# JAYPEE UNIVERSITY OF ENGINEERING AND TECHNOLOGY, GUNA

# PROPOSED
# DIPLOMA PROGRAMME IN CIVIL ENGINEERING

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**COURSE CURRICULUM**

**(EFFECTIVE FROM ACADEMIC YEAR 2024 - 25)**

DEPARTMENT OF CIVIL ENGINEERING
JAYPEE UNIVERSITY OF ENGINEERING & TECHNOLOGY
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**DIPLOMA IN CIVIL ENGINEERING**
**Proposed Course Structure for 120 Credits (WEF July 2024)**

**FIRST SEMESTER**

| | | | Contact Hour | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | | **Subject Name** | **L** | **T** | **P** | **Total** | **Credits** |
| 1 | DMA101 | Mathematics-I | 2 | 1 | 0 | 3 | 3 |
| 2 | DPH101 | Applied Physics-I | 2 | 1 | 0 | 3 | 3 |
| 3 | DCH101 | Applied Chemistry | 2 | 1 | 0 | 3 | 3 |
| 4 | DHS101 | Communication Skills in English | 2 | 0 | 0 | 2 | 2 |
| 5 | DCE201 | Engineering Graphics | 0 | 0 | 3 | 3 | 1.5 |
| 6 | DME201 | Engineering Workshop Practice | 0 | 0 | 3 | 3 | 1.5 |
| 7 | DPH201 | Applied Physics-I Lab | 0 | 0 | 2 | 2 | 1 |
| 8 | DCH201 | Applied Chemistry Lab | 0 | 0 | 2 | 2 | 1 |
| 9 | DGE201 | Introduction to Computers | 0 | 0 | 2 | 2 | 1 |
| 10 | DHS201 | Communication Skills in English Lab | 0 | 0 | 2 | 2 | 1 |
| | | **SUB TOTAL** | | | | **25** | **18** |

**SECOND SEMESTER**

| | | | Contact Hour | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | | **Subject Name** | **L** | **T** | **P** | **Total** | **Credits** |
| 1 | DMA102 | Mathematics-II | 3 | 1 | 0 | 4 | 4 |
| 2 | DPH102 | Applied Physics-II | 2 | 1 | 0 | 3 | 3 |
| 3 | DCS101 | Introduction to IT Systems | 2 | 0 | 0 | 2 | 2 |
| 4 | DEC101 | Fundamentals of Electrical & Electronics Engineering | 2 | 1 | 0 | 3 | 3 |
| 5 | DCE101 | Engineering Mechanics | 2 | 1 | 0 | 3 | 3 |
| 6 | DPH202 | Applied Physics-II Lab | 0 | 0 | 2 | 2 | 1 |
| 7 | DCS201 | Introduction to IT Systems Lab | 0 | 0 | 4 | 4 | 2 |
| 8 | DEC201 | Fundamentals of Electrical & Electronics Engineering Lab | 0 | 0 | 2 | 2 | 1 |
| 9 | DCE202 | Engineering Mechanics Lab | 0 | 0 | 2 | 2 | 1 |
| 10 | DGE001 | Environmental Science | 2 | 0 | 0 | 2 | 0 |
| | | **SUB TOTAL** | | | | **27** | **20** |

**THIRD SEMESTER**

| | | | Contact Hour | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | | **Subject Name** | **L** | **T** | **P** | **Total** | **Credits** |
| 1 | DCE102 | Construction Material | 3 | 0 | 0 | 3 | 3 |
| 2 | DCE103 | Basic Surveying | 2 | 0 | 0 | 2 | 2 |
| 3 | DCE104 | Mechanics of Materials | 2 | 0 | 0 | 2 | 2 |
| 4 | DCE105 | Building Construction | 2 | 0 | 0 | 2 | 2 |
| 5 | DCE106 | Concrete Technology | 2 | 0 | 0 | 2 | 2 |
| 6 | DCE107 | Geotechnical Engineering | 2 | 0 | 0 | 2 | 2 |
| 7 | DCE203 | Construction Material Lab | 0 | 0 | 2 | 2 | 1 |
| 8 | DCE204 | Basic Surveying Lab | 0 | 0 | 2 | 2 | 1 |
| 9 | DCE205 | Mechanics of Materials Lab | 0 | 0 | 2 | 2 | 1 |
| 10 | DCE206 | Concrete Technology Lab | 0 | 0 | 2 | 2 | 1 |
| 11 | DCE207 | Geotechnical Engineering Lab | 0 | 0 | 2 | 2 | 1 |
| 12 | DCEXXX | Summer Internship-I (4 weeks) | 0 | 0 | 0 | 0 | 2 |
| | | **SUB TOTAL** | | | | **23** | **20** |

**FOURTH SEMESTER**

| | | | Contact Hour | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | | **Subject Name** | **L** | **T** | **P** | **Total** | **Credits** |
| 1 | DCE108 | Hydraulics | 2 | 0 | 0 | 2 | 2 |
| 2 | DCE109 | Advanced Surveying | 2 | 0 | 0 | 2 | 2 |
| 3 | DCE110 | Theory of Structure | 2 | 0 | 0 | 2 | 2 |
| 4 | DCE111 | Building Planning and Drawing | 1 | 0 | 0 | 1 | 1 |
| 5 | DCE112 | Water Resource Engineering | 2 | 0 | 0 | 2 | 2 |
| 6 | DCE113 | Transportation Engineering | 2 | 0 | 0 | 2 | 2 |
| 7 | DCE208 | Hydraulics Lab | 0 | 0 | 2 | 2 | 1 |
| 8 | DCE209 | Advanced Surveying Lab | 0 | 0 | 2 | 2 | 1 |
| 9 | DCE210 | Building Planning and Drawing Lab | 0 | 0 | 4 | 4 | 2 |
| 10 | DCE211 | Water Resource Engineering Lab | 0 | 0 | 2 | 2 | 1 |
| 11 | DCE212 | Transportation Engineering Lab | 0 | 0 | 2 | 2 | 1 |
| 12 | DCE3XX | Elective - I | 3 | 0 | 0 | 3 | 3 |
| 13 | DCEXXX | Minor Project | 0 | 0 | 4 | 4 | 2 |
| 14 | DHS001 | Essence of Indian Knowledge and Tradition | 2 | 0 | 0 | 2 | 0 |
| | | **SUB TOTAL** | | | | **32** | **22** |

**FITHTH SEMESTER**

| | | | Contact Hour | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | | **Subject Name** | **L** | **T** | **P** | **Total** | **Credits** |
| 1 | DCE114 | Design of Steel and RCC structure | 3 | 0 | 0 | 3 | 3 |
| 2 | DCE115 | Estimating, Costing and valuation | 2 | 0 | 0 | 2 | 2 |
| 3 | DCE213 | Design of Steel and RCC structure Lab | 0 | 0 | 2 | 2 | 1 |
| 4 | DCE214 | Estimating, Costing and valuation Lab | 0 | 0 | 2 | 2 | 1 |
| 5 | DCE3XX | Elective - II | 3 | 0 | 0 | 3 | 3 |
| 6 | DCE3XX | Elective -III | 3 | 0 | 0 | 3 | 3 |
| 7 | DYYXXX | Open Elective - I | 3 | 0 | 0 | 3 | 3 |
| 8 | DCEXXX | Summer Internship-II (6 weeks) | 0 | 0 | 0 | 0 | 3 |
| 9 | DCEXXX | Major Project - I | 0 | 0 | 2 | 2 | 1 |
| | | **SUB TOTAL** | | | | **20** | **20** |

**SIXTH SEMESTER**

| | | | Contact Hour | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | | **Subject Name** | **L** | **T** | **P** | **Total** | **Credits** |
| 1 | DCE116 | Public Health Engineering | 2 | 0 | 0 | 2 | 2 |
| 2 | DCE215 | Public Health Engineering Lab | 0 | 0 | 2 | 2 | 1 |
| 3 | DCE3XX | Elective - IV | 3 | 0 | 0 | 3 | 3 |
| 4 | DHS102 | Entrepreneurship and Start-ups | 3 | 1 | 0 | 4 | 4 |
| 5 | DYYXXX | Open Elective - II | 3 | 0 | 0 | 3 | 3 |
| 6 | DYYXXX | Open Elective - III | 3 | 0 | 0 | 3 | 3 |
| 7 | DHS002 | Indian Constitution | 2 | 0 | 0 | 2 | 0 |
| 8 | DCEXXX | Major Project - II | 0 | 0 | 6 | 6 | 3 |
| 9 | DCEXXX | Seminar | 1 | 0 | 0 | 1 | 1 |
| | | **SUB TOTAL** | | | | **26** | **20** |

| | |
|---|---|
| **Total Credits for Diploma** | **120** |

| Elective Courses | | | | | | | |
|---|---|---|---|---|---|---|---|
| **S. No.** | | **Subject Name** | **L** | **T** | **P** | **Total** | **Credits** |
| **Elective I (any one to be selected)** | | | | | | | |
| 1 | DCE301 | Precast and Prestressed concrete | 3 | 0 | 0 | 3 | 3 |
| 2 | DCE302 | Construction Management | 3 | 0 | 0 | 3 | 3 |
| 3 | DCE303 | Rural Construction Technology | 3 | 0 | 0 | 3 | 3 |
| **Elective II ( any one to be selected)** | | | | | | | |
| 1 | DCE304 | Traffic Engineering | 3 | 0 | 0 | 3 | 3 |
| 2 | DCE305 | Solid Waste Management | 3 | 0 | 0 | 3 | 3 |
| 3 | DCE306 | Advanced Construction Technology | 3 | 0 | 0 | 3 | 3 |
| **Elective III ( any one to be selected)** | | | | | | | |
| 1 | DCE307 | Pavement Design & maintenance | 3 | 0 | 0 | 3 | 3 |
| 2 | DCE308 | Green Building and Energy Conservation | 3 | 0 | 0 | 3 | 3 |
| 3 | DCE309 | Building Services and Maintenance | 3 | 0 | 0 | 3 | 3 |
| **Elective IV ( any one to be selected)** | | | | | | | |
| 1 | DCE310 | Repairs and Maintenance of Structures | 3 | 0 | 0 | 3 | 3 |
| 2 | DCE311 | Advanced Design of Structures | 3 | 0 | 0 | 3 | 3 |
| 3 | DCE312 | Tendering and Accounts | 3 | 0 | 0 | 3 | 3 |

# FIRST SEMESTER

## Course Description

**Course Name: Mathematics-I** **Course Code: DMA101**
**L-T-P Scheme: 2-1-0** **Credits: 3**

**Objective:** This course is designed to give a comprehensive coverage at an introductory level to the subject of Trigonometry, Differential calculus and Basic elements of algebra.

