

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



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 | Theory of Structure-II | 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 | - | - | - |
| Total | | | 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 | Water Resource Engineering -I | 3 | 1 | - | 4 |
| 2 | CE 322 | Transportation Engineering –II | 3 | - | - | 3 |
| 3 | CE 323 | Environmental Engineering-II | 3 | - | - | 3 |
| 4 | CE 324 | Geotechnical Engineering- II | 3 | - | - | 3 |
| 5 | CE 325 | Design of Steel Structures | 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 | - | - | - |
| Total | | | 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 VIIth 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 THEORY OF STRUCTURES – II

**Teaching Scheme: L: 3 hrs/week
: T: 1 hrs/week**

Credits: 4

UNIT 1

7 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

6 hrs

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

UNIT 3

7 hrs

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

UNIT 4

6 hrs

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

UNIT 5

7 hrs

Finite difference method – Backward, central, forward differences, application to deflection of beams, column buckling.

UNIT 6

6 hrs

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

(i) Portal method (ii) Cantilever method

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

References Books:

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



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Department of Technology

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”, 8th Edition, 2001, Nem Chand and Bros, Roorkee(U.A)
3. Khanna S. K., Justo C. E. G., “Highway Material Testing”, 8th 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, 1st 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

Department of Technology

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. Murthy V. N. S., “ Soil Mechanics and Foundation Engineering”,
2. Raj Purushothma, “ Geotechnical Engineering”,
3. Punmia B. C., “Soil Mechanics and Foundation Engineering”
4. Dr Kasmalkar B. J., “Geotechnical Engineering”
5. Bowles J. E., “Engineering Properties Of Soils And Their Measurements”,
6. Lambe and Whitman, “Soil Mechanics” (VI Version),
7. Coduto D. and Donald P., “Geotechnical Engineering Principle and practice”, PHI
8. Ranjan G. and Rao A.S., “Basic and Applied Soil Mechanics”,



Department of Technology

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 & 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.



Shivaji University, Kolhapur

Department of Technology

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. Centifuge 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

| Teaching Scheme: P: 2hrs/week | No Credits |
|--|--------------|
| UNIT 1 Introduction to Research Methodology | 4 hrs |
| Objective of Research, Types of Research, Research Methods and Methodology, Scientific method of Research, Research Process | |
| UNIT 2 Research Problem | 4 hrs |
| Research Problem and Selection of Research Problem, Need for defining the Problem, Techniques for defining a Problem, Development of hypothesis | |
| UNIT 3 Research Design | 4 hrs |
| Meaning and Need of Research Design , Features of a good Research Design, Types of Research Design-Exploratory, Descriptive and Experimental Research | |
| UNIT 4 Referencing Information Sources | 4 hrs |
| 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 | |
| UNIT 5 Sampling Design | 4 hrs |
| Census and Sample survey, Implication of Sample design, Steps in Sampling Characteristics of a good Sample design, Types of Sample design | |
| UNIT 6 Scaling Techniques & Data Collection | 3 hrs |
| 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 | |

UNIT 7 Processing Operations and Report Writing

3 hrs

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



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

CE 321 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. & 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 & 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 322 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) & 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 & embankment, suitability of drainage.

UNIT 2

4 hrs

Geometric Design

Necessity, types of Gradients, curves, Grade Compensation on curves, Alignment, Super elevation, Equilibrium cant; & 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 & their configurations, Listing of types of Turnouts.

Signaling & 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

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, 2nd Edition.
3. Saxena S.C., Arora, “A Textbook of Railway Engineering”, Dhanpat Rai & Sons, Delhi.
4. Mundrey J.S., “Railways Track Engineering”, Tata Mcgraw Hill, New Delhi.
5. Saxena Subhash C., “Tunnel Engineering”, Dhanpat Rai & 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, 1st 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, 4th 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 323 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. Manual on sewerage & sewage Treatment published by Ministry of Urban Development Govt. of India Msy-2000. 35 PDOP-4-59-85-97, Ministry of Urban development
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. Bhide, A.D., and Sunderasen B.B., “Solid Waste Management in Developing Countries”, Indian National Scientific Documentation Centre, New Delhi, 1998.
15. “Manual on Municipal Solid Waste and Management”, Government of India Publication, 2000.



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

CE 324 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

10 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.

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

3 hrs

Well Foundation and Caissons

Element of wells, types, methods of construction, tilt and shift, remedial measures, Pneumatic caissons: Caisson disease.

