delhi.
6. Vazirani V.N. and Chandola S.P., “Transportation Engineering Volume 1”.
7. Mathur G. N. and Chawla A. B., “Productivity and Speed Tunneling”, CBIP, 2003, 1st Edition.
8. Megaw T. M. and Bartlett J., “Tunnels Planning, Design, Construction”, EHJW, 1983, 1st Edition.
9. Murthy G. V., “Tunnels and Elements of Docks and Harbours”.
10. Saxena S. C., “Tunnel Engineering”, Dhanpat Rai and Sons, 1984, 1st Edition.
11. Bindra S. P., “Dock and Harbour Engineering”, Dhanpat Rai Publications, 1979, 1<sup>st</sup> Edition.
12. Coaster Engineering Manuals Volume I and II, US Army Corps of Engineers, Vicksburg
13. Oza H. P. and Oza G.H., “Dock and Harbour Engineering”, Charotar Publishing House, 1999, 4<sup>th</sup> Edition.
14. Quinn, “Planning and construction of Docks and Harbours”, Tata McGraw Hill, Latest Edition





Shivaji University, Kolhapur  
**Department of Technology**

**Third Year B. Tech (CIVIL ENGINEERING) (Semester VI)**

**CE 324 ENVIRONMENTAL ENGINEERING - II**

**Teaching Scheme: L: 3 hrs/week**

**Credits: 3**

**UNIT 1**

**7 hrs**

**Introduction**

Objective, Basic design considerations like Engineering, Environmental, process and cost, flow diagrams, design period, population Forecasting.

**Characteristics of wastewater**

Physical, Chemical and Biological characteristics.

Waste water sampling and analysis, interpretation and practical Significance of test results. Important microorganisms in wastewater and their importance in wastewater treatment system.

**River Sanitation**

Self-purification of natural streams, Stream standards, effluents Standards, Oxygen Sag Curve.

**UNIT 2**

**6 hrs**

**Sewerage Flow**

Sources of sewage, Variations in sewage flow, storm-water runoff, ground water infiltration.

Design of sanitary sewers, Minimum size of sewer, velocities in sewers and gradient of sewers.

Sewer appurtenances i.e. manholes, street inlets, flushing devices, Vent pipes etc.

Pumping of sewage, types of pumps for sewage pumping.

**UNIT 3**

**7 hrs**

**Wastewater Treatment**

Theory and design of primary treatment UNITS.

**Screens:** Types of screens, design of screen chamber, disposal of Screenings.

**Grit Chamber:** Sources of grit, velocity control in grit chamber, design of grit chambers including proportional flow weir, disposal of grit,

Sources of oil and grease, importance of removal, methods of oil and grease removal, design of skimming tanks.

**Primary Sedimentation:** Necessity, design of PST with inlet and outlet details,

Primary Sludge and its disposal

**UNIT 4**

**6 hrs**

**Theory and Design of Aerobic Secondary Treatment UNITS**

**Activated sludge Process:** Biological principle, modification of ASP, sludge volume index, sludge bulking and control.

**Trickling filter:** Biological principle, different T.F. And their characteristics, Design of standard rate or High rate filters, single stage and two stage filters, Recirculation, Ventilation, Operational problems, Control measure, Rotating Biological Contactor.

**Low Cost Treatment methods:** Oxidation pond Bacteria - algae symbiosis, design of oxidation pond as per Altitudes, disposal of pond effluent, Advantages and Disadvantages of oxidation ponds. Aerated Lagoons: Principle, aeration method, Advantages and Disadvantages of A. L. Oxidation Ditches: Principle, advantages and Disadvantages. Effluent disposal and reuse, disposal into water bodies, sewage farming, ground water recharge etc.

**UNIT 5**

**7 hrs**

**Theory and Design of Anaerobic Treatment Units**

Septic tanks, suitable conditions and situations, biological Principle, method of treatment and disposal of septic Tank effluent.