**Learning Outcomes:**

Course Outcome This course will enable the students to:

**CO1**: Understand and apply concepts of angle measurement, trigonometric ratios and identities, and solve problems involving graphs of trigonometric functions, addition formulas,

sum and product formulas. Develop skills to solve triangles and problems related to height and distance.

**CO2**: Master the techniques for solving quadratic equations and higher degree equations. Understand and apply the concept of partial fractions.

**CO3**: Gain proficiency in understanding and applying concepts of sequence and series, including Arithmetic Progression (AP) and Geometric Progression (GP) series. Apply the binomial theorem in relevant scenarios.

**CO4**: Develop skills in the algebra of matrices, including operations, calculation of determinants, and finding the inverse of matrices. Solve simultaneous equations using matrix methods.

**CO5**: Understand the concepts of vectors and scalars. Apply the dot and cross product of vectors in solving problems.

**CO6**: Create and solve real-world problems using the concepts and techniques including trigonometry, quadratic equations, and vector operations. This includes the ability to model problems, apply appropriate mathematical techniques, and interpret the results.

**Teaching Plan:**

**Unit 1:** Measurement of angles, Trigonometric Ratios and Identities. Graphs of trigonometric Functions, Addition formulas, Sum and product formulas. Solution of triangles, Height and distance.

**Unit 2:** Quadratic equations, Solution of higher degree equations, Partial fractions

**Unit 3:** Sequence and Series, AP and GP series., Binomial theorem.

**Unit 4:** Algebra of matrices, Determinants and inverse of matrices, Solution of simultaneous equations.

**Unit 5:** Vectors and scalars, dot and cross product of vectors and applications.

**Methodology:**

The course will be covered through lectures supported by tutorials. Apart from the discussions on the topics covered in the lectures assignments/ quizzes in the form of questions will also be given..

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Syllabus covered upto Test-1 |

| | | |
|---|---|---|
| Test-2 | 25 Marks | Syllabus covered upto Test-2 |
| Test-3 | 35 Marks | Full Syllabus |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Tutorials, lecture slides and books on mathematics-1 will be available on the JUET server.

**Books**

References:

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi, 2007.

2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 1995.

3. Reena Garg, Engineering Mathematics, Khanna Publishing House, New Delhi (Revised Ed. 2018)

4. V. Sundaram, R. Balasubramanian, K.A. Lakshminarayanan, Engineering Mathematics, 6/e., ViFirst

5. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House,

New Delhi

## Course Description

**Title: Applied Physics-I** **Code: DPH101**

**L-T-P scheme: 2-1-0** **Credits: 3**

**Prerequisite: None**

Objectives:

1. To learn about the various physical quantities; fundamental and derived, Units and systems of units (FPS, CGS and SI units),Dimensions and dimensional formulae of physical quantities, Principle of homogeneity of dimensions, Dimensional equations and their applications. To learn fundamentals of measurements, measuring

instruments, least count, types of measurement (direct,indirect), Errors in measurements (systematic and random), absolute error, relative error, error propagation, error estimation and significant figures.

2. To learn fundamentals of scalar and vector quantities, their examples. Types of vectors, basic algebraic operations involving vectors. Basic ideas of motion, momentum, force. Statement and derivation of conservation of linear momentum and its applications. Impulse and its applications. Circular motion and related topics. Problems and examples.

3. To learn the fundamentals of work. Concepts of zero, positive and negative work. Basic idea of friction, its types. Laws of laws of limiting friction, coefficient of friction, reducing friction and its engineering applications, Work done in moving an object on horizontal and inclined plane for rough and plane surfaces and related applications. Energy and its units, kinetic energy, gravitational potential energy with examples and derivations, mechanical energy, conservation of mechanical energy for freely falling bodies, transformation of energy (examples). Power and its units, power and work relation. Power and its units, power and work relationship, calculation of power (numerical problems)

4. Study of translational and rotational motions with examples, Definition of torque and angular momentum and their examples, Conservation of angular momentum (quantitative) and its applications. Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid); (Formulae only).

5. To learn about the general properties of matter. Elasticity definition of stress and strain, moduli of elasticity, Hooke's law, significance of stress-strain curve. Pressure: definition, units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications. Surface tension: concept, units, cohesive and adhesive forces, angle of contact, Ascent Formula (No derivation), applications of surface tension, effect of temperature and impurity on surface tension. Viscosity and coefficient of viscosity, continuity, Bernoulli's Theorem (only formula and numericals) and its applications.

6. Concept of heat and temperature, modes of heat transfer (conduction, convection and radiation with examples), specific heats, scales of temperature and their relationship, Types of Thermometer (Mercury thermometer, Bimetallic thermometer, Platinum resistance thermometer, Pyrometer) and their uses. Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them, Coefficient of thermal conductivity, engineering applications.

Learning Outcomes:

| Course Outcome | Description |
|---|---|
| CO1 | Outline and describe types of physical quantities (vector and scalar), their units and dimensions. |
| CO2 | Implement the knowledge of vector algebra and dimensional analysis in problems involving motion, circular motion, work and energy, friction and related problems. |
| CO3 | Apply the knowledge of basic vector algebra and laws of force and motion to understand problems of force and motion. |
| CO4 | Analyse the variety of properties of matter with the help of basic ideas of motion, force. |
| CO5 | |
| | |

Course Content:

Unit – I: Physical world, Units and Measurements: Physical quantities; fundamental and derived, Units and systems of units (FPS, CGS and SIunits), Dimensions and dimensional formulae of physical quantities, Principle of homogeneity of dimensions, Dimensional equations and their applications (conversion from one system of units to other, checking of dimensional equations and derivation of simple equations), Limitations of dimensional analysis. Measurements: Need, measuring instruments, least count, types of measurement (direct, indirect), Errors in measurements (systematic and random), absolute error, relative error, error propagation, error estimation and significant figures.

Unit– II: Force and Motion: Scalar and Vector quantities – examples, representation of vector, types of vectors. Addition and Subtraction of Vectors, Triangle and Parallelogram law (Statement only), Scalar and Vector Product, Resolution of a Vector and its application to inclined plane and lawn roller. Force, Momentum, Statement and derivation of conservation of linear momentum, its applications such as recoil of gun, rockets, Impulse and its

applications. Circular motion, definition of angular displacement, angular velocity, angular acceleration, frequency, time period, Relation between linear and angular velocity, linear acceleration and angular acceleration (related numerical), Centripetal and Centrifugal forces with live examples, Expression and applications such as banking of roads and bending of cyclist.

Unit– III: Work, Power and Energy: Concept and units of work, examples of zero work, positive work and negative work Friction: concept, types, laws of limiting friction, coefficient of friction, reducing friction and its engineering applications, Work done in moving an object on horizontal and inclined plane for rough and plane surfaces and related applications. Energy and its units, kinetic energy, gravitational potential energy with examples and derivations, mechanical energy, conservation of mechanical energy for freely falling bodies, transformation of energy (examples). Power and its units, power and work relationship, calculation of power (numerical problems).

Unit– IV: Rotational Motion: Translational and rotational motions with examples, Definition of torque and angular momentum and their examples, Conservation of angular momentum (quantitative) and its applications. Moment of inertia and its physical significance, radius of gyration for rigid body, Theorems of parallel and perpendicular axes (statements only), Moment of inertia of rod, disc, ring and sphere (hollow and solid); (Formulae only).

Unit– V: General Properties of Matter: Elasticity: Definition of stress and strain, moduli of elasticity, Hooke's law, significance of stress-strain curve. Pressure: definition, units, atmospheric pressure, gauge pressure, absolute pressure, Fortin's Barometer and its applications. Surface tension: concept, units, cohesive and adhesive forces, angle of contact, Ascent Formula (No derivation), applications of surface tension, effect of temperature and impurity on surface tension. Viscosity and coefficient of viscosity: Terminal velocity, Stoke's law and effect of temperature on viscosity, application in hydraulic systems. Hydrodynamics: Fluid motion, streamline and turbulent flow, Reynold's number Equation of continuity, Bernoulli's Theorem (only formula and numericals) and its applications.

Unit -VI: Heat & Thermometry: Concept of heat and temperature, modes of heat transfer (conduction, convection and radiation with examples), specific heats, scales of temperature and their relationship, Types of Thermometer (Mercury thermometer, Bimetallic thermometer, Platinum resistance thermometer, Pyrometer) and their uses. Expansion of solids, liquids and gases, coefficient of linear, surface and cubical expansions and relation amongst them, Coefficient of thermal conductivity, engineering applications.