Reference Books:

1. Arora, “Soil Mechanics and Foundation Engineering”
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”
6. Nayak N. V., “Foundation Design Manua”.
7. Ranjan Gopal and Rao A. S., “Basic and Applied Soil Mechanics”,



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

CE 325 DESIGN OF STEEL STRUCTURES

Teaching Scheme: L: 3 hrs/week

Credits: 3

UNIT 1

6 hrs

Introduction to structural design, Structural systems, Roll 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. Codes and specifications. Design philosophies, Limit state method.

UNIT 2

7 hrs

i) Bolted connections: Behavior of bolted joints. Design strength of ordinary black bolts, Design strength of ordinary black bolts, Design of simple connections, Beam to beam, beam to column, framed connections.
ii) Welded connections: Types and properties of welds, Types of joints, Effective areas of welds, Design of simple connections, Beam to beam, beam to column, framed connections.

UNIT 3

6 hrs

Design of Tension members: Types of tension members, Slenderness ratio, Behavior of tension members, Modes of failure, Design of angle sections for tension.

UNIT 4

7 hrs

Design of Compression Members: Behavior of compression members, Modes of failure, Classification of cross section, Effective length of compression members, Design strength, Compression members in trusses, Design of columns subjected to axial loads, Laced and Battened columns. Column bases: Slab base and Gusseted base.

UNIT 5

6 hrs

Plastic theory: Plastic hinge concept, Plastic collapse load, Plastic moment, Shape factor, Plastic section modulus. Design of beams: Laterally restrained and unrestrained simply-supported beams. Design of compound beams. Curtailment of flange plates.

UNIT 6

7 hrs

Design of Roofing for an industrial building: Roofing materials, Types of trusses, Loading on roof trusses, Analysis of trusses, Design of various members of roof trusses, Design concept of Foot-over Bridge.

Introduction to Limit State Method

General, Material properties, Partial safety factors, General requirements of design, Design of Tension Members and Compression Members with reference to IS 800:2007 and comparison with Working Stress Method.

Reference Books

1. Arya A.S. and Ajamani J.L., “Design of Steel Structures”, Nemchand and Brothers, Roorkee, 1996, 2nd Edition.
2. Dayaratnam, “Design of Steel Structures”, Wheeler Publishing, New Delhi, 2006, 3rd Edition.
3. Duggal S. K., “Design of Steel Structures”, Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 2008, 3rd Edition.
4. Gaylord E.H. and Gaylord C.N., “Design of Steel Structures”, Mc Graw Hill, New York, 2008, 3rd Edition.
5. Lothers J. E., “Design in Structural Steel Vol-I”, Prentice Hall New Jersey.
6. Punmia B.C., Jain & Jain, “Design of Steel Structures”, Laxmi Publication, New Delhi, 2008, 2nd Edition.
7. Ram Chandra, “Design of Steel Structures, Vol - I & Vol – II”, Standard Book House, New Delhi, 2007, 2nd Edition.
8. Subramanian N., “Design of Steel Structures”, Oxford University Press, New Delhi, 2008, 2nd Edition.
9. Vazirani & Ratwani, “Design of Steel Structures”, Mc Graw Hill, New York, 2000, 2nd Edition.
10. Salmon C.G. and Johnson J.E., “Steel Structures: Design and Behaviour”, Harper and Row, New York, 1995.
11. “Teaching Resource in Design of Steel Structures”, IIT Madras, SERC Madras, Anna Univ., INSDAG, 2007.



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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.

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

Laboratory-III

CE 328 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

- c) Field test for finding bearing capacity of soil



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**Third Year B. Tech (CIVIL ENGINEERING) (Semester VI)
CE 326 STRUCTURAL DESIGN AND DRAWING -I**

Teaching Scheme: P: 4 hrs/week

Credit: 2

The laboratory work should include the following:

Design of an industrial building with mezzanine floor which should include the following:

1. Design of roof truss (Analysis may be carried out using commercial software)
2. Design of purlins
3. Design of connections
4. Design of beams
5. Design of columns
6. Design of base
7. Design of beam to beam and beam to column connections
8. Detail design report
9. Drawing of the above elements on half imperial size drawing sheets

(AUTOCAD may be used)

Report of a site visit mentioning structural details with relevant sketches of structural connections.



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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 & 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.



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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 & ethical issues in communication (intellectual property rights, patents)

UNIT 2 Advanced Technical Writing

5 hrs

- 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
- Technical Paper Writing
- 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 & Kaczmark – 'Business Communication Building Critical Skills' McGraw Hill
- (iv) Vikas Gupta: Comdex Computer Course Kit, IDG Books Pvt, Ltd.
- (v) Heller & 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.