Anaerobic Digester, principle of anaerobic digestion, Stages of digestion, Bio-gas production, its Characteristics and application, Factors governing Anaerobic digestion, Sludge disposal methods, advantages and disadvantages

**UNIT 6**

**6 hrs**

**Emerging Technologies for Waste Water Treatment**

Centralized sewage treatment systems, Consequences of centralized wastewater treatment, Objectives of small and decentralized wastewater treatment systems

Advantages of Decentralized Wastewater Treatment, Applications of decentralized wastewater management to:

- a) Root zone Technology Principle, types of plants used, advantages, disadvantages
- b) Constructed wastelands process description, advantages and disadvantages
- c) Duckweed ponds process description, advantages and disadvantages
- d) Fluidized aerobic bed technology Principle, process description, advantages Disadvantages
- e) Up flow sludge Blanket Reactors (UASBR) - Principle, design, advantages and disadvantages

**Reference Books**

1. Bhide, A.D., and Sunderasen B.B., “Solid Waste Management in Developing Countries”, Indian National Scientific Documentation Centre, New Delhi, 1998.
2. Canter, “Environmental Impact Assessment”, TMH Publication, 2000.
3. Hammer and Hammer, “Water and Wastewater Technology”, Prentice Hall Publication, 2008
4. Garg S. K, “Sewage Disposal and Air Pollution Engineering”, Khanna Publishers, 2000.
5. Garg S.K., “Wastewater Engineering”, Khanna publication, 2000
6. Gray N. F., “Water Technology”, Butterworth-Heinamann, 2002
7. Masters G. M., “Introduction to Environmental Engineering and Science”, 2004.
8. Metcalf and Eddy, “Waste Water Engineering Treatment and Disposal”, Tata McGraw-Hill Publication, 2003.
9. Peavy H. S., Rowe D. R., and Tchobanoglous, “Environmental Engineering”, McGraw-Hill Book Company, 1985.
10. Rao M.N. and Rao H.V.N., “Air Pollution”, Tata McGraw Hill, 2006.
11. Rao P. V., “Environmental Engineering – II”, Tata McGraw Hill Publication, 2003
12. Soli J. Arceivala, “Wastewater Treatment For Pollution Control”, 1999
13. Viessman W. and Hammer M. J, “Water Supply and Pollution Control”, Harper Collins College Publishers, 1993.
14. Manual on sewerage and sewage Treatment published by Ministry of Urban Development Govt. of India Msy-2000. 35 PDOP-4-59-85-97, Ministry of Urban development
15. “Manual on Municipal Solid Waste and Management”, Government of India Publication, 2000.



Shivaji University, Kolhapur  
**Department of Technology**

**Third Year B. Tech (CIVIL ENGINEERING) (Semester VI)**

**CE 325 GEOTECHNICAL ENGINEERING - II**

**Teaching Scheme: L: 3 hrs/week**

**Credits: 3**

**UNIT 1**

**6 hrs**

**Introduction**

Functions of substructure, Common Types of foundations viz. shallow and deep foundations, isolated and combined footings, raft, pile, well foundations. suitability and applications.

Minimum depth of footing, effect of surcharge load on foundations, allowable soil pressure, serviceability requirements

**UNIT 2**

**7 hrs**

**Soil Exploration**

Purpose, importance, methods of soil exploration, subsurface exploration, trial pits, boring: method of borings. Number of boreholes, depth and spacing of boreholes, types of test to suit the soil conditions, Location of water table, Sampling: Disturbed And Undisturbed Samples, Field tests: SPT, DCPT, SCPT, pressure-meter test, plate load test, field vane shear test.

**UNIT 3**

**6 hrs**

**Consolidation**

Spring analogy, Terzaghi's theory of one dimensional consolidation, Lab consolidation test, determination of consolidation parameters viz.  $c_c$ ,  $c_v$ ,  $m_v$  and  $a_v$ . Square root and logarithm of time fitting method. Rate of settlement, normally and over consolidated soils, Determination of pre consolidation pressure, Evaluation of consolidation settlement.

**UNIT 4**

**7 hrs**

**Shallow Foundation**

**a) Bearing Capacity**

Terzaghi's bearing capacity analysis, Meyerhoff, Hansen's and basic equations for strip, rectangular and round footing, effect of various BC factor on bearing capacity,

Use of field test (SPT and Plate Load) data for bearing capacity determination, bearing capacity of rocks, RQD concept,

**b)Settlement**

Total and differential settlement, Tolerable settlement, IS Criteria, Concept of pressure bulb.