Teaching Methodology:

This course is introduced to help students to know about the basic knowledge of physics. This course has been divided into six units and each section includes theory and numerical exercises to help a student gain more experience on the subject. This theory course is well complemented by a laboratory course under the name 'Applied Physics Lab-I' in the same semester that helps a student to learn more practical knowledge and experience.

Evaluation Scheme:

| Exams | Marks | Coverage |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| Total | 100 Marks | |

Learning Resources:

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

TEXT BOOKS:

1. Concepts of Physics Vol-I, H.C. Verma
2. Fundamentals of Physics, R. Resnick and D. Halliday
3. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi

REFERENCE BOOKS:

1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
2. e-books/e-tools/ learning physics software/websites etc.

## Course Description

**Title: Introduction to Computers** **Code: DGE201**

**L-T-P scheme: 0-0-2** **Credit: 01**

**Prerequisite:** Students must have the knowledge of basic logical operations

**Objective:**

**1.** Identify computer hardware and software

**2.** Basic knowledge of computer system and its working

**3.** Basic knowledge of logical thinking and problem solving

**Learning Outcomes:**

| **Course Outcome** | **Description** |
|---|---|
| CO1 | **Outline** various components of a Computer system. |
| CO2 | **Describe** the basic system operations using Operating System. |
| CO3 | **Develop** the basic documentation and presentation using word processing |

| | |
|---|---|
| | and presentation tools. |
| CO4 | **Classify** various mathematical manipulations in a spreadsheet. |
| CO5 | **Apply** the basics of Programming language for simple programming examples. |

**Course Content:**

**UNIT-1: Knowing computer:** What is Computer, Basic Applications of Computer; Components of Computer System, Central Processing Unit (CPU), VDU, Keyboard and Mouse, Other input/output Devices, Computer Memory, Concepts of Hardware and Software; Concept of Computing, Data and Information; Applications of IECT; Connecting keyboard, mouse, monitor and printer to CPU and checking power supply.

**UNIT-2: Operating Computer using GUI Based Operating System:** What is an Operating System; Basics of Popular Operating Systems; The User Interface, Using Mouse; Using right Button of the Mouse and Moving Icons on the screen, Use of Common Icons, Status Bar, Using Menu and Menu-selection, Running an Application, Viewing of File, Folders and Directories, Creating and Renaming of files and folders, Opening and closing of different Windows; Using help; Creating Short cuts, Basics of O.S Setup; Common utilities.

**UNIT-3: Understanding Word Processing:** Word Processing Basics; Opening and Closing of documents; Text creation and Manipulation; Formatting of text; Table handling; Spell check, language setting and thesaurus; Printing of word document.

**UNIT-4: Using Spread Sheet:** Basics of Spreadsheet; Manipulation of cells; Formulas and Functions; Editing of Spread Sheet, printing of Spread Sheet.

**UNIT-5: Making Small Presentation:** Basics of presentation software; Creating Presentation; Preparation and Presentation of Slides; Slide Show; Taking printouts of presentation / handouts.

**UNIT-6: Introduction to Computer Programming:** Basics of programming logic and problem solving, overview of programming languages, introduction to C++/python, understanding variables and data types, control structures (if statements and loops etc ).

**Methodology:**
The course will be covered through lab classes. There shall be 2 hours lab engagement per week. About 15 weeks is required to cover covering whole of the syllabus shall be given. Apart from the discussions on the topics covered in the lab classes. In lab classes, assigned lab work to be performed under the guidance of faculty and lab staff.

**Evaluation Scheme:**

| Exams | Marks | Coverage |
|---|---|---|
| P-1 | 15 Marks | Based on Unit: 1-3 |
| P-2 | 15 Marks | Based on Unit: 4-6 |

| | | | |
|---|---|---|---|
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| Total | | 100 Marks | |

**REFERENCES:**


1. Microsoft Office 2007 Training Guide, BPB Publications-2010

2. Fundamentals of Computers,V Rajaraman 6th edition PHI Learning Private Limited 2014

3. Sanjay Saxena: A First Course in Computers. Vikas Publishing House.

4. Peter Norton: Computing Fundamentals. 6th Edition, McGraw Hill-Osborne,2007

5. Alexis Leon and Marthews Leon: Introduction to Computers, Leon Vikas,1999.


## Course Description

**Course Name:** Communication Skills in English **Course Code: DHS101**

**L-T-P Scheme: 2-0-0** **Credits: 2**
**Pre requisite : NIL**

Course Outline

| Unit | Topic |
|---|---|
| 1 | Communication: Basics of communication, Introduction, meaning and definition, process of communication, Types of communication: formal and informal, verbal, non-verbal and written Barriers to effective communication, 7 Cs for effective communication (considerate, concrete, concise, clear, complete, correct, courteous), Art of Effective communication, Choosing words, Voice, Modulation, Clarity, Time, Simplification of words, Technical Communication. |
| 2 | Soft Skills for Professional Excellence: Soft Skills and Hard Skills, Importance of soft skills. Life skills: Self-awareness and Self-analysis, adaptability, resilience, emotional intelligence and empathy, Applying soft skills across cultures, Case Studies. |

| | |
|---|---|
| 3 | Reading Comprehension & vocabulary enhancement: Grammar exercises based on reading of the following texts: Malgudi Days: R.K. Narayan, The Room on Roof: Ruskin Bond "The Gift of the Magi" by O. Henry "Uncle Podger Hangs a Picture" Jerome K. Jerome, Night of the Scorpion by Nissim Ezekiel, Stopping by Woods on a Snowy Evening by Robert Frost, Where the Mind is Without Fear by Rabindranath Tagore. |
| 4 | Professional Writing: The art of précis writing, Letters, business and personnel, Drafting e-mail, notices, minutes of a meeting, Filling-up different forms such as banks and on-line forms for placement. |
| 5 | Vocabulary and Grammar: Vocabulary of commonly used words, Glossary of administrative terms (English and Hindi), One-word substitution, Idioms and phrases, Parts of speech, active and passive voice, tenses, Punctuation. |

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Syllabus covered upto Test-1 |
| Test-2 | 25 Marks | Syllabus covered upto Test-2 |
| Test-3 | 35 Marks | Full Syllabus |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

## Course Description

**Title: Applied Chemistry** **Code: DCE001**

**L-T-P scheme: 3-0-0** **Credits: 3**

**Prerequisite:** None

**Objectives:**
There are numerous number materials are used in fabricating and manufacturing devices for the comfort of life. The selection, characterization and suitability assessment of natural raw materials essentially requires principles and concepts of Applied Chemistry for technicians. On successful completion of this course content will enable technicians to understand, ascertain and analyze and properties of natural raw materials require for producing economical and eco-friendly finished products.

1. Solve various engineering problems applying the basic knowledge of atomic structure and chemical bonding.
2. Use relevant water treatment method to solve domestic and industrial problems.
3. Solve the engineering problems using knowledge of engineering materials and properties.
4. Use relevant fuel and lubricants for domestic and industrial applications
5. Solve the engineering problems using concept of Electrochemistry and corrosion.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | Outline the classification and general properties of engineering materials such as metal, alloys, glasses, cement, refractory and composite materials using knowledge of chemical bonding. |
| CO2 | Describe and Implement the suitability of water source for domestic and industrial application, effluents and minimize water pollution. |
| CO3 | Qualitatively analyze the engineering materials and understand their properties and applications. |
| CO4 | Identify the different fuel and lubricants suitable for economical industrial processing to obtain eco-friendly finished products. |
| CO5 | Ascertain construction, mechanism efficiency of electrochemical cells, solar cell fuel cells. |
| CO6 | Evaluate issues related to corrosion and develop economical prevention techniques. |

**Course Content:**

**Unit 1: Atomic Structure, Chemical Bonding and Solutions**
**08**

Rutherford model of atom, Bohr's theory (expression of energy and radius to be omitted), and hydrogen spectrum explanation based on Bohr's model of atom, Heisenberg uncertainty principle, Quantum numbers – orbital concept. Shapes of s,p and d orbitals, Pauli's exclusion principle, Hund's rule of maximum multiplicity Aufbau rule, electronic configuration.

Concept of chemical bonding – cause of chemical bonding, types of bonds: ionic bonding (NaCl example), covalent bond ($H_2$ , $F_2$ , HF hybridization in $BeCl_2$ , $BF_3$ , $CH_4$ , $NH_3$ , $H_2O$), coordination bond in $NH_4^+$ , and anomalous properties of $NH_3$ , $H_2O$ due to hydrogen bonding, and metallic bonding.

Solution – idea of solute, solvent and solution, methods to express the concentration of solution- molarity (M = mole per liter), ppm, mass percentage, volume percentage and mole fraction.

**Unit 2: Water** **08**

Graphical presentation of water distribution on Earth (pie or bar diagram). Classification of soft and hard water based on soap test, salts causing water hardness, unit of hardness and simple numerical on water hardness.

Cause of poor lathering of soap in hard water, problems caused by the use of hard water in boiler (scale and sludge, foaming and priming, corrosion etc), and quantitative measurement of water hardness by ETDA method, total dissolved solids (TDS) alkalinity estimation.

i). Water softening techniques – soda lime process, zeolite process and ion exchange process.

ii). Municipal water treatment (in brief only) – sedimentation, coagulation, filtration, sterilization.

Water for human consumption for drinking and cooking purposes from any water sources and enlist Indian standard specification of drinking water (collect data and understand standards).

**Unit 3: Engineering Materials** **08**

Natural occurrence of metals – minerals, ores of iron, aluminium and copper, gangue (matrix), flux, slag, metallurgy – brief account of general principles of metallurgy.

Extraction of - iron from haematite ore using blast furnace, aluminium from bauxite along with reactions. Alloys – definition, purposes of alloying, ferrous alloys and non-ferrous with suitable examples, properties and applications.