Slope Stability: Stability of finite slopes- slip circle method, Semi graphical and graphical methods, location of critical slip circle center, Friction circle method , , Stability number concept and its use.

**c) Design of Shallow Foundation**

Concept of isolated and floating foundation, Raft foundation.

**UNIT 5**

**7 hrs**

**File Foundation**

Pile classification, Carrying capacity of pile, static and dynamic methods, pile load test, group action, Rigid block method, Negative skin friction, Settlement of single and group of piles.

**UNIT 6**

**6 hrs**

**Well Foundation and Caissons**

Element of wells, types, methods of construction, tilt and shift, remedial measures,

Pneumatic caissons: Caisson disease.

Sheet Piles: Classification, Design of cantilever sheet pile in cohesionless and cohesive soils. Design of anchored sheet pile by free earth support method. Cellular Cofferdams: Types, cell fill stability considerations.

**Reference Books:**

1. Arora, “Soil Mechanics and Foundation Engineering”, Standard Publishers and Distributors
2. Bowles J. E., “Foundation Analysis and Design”, McGraw-Hill International.
3. Dass B. M., “Foundation Engineering”,
4. Dr. Kasmalkar B. J., “Foundation Engineering”
5. Punmia B.C., “Soil Mechanics and Foundation Engineering”, Laxmi Publications
6. Nayak N. V., “Foundation Design Manual”.
7. Ranjan Gopal and Rao A. S., “Basic and Applied Soil Mechanics”,

Shivaji University, Kolhapur

**Department of Technology**

**Third Year B. Tech (CIVIL ENGINEERING) (Semester VI)**

**Laboratory-III**

**CE 326 GEOTECHNICAL ENGINEERING -II**



**Teaching Scheme: P: 2hrs/week**

**Credit: 1**

- a) Visit to foundation construction sites and preparation of the report.
- b) Design Problem-
  1. Bearing capacity calculation by various method and settlement calculations
  2. Design of shallow foundation
  3. Pile and Pile group
  4. Cantilever sheet pile
  5. Stability analysis



Shivaji University, Kolhapur  
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**Third Year B. Tech (CIVIL ENGINEERING) (Semester VI)**

**Laboratory-II**

**CE 327 ENVIRONMENTAL ENGINEERING –II**

**Teaching Scheme: P: 2hrs/week**

**Credit: 1**

**I) Laboratory Experiments to be conducted for the Determination of (Any Eight)**

1. Dissolved Oxygen
2. Biochemical Oxygen Demand
3. Chemical Oxygen Demand
4. Different Forms of Solids
5. Sludge Volume Index
6. Conductivity and Dissolved Salt Concentration
7. Phosphate
8. Nitrates
9. Heavy Metals
10. Study of Various types of Micro Organisms

**II) Site visit to Wastewater Treatment Plant and Visit Report**

**III) Design of various components of wastewater treatment plant**

**IV) Study of Software or programming for analysis of wastewater collection System or programming for design of wastewater treatment units.**



Shivaji University, Kolhapur  
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**Third Year B. Tech (CIVIL ENGINEERING) (Semester VI)**  
**CE 328 STRUCTURAL DESIGN AND DRAWING -I**

**Teaching Scheme: P: 4 hrs/week**

**Credit: 2**

**The laboratory work should include the following:**

- A. Design of any ONE structure as per IS 800- 2007
  - 1. Industrial building with roof supported by steel trusses.
  - 2. Pedestrian bridge
  - 3. Design of Pre Engineered Building
- B. Design of any ONE structure
  - 1. Design of continuous beams using plastic analysis as per SP:6
  - 2. Design of plate girder (welded)

The Report should include

- 1. Brief Technical design project report involving
  - Introduction, assumptions, load calculations, analysis, must be using suitable software (such as STAAD.PRO, STRUD, ETABS, SAP, etc.) and detailed design.
- 2. Drawings
  - Structural plan and detailed structural drawings using AUTOCAD/other software
- 3. Report of a site visit mentioning structural details with relevant sketches of structural connections.