General chemical composition, composition based applications (elementary idea only details omitted):

Portland cement and hardening, Glasses Refractory and Composite materials.

Polymers – monomer, homo and co polymers, degree of polymerization, simple reactions involved in preparation and their application of thermoplastics and thermosetting plastics (using PVC, PS, PTFE, nylon – 6, nylon-6,6 and Bakelite), rubber and vulcanization of rubber.

**Unit 4: Chemistry of Fuels and Lubricants** **08**

Definition of fuel and combustion of fuel, classification of fuels, calorific values (HCV and LCV), calculation of HCV and LCV using Dulong's formula.

Proximate analysis of coal solid fuel

petrol and diesel - fuel rating (octane and cetane numbers),

Chemical composition, calorific values and applications of LPG, CNG, water gas, coal gas, producer gas and biogas.

Lubrication – function and characteristic properties of good lubricant, classification with examples, lubrication mechanism – hydrodynamic and boundary lubrication, physical properties (viscosity and viscosity index, oiliness, flash and fire point, could and pour point

only) and chemical properties (coke number, total acid number saponification value) of lubricants.

**Unit 5: Electro Chemistry**

**08**

Electronic concept of oxidation, reduction and redox reactions. Definition of terms: electrolytes, non-electrolytes with suitable examples, Faradays laws of electrolysis and simple numerical problems.

Industrial Application of Electrolysis –

- Electrometallurgy
- Electroplating
- Electrolytic refining.

Application of redox reactions in electrochemical cells –

- Primary cells – dry cell,
- Secondary cell - commercially used lead storage battery, fuel and Solar cells.

Introduction to Corrosion of metals –

- definition, types of corrosion (chemical and electrochemical), H2 liberation and O2 absorption mechanism of electrochemical corrosion, factors affecting rate of corrosion.

Internal corrosion preventive measures –

- Purification, alloying and heat treatment and External corrosion preventive measures: a) metal (anodic, cathodic) coatings,
  b) organic inhibitors.

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of chemistry. This course has been divided into five units and each section includes theory and numerical exercises to help a student gain more experience on the subject. This theory course is well complemented by a laboratory course under the name 'Applied Chemistry lab' in the same semester that helps a student to learn more practical knowledge and experience.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |

**References/Suggested Learning Resources:**

**(a) Books :**

1. Text Book of Chemistry for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
2. Agarwal, & Shikha, Engineering Chemistry, Cambridge University Press; New Delhi, 2015.
3. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
4. Dara, S. S. & Dr.S.S.Umare, Engineering Chemistry, S. Chand Publication, New Delhi, New Delhi, 2015. 5) Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.
5. Dr. Vairam, S., Engineering Chemistry, Wiley India Pvt.Ltd., New Delhi, 2013.
6. Dr. G. H. Hugar & Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.
7. Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt. Ltd., 2014.

**(b) Open source software and website address:**

1. www.chemguide.co.uk/atommenu.html (Atomic structure and chemical bonding)
2. www.visionlearning.com (Atomic structure and chemical bonding)
3. www.chem1.com (Atomic structure and chemical bonding)
4. https://www.wastewaterelearning.com/elearning/ (Water Treatment)
5. www.capital-refractories.com (Metals, Alloys, Cement, and Refractory Materials)
6. www.em-ea.org/guide%20books/book-2/2.1%20fuels%20and%20combustion.pdf (Fuel and Combustion)
7. www.chemcollective.org (Metals, Alloys) 8 www.wqa.org(Water Treatment)

## Course Description

**Title: Engineering Graphics** **Code: DCE201**

**L-T-P scheme: 0-0-3** **Credits: 1.5**

**Prerequisite: Nil**

**Objectives:**

- To develop drafting and sketching skills, to know the applications of drawing equipments, andget familiarize with Indian Standards related to engineering drawings.
- To develop skills to visualize actual object or a part of it, on the basis of drawings.
- To understand the basic commands and develop basic skills related to computer aided drafting,of how to draw, modify, and edit basic shapes (2D), using AUTOCAD.

**Learning Outcomes:**

**Course Outcomes**

Following outcomes will be achieved:

1) Select and construct appropriate drawing scales, use drawing equipment's, and understand Indi-an Standards of engineering drawing

2) Draw views of given object and components

3) Sketch orthographic projections into isometric projections and vice versa.

4) Apply computer aided drafting tools to create 2D engineering drawings

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** and construct appropriate drawing scales, use drawing equipment's, and understand Indi- an Standards of engineering drawing |
| CO2 | **Describe and** Draw views of given object and components |
| CO3 | **Develop** orthographic projections into isometric projections and vice versa. |
| CO4 | **Identify** different types of Projections diagram |
| CO5 | **Apply** computer aided drafting tools to create 2D engineering drawings |

**Course Content**

**Unit – I Basic elements of Drawing**

Drawing Instruments and supporting materials: method to use them with applications. Convention of lines and their applications. Representative Fractions – reduced, enlarged and full size scales; Engineering Scales such as plain and diagonal scale. Dimensioning techniques as per SP-46:2003 – types and applications of chain, parallel and coordinate dimensioning. Geometrical and Tangency constructions. (Redraw the figure)

**Unit – II Orthographic projections**

Introduction of projections-orthographic, perspective, isometric and oblique: concept and applications. (No question to be asked in examination). Introduction to orthographic projection, First angle and Third angle method, their symbols. Conversion of pictorial view into Orthographic Views – object containing plain surfaces, slanting surfaces, slots, ribs, cylindrical surfaces. (use First Angle Projection method only)

**Unit – III Isometric Projections**

Introduction to isometric projections. Isometric scale and Natural scale. Isometric view and isometric projection. Illustrative problems related to objects containing lines, circles and arcs shape only. Conversion of orthographic views into isometric view/projection.

**Unit – IV Free Hand Sketches of engineering elements**

Free hand sketches of machine elements: Thread profiles, nuts, bolts, studs, set screws, wash-

er, Locking arrangements. (For branches other than mechanical Engineering, the teacher should select branch specific elements for free hand sketching), Free hand sketches of orthographic view (on squared graph paper) and isometric view (on isometric grid paper)

**Unit – V Computer aided drafting interface**

Computer Aided Drafting: concept. Hardware and various CAD software available. System requirements and Understanding the interface. Components of AutoCAD software window: Title bar, standard tool bar, menu bar, object properties tool bar, draw tool bar, modify tool bar, cursor cross hair. Command window, sta-tus bar, drawing area, UCS icon. File features: New file, aving the file, Opening an existing drawing file, Creating templates, Quit. Setting up new drawing: Units, Limits, Grid, Snap.Undoing and redoing action.

**Unit – VI Computer aided drafting**

Draw basic entities like Line, Circle, Arc, Polygon, Ellipse, Rectangle, Multiline, PolyLine. Method of Specifying points: Absolute coordinates, Relative Cartesian and Polar coordinates.

Modify and edit commands like trim, extend, delete, copy, offset, array, block, layers. Dimensioning: Linear, Horizontal Vertical, Aligned, Rotated, Baseline, Continuous, Diameter, Radius, Angular Dimensions. Dim scale variable. Editing dimensions. Text: Single line Text, Multiline text. Standard sizes of sheet. Selecting Various plotting parameters such as Paper size, paper units, Drawing orientation, plot scale, plot offset, plot area, print preview.

| **S. No.** | **Practical Exercises** | **Unit No.** | **Approx. Hrs** |
|---|---|---|---|
| 1 | Draw horizontal, Vertical, 30 degree, 45 degree, 60 and 75 degrees lines, differ-ent types of lines, dimensioning styles using Tee and Set squares/ drafter. (do this exercise in sketch book) | I | 02 |
| 2 | Write alphabets and numerical (Vertical only) (do this exercise in sketch book) | I | 02 |
| 3 | Draw regular geometric constructions and redraw the given figure (do this exer-cise in sketch book) Part I | II | 02 |
| 4 | Draw regular geometric construction and redraw the given figure (do this exer-cise in sketch book) Part II | II | 02 |
| 5 | Draw a problem on orthographic projections using first angle method of projec-tion having plain surfaces and slanting. Part I | III | 02 |
| 6 | Draw another problem on orthographic projections using first angle method of<br>projection having slanting surfaces with slots. Part II | III | 02 |
| 7 | Draw two problems on orthographic projections using first angle method of pro-jection having cylindrical surfaces, ribs. Part I | III | 02 |
| 8 | Draw two problems on Isometric view of simple objects having plain and slant-ing surface by using natural scale. Part I | IV | 02 |
| 9 | Draw some problems on Isometric projection of simple objects having cylindri-cal surface by using isometric scale. Part I | IV | 02 |
| 10 | Draw free hand sketches/ conventional representation of machine elements in sketch book such as thread profiles, nuts, bolts, studs, set screws, washers, Locking arrangements. Part I | V | 02 |

| | | | |
|---|---|---|---|
| 11 | Problem based Learning: Given the orthographic views of at least three objects with few missing lines, the student will try to imagine the corresponding ob- jects, complete the views and draw these views in sketch book. Part I | III, II, V | 02 |
| 12 | Draw basic 2D entities like: Rectangle, Rhombus, Polygon using AutoCAD(Print out should be a part of progressive assessment). Part I | V | 02 |
| 13 | Draw basic 2D entities like: Circles, Arcs, circular using AutoCAD (Printoutshould be a part of progressive assessment). Part II | V | 02 |
| 14 | Draw basic 2D entities like: Circular and rectangular array using AutoCAD(Printout should be a part of progressive assessment). Part III | V | 02 |
| 15 | Draw blocks of 2D entities comprises of Rectangle, Rhombus, Polygon, Circles, Arcs, circular and rectangular array, blocks using AutoCAD (Print out should be a part of progressive assessment). Part IV | V | 02 |
| 16 | Draw basic branch specific components in 2D using AutoCAD (Print out shouldbe a part of term work). Part I | VI | 02 |
| | **Total** | | **34** |

**Evaluation Scheme:**

| Exams | | Marks | Coverage |
|---|---|---|---|
| P-1 | | 15 Marks | Based on Lab Exercises: 1-8 |
| P-2 | | 15 Marks | Based on Lab Exercises: 9-16 |
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| Total | | 100 Marks | |

**LEARNING RESOURCES**


1. Bureau of Indian Standards. *Engineering Drawing Practice for Schools and Colleges IS: Sp-46.* BIS. Government of India, Third Reprint, October 1998; ISBN: 81-7061-091-2.

2. Bhatt, N. D. *Engineering Drawing*. Charotar Publishing House, Anand, Gujrat 2010; ISBN: 978-93-80358-17-8.

3. Jain & Gautam, Engineering Graphics & Design, Khanna Publishing House, New Delhi (ISBN: 978-93-86173-478)

4. Jolhe, D. A. *Engineering Drawing*. Tata McGraw Hill Edu. New Delhi, 2010; ISBN: 978-0-07-064837-1

5. Dhawan, R. K. *Engineering Drawing*. S. Chand and Company, New Delhi; ISBN: 81-

219-1431-0.

6. Shah, P. J. *Engineering Drawing*. S. Chand and Company, New Delhi, 2008, ISBN:81-219-2964-4.

7. Kulkarni, D. M.; Rastogi, A. P.; Sarkar, A. K. *Engineering Graphics with AutoCAD*. PHI Learning Pri-vate Limited-New Delhi (2010); ISBN: 978-8120337831.

8. Jeyapoovan, T. *Essentials of Engineering Drawing and Graphics using AutoCAD*. Vikas PublishingHousePvt. Ltd, Noida, 2011; ISBN: 978-8125953005.

9. Autodesk. *AutoCAD User Guide*. Autodesk Press, USA, 2015.

10. Sham, Tickoo. *AutoCAD 2016 for Engineers and Designers*. Dreamtech Press; Galgotia Publication,New Delhi, 2015; ISBN 978-9351199113.

**Software/Learning Websites**

1. https://www.youtube.com/watch?v=TJ4jGyD-WCw
2. https://www.youtube.com/watch?v=dmt6_n7Sgcg
3. https://www.youtube.com/watch?v=_MQScnLXL0M
4. https://www.youtube.com/watch?v=3WXPanCq9LI
5. https://www.youtube.com/watch?v=fvjk7PlxAuo
6. http://www.me.umn.edu/coursesme2011/handouts/engg%20graphics.pdf
7. https://www.machinedesignonline.com

## Course Description

**Title: Engineering Workshop Practice** **Code: DME201**

**L-T-P scheme: 0-0-3** **Credits: 1.5**

**Prerequisite: Nil**

| |
|---|
| **Objective:** This course is aimed at |
| • To understand basic engineering processes for manufacturing and assembly.<br>• To understand, identify, select and use various marking, measuring, and holding, striking and cutting g tools and equipment's |

| |
|---|
| • To understand and interpret job drawings, produce jobs, and inspect the job for specified<br>• dimensions<br>• To understand the various types of wiring systems and acquire skills in house wiring<br>• To understand, operate, control different machines and equipment's adopting safety practices |
| |

**Learning Outcomes:**

| | |
|---|---|
| CO1 | Acquire skills in basic engineering practice to identify, select and use various marking, measuring, and holding, striking and cutting tools & equipment's and machines |
| CO2 | Understand job drawing and complete jobs as per specifications in allotted time |
| CO3 | Inspect the job for the desired dimensions and shape |
| CO4 | Operate, control different machines and equipment's adopting safety practices |

**List of Experiments:**

| S.No. | Details Of Practical Content |
|---|---|
| **I** | **Carpentry:** i) Demonstration of different wood working tools / machines. ii) Demonstration of different wood working processes, like plaining, marking, chiseling, grooving, turning of wood etc. iii) One simple job involving any one joint like mortise and tenon dovetail, bridle,half lap etc. |
| **II** | **Fitting:** i) Demonstration of different fitting tools and drilling machines and power tools ii) Demonstration of different operations like chipping, filing, drilling, tapping, sawing, cutting etc. iii) One simple fitting job involving practice of chipping, filing, drilling, tapping, cutting etc |
| **III** | **Welding:** i) Demonstration of different welding tools / machines. ii) Demonstration on Arc Welding, Gas Welding, MIG, MAG welding, gas cutting and rebuilding of broken parts with welding. iii) One simple job involving butt and lap joint |
| **IV** | **Sheet Metal Working:** i) Demonstration of different sheet metal tools / machines. ii) Demonstration of different sheet metal operations like sheet cutting, bending, edging, end curling, lancing, soldering, brazing, and riveting. iii) One simple job involving sheet metal operations and soldering and riveting. |
| **V** | **Electrical House Wiring:** Practice on simple lamp circuits (i) one lamp controlled by one switch by surface conduit wiring, (ii) Lamp circuits- connection of lamp and socket by sep- arate switches, (iii) Connection of Fluorescent lamp/tube light, (iv) simple lamp circuits-in-stall bedroom lighting. And (v) Simple lamp circuits- install stair case wiring. |
| **VI** | **Demonstration:** i) Demonstration of measurement of Current, Voltage, Power and Energy.<br>ii) Demonstration of advance power tools, pneumatic tools, electrical wiring tools and acces-sories. iii) Tools for Cutting and drilling |

**Methodology:**

The course will be covered through lab classes. There shall be 3 hour lab engagement per week. About 14 weeks is required to cover covering whole of the syllabus shall be given.

Apart from the discussions on the topics covered in the lab classes. In lab classes, assigned lab work to be performed under the guidance of faculty and lab staff.

**Evaluation Scheme:**

| Exam | Marks | Course Coverage |
|---|---|---|
| P-1 | 15 | Syllabus covered up to P-1 |
| P-2 | 15 | Full syllabus |
| DTDW | 40 | |
| Discipline and attendance | 15 | |
| Lab Record | 15 | |
| Total | 100 | |

**Books:**


1. S.K. Hajara Chaudhary, Workshop Technology, Media Promoters and Publishers, New Delhi,2015
2. B.S. Raghuwanshi, Workshop Technology, Dhanpat Rai and sons, New Delhi 2014
3. K. Venkat Reddy, Workshop Practice Manual, BS Publications, Hyderabad 2014
4. Kents Mechanical Engineering Hand book, John Wiley and Sons, New York


## Course Description

**Title: Applied Physics-I Lab** **Code: DPH201**

**L-T-P scheme: 0-0-2** **Credits: 1**

**Prerequisite:** None

**Objectives:** To develop an appreciation for the importance of applied physics in engineering discipline with the help of experiments.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline and describe** basic principles of measurements and the instruments used for the same. |

| | |
|---|---|
| CO2 | **Demonstrate** ability to collect experimental data and understanding the working procedures within the precautionary limits |
| CO3 | **Acquire** the ability to analyse the experimental data and related errors in a reflective, iterative and responsive way |
| CO4 | **Develop** understanding of the basic concepts related to basic applied physics. |
| CO5 | **Appreciate** the importance of the laboratory work culture and ethics that is intended to impart features like regularity, continuity of self evaluation and honesty of reporting the data. |
| | |

**Course Content: List of Experiments**

1. To measure length, radius of a given cylinder, a test tube and a beaker using a Vernier calliper and find the volume of each object.
2. To determine diameter of a wire, a solid ball and thickness of cardboard using a screw gauge.
3. To determine radius of curvature of a convex and a concave mirror/surface using a spherometer.
4. To verify triangle and parallelogram law of forces.
5. To find the coefficient of friction between wood and glass using a horizontal board.
6. To determine the force constant of a spring using Hooke's Law.
7. To find the moment of inertia of a flywheel.
8. To find the viscosity of a given viscous liquid by Stoke's law.
9. Determination of acceleration due to gravity (*g)* using a simple pendulum.
10. To measure room temperature and temperature of a hot bath using mercury thermometer.
11. To determine atmospheric pressure at a place using Fortin's barometer.

**Teaching Methodology:**
This course is introduced to help students for better appreciation of the theory course **Applied Physics-I** offered in the same semester. In this course students learn and develop basic measurements skills, handling errors, and handling experimental setups.

**Evaluation Scheme:**

| Exams | | Marks | Coverage |
|---|---|---|---|
| P-1 | | 15 Marks | Based on Lab Exercises: 1-5 |
| P-2 | | 15 Marks | Based on Lab Exercises: 6-10 |
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |

| | | | |
|---|---|---|---|
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| Total | | 100 Marks | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**

1. Concepts of Physics Vol-I, H.C. Verma

**REFERENCE BOOKS:**

1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi

**Course Description**

**Title : Applied Chemistry Lab** **Code : BS109**

**L -T - P scheme : 0-0-2**

**Prerequisites :** None

**Objectives:**

1. There are numerous number of materials used in fabricating and manufacturing devices for the comfort of life.
2. The selection, characterization and suitability assessment of natural raw materials essentially requires principles and concepts of Applied Chemistry for technicians.
3. The course aims to supplement the factual knowledge gained in the lectures by first hand manipulation of processes and apparatus.
4. This will develop scientific temper and help to apply the basic concepts and principles in solving engineering problems.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|

| | |
|---|---|
| CO1 | To understand and differentiate different methods of quantitative analysis. |
| CO2 | To know and understand principles of quantitative analysis using instruments. |
| CO3 | To practice and adapt good measuring techniques. |
| CO4 | To use various apparatus for precise measurements and analysis. |
| CO5 | To practice and adapt good measuring techniques for accurate evaluation. |

**Course Content:**

**List of Experiments**:

1. Preparation of standard solution of oxalic acid or potassium permanganate.
2. To determine strength of given sodium hydroxide solution by titrating against standard oxalic acid solution using phenolphthalein indicator.
3. Standardization of KMnO4 solution using standard oxalic acid and Determine the percentage of iron present in given Hematite ore by KMnO4 solution.
4. Iodometric estimation of copper in the copper pyrite ore.
5. Volumetric estimation of
    a) Total hardness of given water sample using standard EDTA solution.
    b) Alkalinity of given water sample using 0.01M sulphuric acid
6. Proximate analysis of coal
    a. Gravimetric estimation moisture in given coal sample
    b. Gravimetric estimation ash in given coal sample
7. Determine the conductivity of given water sample.
8. Determination of the Iron content in given cement sample using colorimeter.
9. Determination of Viscosity by Ostwald viscometer.
10. Determination of Surface tension by Staglagmometer.