Shivaji University, Kolhapur  
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**Third Year B. Tech (CIVIL ENGINEERING) (Semester VI)**

**CE 329 MINI PROJECT**

**Teaching Scheme: P: 4hrs/week**

**Credit: 2**

The purpose of this particular exercise is to promote self-study, critical thinking and independent research ability. Students have to initiate their own small conceptual or practical based projects individually or as a team of no more than 2 members. While making this exercise it is expected that the knowledge acquired by them through Research Methodology subject is applied by them

Carrying out mini project work will certainly help the students to for satisfactory and successful complete their major project in the final year.

**Project Completion and Assessment**

A 15 to 20-pages report is to be written upon completion of the activity. For team projects, each member has to write his own report. The report should include academic content such as the background, objectives, product/system description, the work done, the achievements and difficulties encountered.

The students will deliver a seminar and will make the demonstration of their work.



Shivaji University, Kolhapur  
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**Third Year B. Tech (CIVIL ENGINEERING) (Semester VI)**

**AUDIT CORSE III**

**AC 323 PRESENTATION AND COMMUNICATION TECHNIQUES**

**Teaching Scheme: P: 2hrs/week**

**No Credits**

**UNIT 1 Communication in a Business Organization**

**5 hrs**

Internal (Upward, Downward, Horizontal, Grapevine, Problems, Solutions) External Communication, Strategies for conducting successful business meetings, documentation (notice, agenda minutes) of meetings. Introduction to modern communication techniques (for e.g. e-mail, internet, video conferencing etc), Legal and ethical issues in communication (intellectual property rights, patents)

**UNIT 2 Advanced Technical Writing**

**5 hrs**

- a. Report – Writing and presentation: Definition and importance of reports. Qualities of Reports, language and style in reports, type of reports, formats (letter, memo, and project- reports), and methods of compiling data. Computer-aids
- b. Technical Paper Writing
- c. Writing Proposals

**UNIT 3 Interpersonal Skills**

**5 hrs**

Introduction to emotional intelligence, Motivation, Negotiation and conflict-resolution Assertiveness, Leadership, Team-building, Decision-making, And Time-management.

**UNIT 4 Interview Techniques**

**5 hrs**

Preparing for job interviews, verbal and non-verbal communication during interview. Observation sessions and role-play techniques may be used to demonstrate interview strategies.

**UNIT 5 Group Discussion**

**5 hrs**

Dynamics of Group Behaviour, Techniques for effective participation.

**Assignments:**

**a) Written**

1. Assignments on Communication topics
2. Assignments on Report writing

3. Assignments on Interpersonal Skills

b) **One class test**

- c) **Oral:** Practical sessions on Group-discussion / Interview Skills /Project Presentation / Power point Presentation.

**Reference Books:**

**A. For classroom teaching**

- (i) Fred Luthans, ‘ Organizational Behavior’ McGraw Hill International Edition
- (ii) Lesiker and Petit ‘Report writing For Business’ McGraw Hill International Edition
- (iii) Huckin and Olsen ‘Technical Writing and Professional Communication’ – McGraw Hill International Edition
- (iv) Wallace and Masters ‘Personal Development for life and Work’ (workbook) Thomson Learning
- (v) Herta Murphy ‘Effective Business Communication’ Herta Murphy Herbutwhildebraudt- McGraw Hill

**B. For Additional Reading:**

- (i) Lewicki, Saunders, Minton ‘Essential of Negotiation’ McGraw Hill International Edition
- (ii) Hartman Lemay ‘Presentation Success’ Thomson learning.
- (iii) Kitty O Locker and Kaczmark – ‘Business Communication Building Critical Skills’ McGraw Hill
- (iv) Vikas Gupta:Comdex Computer Course Kit, IDG Books Pvt, Ltd.
- (v) Heller and Handle: The Essential Manager’s Manual – Dorleen Kindercey
- (vi) The Sunday Times ‘Creating Success Series’
  - 1. Develop your Assertiveness
  - 2. Make every Minute Count
  - 3. Successful Presentation Skills
  - 4. How to motivate people
  - 5. Team building.