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of Applied Chemistry Lab. This course has ten experiments to help a student gain more experience on the subject. This theory course is well complemented by a Theory course under the name 'Applied Chemistry' in the same semester that helps a student to learn more practical knowledge and experience.

**Evaluation Scheme:**

| **Exams** | | **Marks** | **Coverage** |
|---|---|---|---|
| P-1 | | 15 Marks | Based on Lab Exercises: 1-5 |
| P-2 | | 15 Marks | Based on Lab Exercises: 6-10 |
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| Total | | 100 Marks | |

**Reference Books:**


1. Text Book of Chemistry for Class XI & XII (Part-I, Part-II); N.C.E.R.T., Delhi, 2017-18.
2. Dr. G. H. Hugar and Prof A. N. Pathak, Applied Chemistry Laboratory Practices, Vol. I and Vol. II, NITTTR, Chandigarh, Publications, 2013-14.
3. Agnihotri, Rajesh, Chemistry for Engineers, Wiley India Pvt.Ltd., 2014.
4. Jain & Jain, Engineering Chemistry, Dhanpat Rai and Sons; New Delhi, 2015.


## Course Description

**Title: Communication Skills in English Lab** **Code: DHS201**
**L-T-P scheme: 0-0-2** **Credits: 1**

**Prerequisite: Nil**

Course Outline

| Unit | Topic |
|---|---|
| 1 | Listening Skills: Listening Process and Practice, Introduction to recorded lectures, poems, interviews and speeches, listening tests. |
| 2 | Introduction to Phonetics Sounds: consonant, vowel, diphthongs, etc. transcription of words (IPA), weak forms, syllable division, word stress, intonation, voice etc. |
| 3 | Speaking Skills: Standard and formal speech: Group discussion, oral presentations, public speaking, business presentations, Conversation practice and role playing, mock interviews. |
| 4 | Building vocabulary: Etymological study of words and construction of words, phrasal verbs, foreign phrases, idioms and phrases, Jargon/ Register related to organizational set up, word exercises, and word games to enhance self-expression and vocabulary of participants. |

**Evaluation Scheme:**

| Exam | Marks | Course Coverage |
|---|---|---|

| | | |
|---|---|---|
| P-1 | 15 | Syllabus covered up to P-1 |
| P-2 | 15 | Full syllabus |
| DTDW | 40 | |
| Discipline and attendance | 15 | |
| Lab Record | 15 | |
| Total | 100 | |

# SECOND SEMESTER

**Course Description**

**Course Name: Mathematics-II** **Course Code: DMA102**
**L-T-P Scheme: 3-1-0** **Credits: 4**

**Objective:** This course is designed to give a comprehensive coverage at an introductory level to the subject of matrices, Integral Calculus coordinate geometry, Basic elements of vector algebra and first order differential equations.

**Learning Outcomes:**

Course Outcome This course will enable the students to:

**CO1**: Understand and apply the concepts of Cartesian and polar coordinates to determine the locus of points and to analyze the properties of straight lines and circles.

**CO2**: Comprehend the foundational principles of functions, limits, continuity; perform differentiation including partial differentiation.

**CO3**: Master the techniques for performing integration as a reverse process to differentiation; apply methods such as substitution, integration by parts, and integration using partial fractions.

**CO4**: Solve definite integrals; formulate and solve differential equations of first order.

**CO5**: Define key statistical terms; construct frequency distributions; calculate measures of central tendency including mean, median, mode.

**CO6**: Analyze data using measures of dispersion such as variance and standard deviation; understand probability theory including binomial Poisson and normal distributions.

**Teaching Plan:**

**Unit 1:** Cartesian and polar co ordinates, locus of point, straight line, Circle.

**Unit 2:** Functions, limits and continuity, differentiations, partial Differentiation.

**Unit 3:** Integration as reverse process of differentiation, integration by Substitution, integration by parts, integration by partial fractions, Definite integral, differential equations of first order.

**Unit 4:** Definition of statistics, frequency distribution, measures of central tendency, mean, median, mode. Measures of dispersion, variance, standard deviation.

**Unit 5:** Probability, binomial, Poisson and normal distributions.

**Methodology:**

The course will be covered through lectures supported by tutorials. There shall be 3 Lectures per week where the teacher will explain the theory, give some examples supporting the theory and its applications. About 12 Tutorial Sheets covering whole of the syllabus shall be given. Difficulties and doubts shall be cleared in tutorials. Apart from the discussions on the topics covered in the lectures, assignments/ quizzes in the form of questions will also be given.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Syllabus covered upto Test-1 |
| Test-2 | 25 Marks | Syllabus covered upto Test-2 |
| Test-3 | 35 Marks | Full Syllabus |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Tutorials, lecture slides and books on mathematics-1I will be available on the JUET server.

**Books**

1. B.S. Grewal, Higher Engineering Mathematics, Khanna Publishers, New Delhi,2007.

2. G. B. Thomas, R. L. Finney, Calculus and Analytic Geometry, Addison Wesley, 1995.

3. S.S. Sabharwal, Sunita Jain, Eagle Parkashan, Applied Mathematics, Vol. I & II, Jalandhar.

4. Comprehensive Mathematics, Vol. I & II by Laxmi Publications, Delhi.

5. Reena Garg & Chandrika Prasad, Advanced Engineering Mathematics, Khanna Publishing House, New Delhi

## Course Description

**Title: Applied Physics-II** **Code: DPH102**

**L-T-P scheme: 2-1-0** **Credits: 3**

**Prerequisite: Applied Physics-I**

**Objectives:**

1. To learn the basics of oscillations and waves, types of waves and familiarise with the associated technical terms. To learn about Simple Harmonic Motion, forced vibrations, resonance, acoustics of buildings and related topics.
2. To learn basic principles of geometrical optics. Image formations in mirrors, lens and thin lenses, lens formula, power of lens, magnification and defects. Basic working of optical fiber. To study some optical Instruments like simple and compound microscopes, astronomical telescopes and their magnification and resolving power.
3. To learn fundamentals of electrostatic fields, electric charges, field lines, flux Coulomb's law and its applications. Calculation of electric field using Gauss's law in a variety of static charge distributions. To study capacitance, its unit, working of capacitors. Series and parallel combination of capacitors (related numerical), dielectric and its effect on capacitance, dielectric break down.
4. To study electric current, resistance, potential and their units. To study parallel and series combinations of resistances. Ohm's law, Kirchoff's laws and related problems. To learn the concept of terminal potential difference and Electromotive force (EMF). To study heating effects of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms of energy.
5. To study basics of magnetic fields, magnetic fields inside the matter, types of magnetic materials. To study the concept of electromagnetic induction, Faraday's Laws, Lorentz force (force on moving charge in magnetic field), force on current carrying conductor, Galvanometers and their working.

6. To learn about energy bands in solid at qualitative level with specific attention on semiconducting materials, their types and simple devices made up with semiconductors. Working principle of photocells and their applications.
7. To study the basic principle of LASERS, types of LASERS. Fiber optics and its applications. Introductory ideas of Nanotechnology.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** types of semiconductors, devices based on them, working principle of LASERS, basic ideas of Nanotechnology |
| CO2 | **Describe** simple harmonic motion and wave phenomenon, basic principle of geometrical optics, laws of electricity and magnetism. |
| CO3 | **Apply** the laws of geometrical optics, laws of motion, laws of electromagnetism to solve problems of practical importance. |
| CO4 | **Analyse** electrical circuits with his/her understanding of laws of electricity and magnetism and basic knowledge of semiconductors. |
| CO5 | |
| | |

**Course Content:**

**Unit – I: Wave Motion & Its Applications**: Wave motion, transverse and longitudinal waves with examples, definitions of wave velocity, frequency and wavelength and their relationship, Sound and light waves and their properties, wave equation amplitude, phase, phase difference, principle of superposition of waves and beat formation. Simple Harmonic Motion (SHM): definition, expression for displacement, velocity, acceleration, time period, frequency etc. Simple harmonic progressive wave and energy transfer, study of vibration of cantilever and determination of its time period, Free, forced and resonant vibrations with examples. Acoustics of buildings – reverberation, reverberation time, echo, noise, coefficient of absorption of sound, methods to control reverberation time and their applications, Ultrasonic waves – Introduction and properties, engineering and medical applications of ultrasonic.

**Unit– II: Optics:** Basic optical laws; reflection and refraction, refractive index, Images and image formation by mirrors, lens and thin lenses, lens formula, power of lens, magnification and defects. Total internal reflection, Critical angle and conditions for total internal reflection, applications of total internal reflection in optical fiber. Optical Instruments; simple and compound microscope, astronomical telescope in normal adjustment, magnifying power, resolving power, uses of microscope and telescope, optical projection systems.

**Unit– III: Electrostatics:** Coulomb's law, unit of charge, Electric field, Electric lines of

force and their properties, Electric flux, Electric potential and potential difference, Gauss law: Application of Gauss law to find electric field intensity of straight charged conductor, plane charged sheet and charged sphere. Capacitor and its working, Types of capacitors, Capacitance and its units. Capacitance of a parallel plate capacitor, Series and parallel combination of capacitors (related numerical), dielectric and its effect on capacitance, dielectric break down.

**Unit– IV: Electric Currents:** Electric Current and its units, Direct and alternating current, Resistance and its units, Specific resistance, Conductance, Specific conductance, Series and parallel combination of resistances. Factors affecting resistance of a wire, carbon resistances and colour coding. Ohm's law and its verification, Kirchhoff's laws, Wheatstone bridge and its applications (slide wire bridge only), Concept of terminal potential difference and Electromotive force (EMF) Heating effect of current, Electric power, Electric energy and its units (related numerical problems), Advantages of Electric Energy over other forms of energy.

**Unit– V: Electromagnetism**: Types of magnetic materials; dia, para and ferromagnetic with their properties, Magnetic field and its units, magnetic field intensity, magnetic lines of force, magnetic flux and units, magnetization. Concept of electromagnetic induction, Faraday's Laws, Lorentz force (force on moving charge in magnetic field). Force on current carrying conductor, force on rectangular coil placed in magnetic field. Moving coil galvanometer; principle, construction and working, Conversion of a galvanometer into ammeter and voltmeter.

**Unit -VI: Semiconductor Physics:** Energy bands in solids, Types of materials (insulator, semiconductor, conductor), intrinsic and extrinsic semiconductors, p-n junction, junction diode and V-I characteristics, types of junction diodes. Diode as rectifier – half wave and full wave rectifier (centre taped). Transistor; description and three terminals, Types- pnp and npn, some electronic applications (list only). Photocells, Solar cells; working principle and engineering applications.

**Unit -VII: Modern Physics:** Lasers: Energy levels, ionisation and excitation potentials; spontaneous and stimulated emission;population inversion, pumping methods, optical feedback, Types of lasers; Ruby, He-Ne and semiconductor, laser characteristics, engineering and medical applications of lasers. Fiber Optics: Introduction to optical fibers, light propagation, acceptance angle and numerical aperture, fiber types, applications in; telecommunication, medical and sensors. Nanoscience and Nanotechnology: Introduction, nanoparticles and nanomaterials, properties at nanoscale, nanotechnology, nanotechnology based devices and applications.

**Teaching Methodology:**
This course is introduced to help students to know about the basic knowledge of physics. This course has been divided into six units and each section includes theory and numerical

exercises to help a student gain more experience on the subject. This theory course is well complemented by a laboratory course under the name 'Applied Physics Lab-I' in the same semester that helps a student to learn more practical knowledge and experience.

**Evaluation Scheme:**

| Exams | Marks | Coverage |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| Total | 100 Marks | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**


1. Concepts of Physics Vol-II, H.C. Verma
2. Fundamentals of Physics, R. Resnick and D. Halliday
3. Engineering Physics by PV Naik, Pearson Education Pvt. Ltd, New Delhi
4. Concepts of Modern Physics, Arthur Beiser
5. Optics by A. Ghatak
6. A Textbook of Optics, Brij Lal and Subramanyam


**REFERENCE BOOKS:**


1. Text Book of Physics for Class XI& XII (Part-I, Part-II); N.C.E.R.T., Delhi
2. e-books/e-tools/ learning physics software/websites etc.
3. Introduction to Fiber Optics, Ajoy Ghatak and K Thyagarajan, Cambridge University Press, India Pvt. Ltd, New Delhi.
4. Nanotechnology: Importance and Applications, M.H. Fulekar, IK International Publishing
5. House Pvt. Ltd, New Delhi.

## Course Description

**Title of Course:** Fundamentals of Electrical & Electronics Engineering **Code:** DEC108

**L-T-P Scheme: 2-1-0** **Credit: 3**

**Objective:**

The objective of this course is to impart and develop sufficient knowledge and experience on electrical instruments and electronics devices. Enable them to extend knowledge of the theory and applications of the particular electrical instruments and electronic devices and components so that students will be able to make meaningful design choices when asked to design and explain.

**Learning Outcomes:**

The students shall acquire the generic skills to understand basic electrical, electronic instruments and able to design and implement circuits based on components such as diode and transistor.

**Course Content:**

**Unit I: Basic Electrical Circuit:** Electromotive Force (EMF), Terminal Voltage; Resistance (*R*), Inductance (*L*) and Capacitance (*C*) from (i) Circuit, (ii) Energy, and (iii) Geometrical Points of View; Voltage Divider, Current Divider; Star-Delta Transformation; Voltage Source and Current Source, Source Transformation, Combination of Sources; Controlled (Dependent) Sources.

**Unit II: Methods of Analysis:** Kichhoff's Circuit Laws; Loop-Current Analysis, Mesh Analysis; Node-Voltage Analysis; Choices of Method of Analysis.

**Unit III: Network Theorems (DC Circuits):** Superposition Theorem; Thevenin's Theorem; Norton's Theorem; Maximum Power Transfer Theorem.

**Unit IV: Diodes and its Applications:** Unidirectional property, *PN*-junction with no bias, with forward bias and with reverse bias, *V-I* characteristics, Comparison of Si and Ge diodes, Diode resistance (static and dynamic), Diode equation, Diode modelling. Diode applications, Introduction to transistor, working and v-I characteristics

**Unit-V: Digital Circuits:** Number system, Inter-conversion of number system, complement

of no. system, Binary arithmetic operations, Logic gates and Boolean algebra

**Unit VI: Transformer:** Operating principle, classification, construction, emf equation, phasor diagrams, equivalent circuit model, losses & efficiency, voltage regulation, frequency response,

**D.C. Machines:** Operating principle, generator & motor action, construction, types of excitation, emf & torque equations, power stages & efficiency.

**Evaluation Scheme:**

| Exams | Marks | Coverage |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| Total | 100 Marks | |

**Text Books:**


[1] "Basic Electrical Engineering", D.C. Kulshreshtha, McGraw Hill Education, 2009.

[2] "Engineering Circuit Analysis", W.H. Hayt, J. E. Kemerlay and S.M. Durbin, 6th edition, McGraw Hill, 2006.

[3] "Introduction to Electric Circuits", R.C. Dorf & J.A. Svoboda, John Wiley, 2004.

[4] J. Milliman and C.C.Halkias: Integrated Electronics, Mc Graw Hill

[5] R. Bolleystead, Electronic Devices and Circuits

[6] Ramakant A.Gayakwad: Op-Amps and Linear Integrated Circuits, P.H.I.

[7] B. L. Threja "Electrical Technology",S. Chand & Co

[8] V. K. Mehta "Basic Electronics",S. Chand & Co.

[9] Morris Mano, Digital Logic and Computer Design, PHI


**Reference Books:**


[1] David A. Bell: Electronics Devices & Circuits, PHI

[2] J B Gupta: Electronics Devices & Circuits

## Course Description

**Title: Introduction to IT Systems** **Code: DCS101**
L-T-P scheme: 2-0-0 Credits: 2
Prerequisite: Nil

Course outcomes:
At the end of the course student will be able to comfortably work on computer, install and configure OS, assemble a PC and connect it to external devices, write documents, create worksheets, prepare presentations, protect information and computers from basic abuses/ attacks.

**Course Objectives:**
This Theory course is intended to taught as 'Introduction of IT Systems' and become proficient in using computing environment - basic computer skills, basic application software tools, Computer Hardware, cyber security features, etc.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | |
| CO2 | |
| CO3 | |
| CO4 | |
| CO5 | |
| CO6 | |

**Course Objectives::**
This course is intended to make new students comfortable with computing environment – Learning basic computer skills, Learning basic application software tools, Understanding Computer Hardware, Cyber security awareness.

**Course Content:**

**UNIT 1:** Basic Internet skills: Understanding browser, efficient use of search engines, awareness about Digital India portals (state and national portals) and college portals. General understanding of various computer hardware components – CPU, Memory, Display, Keyboard, Mouse, HDD and other Peripheral Devices.

**UNIT 2:** OS Installation (Linux and MS Windows), Unix Shell and Commands, vi editor.

**UNIT 3:** HTML4, CSS, making basic personal webpage.

**UNIT 4:** Office Tools: Open Office Writer, Open Office Spreadsheet (Calc), Open Office Impress.

**UNIT 5:** Information security best practices. Class lectures will only introduce the topic or demonstrate the tool, actual learning will take place in the Lab by practicing regularly.

**Teaching Methodology:**
This course is introduced to help students to know about the fundamental knowledge of mechanics and forces.
**Evaluation Scheme:**

| Exams | Marks | Coverage |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| Total | 100 Marks | |

**Learning Resources:**
Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.
**Books/ References:**
R.S. Salaria, Computer Fundamentals, Khanna Publishing House
Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House
Online Resources, Linux man pages, Wikipedia
Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and
Shell programming, by Mokhtar Ebrahim, Andrew Mallett

**Course Description**

**Title: Introduction to IT Systems Lab** **Code: DCS201**
L-T-P scheme: 0-0-4 Credits: 2
Prerequisite: Nil

Course outcomes:
At the end of the course student will be able to comfortably work on computer, install and configure OS, assemble a PC and connect it to external devices, write documents, create worksheets, prepare presentations, protect information and computers from basic abuses/attacks.

Course Objectives:
This Lab course is intended to practice whatever is taught as 'Introduction of IT Systems Lab' and become proficient in using computing environment - basic computer skills, basic application software tools, Computer Hardware, cyber security features, etc.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | |
| CO2 | |
| CO3 | |
| CO4 | |
| CO5 | |
| CO6 | |

**Course Content:**

**Experiment:1** : Browser features, browsing, using various search engines, writing search queries

**Experiment:2** : Visit various e-governance/Digital India portals, understand their features, services offered

**Experiment:3** : Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, recognize various ports/interfaces and related cables, etc.

**Experiment:4** : Install Linux and Windows operating system on identified lab machines, explore various options, do it multiple times

**Experiment:5** : Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.

**Experiment:6** : Practice HTML commands, try them with various values, make your own Webpage

**Experiment:7** : Explore features of Open Office tools, create documents using these features, do it multiple times

**Experiment:8** : Explore security features of Operating Systems and Tools, try using them and see what happens.

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of Computers. This course has eight experiments to help a student gain more experience on the subject. This course is will helps a student to learn more practical knowledge and experience.

**Evaluation Scheme:**

| Exams | | Marks | Coverage |
|---|---|---|---|
| P-1 | | 15 Marks | Based on Lab Exercises: 1-7 |
| P-2 | | 15 Marks | Based on Lab Exercises: 8-15 |
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| Total | | 100 Marks | |

**Learning Resources:**
Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**Books/ References:**
1. Online resources, Linux man pages, Wikipedia.
2. R.S. Salaria, Computer Fundamentals, Khanna Publishing House.
3. Ramesh Bangia, PC Software Made Easy – The PC Course Kit, Khanna Publishing House.
4. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett.

5. IT Essentials PC Hardware and Software Companion Guide, Davis Anfinson and Ken Quamme, CISC Press, Pearson Education.
6. PC Hardware and A+ Handbook, Kate J. Chase PHI (Microsoft).

## Course Description

## Course Description

**Title: Engineering Mechanics** **Code: DCE101**

**L-T-P scheme: 2-1-0** **Credits: 3**

**Prerequisite:** None

**Objectives:**
1. To learn the fundamentals of engineering mechanics and to implement them in analysis of structures.
2. To identify the types of supports, beams and loads acting in a member.
3. To understand the various forces acting on a structure.
4. To perform basic static and dynamic calculations on structural members.
5. To understand the basic structural behavior of static structures in equilibrium.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** the various forces acting on structures |
| CO2 | **Describe and Implement** the fundamental laws governing the mechanics of structures |
| CO3 | **Develop** the knowledge of various terms used in calculation of engineering mechanics problems |
| CO4 | **Identify** the different force systems acting on a structure |
| CO5 | **Apply** different laws of science and solve Static and Kinetic problems |
| CO6 | **Demonstrate** the different principles of mechanics in real life problems |

**Course Content:**

**Unit – I: Concept of engineering mechanics**: definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields, basic quantities and derived quantities of basic units and derived units, different systems of units (FPS, CGS, MKS and SI) and their conversion from one to another for density, force, pressure, work, power, velocity, acceleration, Concept of rigid body, scalar and vector quantities

**Unit– II: Laws of forces** Definition of force, measurement of force in SI units, its

representation, types of force: Point force/concentrated force & Uniformly distributed force, effects of force, characteristics of a force, different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of superposition, Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, triangle law of forces, polygon law of forces - graphically, analytically, resolution of forces, resolving a force into two rectangular components, Free body diagram, Lami's theorem, Type of Load, supports, Beams- analysis for simply supported, cantilever beams

**Unit– III: Loading on beams:** Type of Load, supports, Beams- analysis for simply supported, cantilever beams, Concept of moment, Moment of a force and units of moment, Varignon's theorem, Principle of moment and its applications, Parallel forces, calculating their resultant, concept of couple, its properties and effects, general conditions of equilibrium of bodies under coplanar forces, position of resultant force by moment.

**Unit– IV: Friction**: Definition and concept of friction, types of friction, force of friction, laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction, equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane, calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force: Acting along the inclined plane Horizontally/At some angle with the inclined plane.

**Unit– V: Centroid and moment of Inertia**: Centroid of Standard shape, Centre of Gravity. Centre of Gravity of standard solids, Distinguish between Centroid and Centre of Gravity. Mass and area moment of inertia, parallel and perpendicular axis theorem, polar moment of inertia.

**Unit -VI:** Simple Machines: Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines, determination of maximum mechanical advantage and maximum efficiency. System of pulleys (first, second, third system of pulleys), Working principle and application of wheel and axle, simple screw jack, worm and worm wheel, single and double winch crab. Expression for their velocity ratio and field of their application

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of mechanics. This course has been divided into six units and each section includes theory and numerical exercises to help a student gain more experience on the subject. This theory course is well complemented by a laboratory course under the name ‘Engineering Mechanics lab’ in the same semester that helps a student to learn more practical knowledge and experience.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |

| | | |
|---|---|---|
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**

1. A Text Book of Applied Mechanics by S Ramamurtham,Dhanpat Rai Publishing Co. Ltd.
2. A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi.
3. A Text Book of Applied Mechanics by RK Rajput; Laxmi Publications, New Delhi.

**REFERENCE BOOKS:**

1. Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House, New Delhi.
2. Test Book of Applied Mechanics by AK Upadhya, SK Kataria & Sons, New Delhi

## Course Description

**Title: Applied Physics-II Lab** **Code: DPH202**

**L-T-P scheme: 0-0-2** **Credits: 1**

**Prerequisite:** None

**Objectives:** To develop an appreciation for the importance of applied physics in engineering discipline with the help of experiments.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline and describe** basic principles of measurements and the instruments used for the same. |
| CO2 | **Demonstrate** ability to collect experimental data and understanding the working procedures within the precautionary limits |
| CO3 | **Acquire** the ability to analyse the experimental data and related errors in a reflective, iterative and responsive way |
| CO4 | **Develop** understanding of the basic concepts related to basic applied physics. |
| CO5 | **Appreciate** the importance of the laboratory work culture and ethics that is intended to impart features like regularity, continuity of self evaluation and honesty of reporting the data. |
| | |

**Course Content: List of Experiments**

1. To verify laws of reflection from a plane mirror/ interface.
2. To verify laws of refraction (Snell's law) using a glass slab.
3. To verify Ohm's law by plotting a graph between current and potential difference.
4. To verify laws of resistances in series and parallel combination.
5. To verify Kirchhoff's law using electric circuits.
6. To determine the value of an unknown resistance using a meter bridge.
7. To convert a galvanometer into a voltmeter and an ammeter.
8. To find the frequency of AC main using an electrical vibrator.
9. To draw V-I characteristics of a semiconductor diode (Ge, Si) and determine its knee voltage.
10. To determine focal length and magnifying power of a convex lens.
11. To measure wavelength of a He-Ne/diode laser using a diffraction grating.
12. Using solar cell Trainer (a) study voltage and current of a solar cell (b) Voltage and current in series and parallel combinations (c) Draw power curve to find maximum power point (MPP) and to obtain efficiency of a solar cell.
13. Study of Newton's law of cooling.

**Teaching Methodology:**

This course is introduced to help students for better appreciation of the theory course **Applied Physics-II** offered in the same semester. In this course students learn and develop basic measurements skills, handling errors, and handling experimental setups.

**Evaluation Scheme:**

| Exams | Marks | Coverage |
|---|---|---|
| P-1 | 15 Marks | Based on Lab Exercises: 1-5 |
| P-2 | 15 Marks | Based on Lab Exercises: 6-10 |

| | | | |
|---|---|---|---|
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| Total | | 100 Marks | |

**Learning Resources:**

**TEXT BOOKS:**

1. Concepts of Physics Vol-I, H.C. Verma
2.

**REFERENCE BOOKS:**

1.

**Course Description**

**Title:** Fundamentals of Electrical & Electronics Engineering Lab **Code:** DEC209

**L-T-P Scheme: 0-0-2** **Credit: 1**

**Prerequisite:** Not Applicable

**Objective:**

1. The main aim of the lab is to familiarize with different types of electrical and electronic circuits
2. Identify their applications to the different electrical and electronic systems.

**Learning Outcomes:**

1. Completion of lab students will be able to understand the different techniques to simplify circuit
2. Two port networks and basic principles of different electronic devices and their characteristics.

| Course Outcome | Description |
|---|---|
| CO1 | Familiarization with CRO, DMM and basic electrical components, Kirchhoff's law. |

| | |
|---|---|
| CO2 | Simplify complex network using Thevenin theorem and verify it.State Superposition Theorem and verify. Perform and verify Maximum Power Transfer Theorem. |
| CO3 | V-I characteristic of p-n junction diode |
| CO4 | Design Clipper and Clamper Circuit. |
| CO5 | Rectifier circuits |
| CO6 | Transistor and their v-I characteristics |

**Course Content:**

1. Familiarization with CRO, DMM and basic electrical components.
2. Verify Kirchhoff's law.
3. Simplify complex network using Thevenin's theorem and verify it.
4. State Superposition Theorem and verify.
5. Perform and verify Maximum Power Transfer Theorem.
6. Draw *v-i* characteristic of P-N junction diode.
7. Perform Clipper Circuit.
8. Design Clamper Circuit.
9. Half wave rectifier with and without filter circuit.
10. Full wave rectifier with and without filter circuit.
11. Common Emitter *v-i* characteristic of n-p-n transistor.
12. Common base *v-i* characteristic of n-p-n transistor.

**Teaching Methodology:**

In each experiment the practical is designed and analyzed on bread board with the help of physical devices by each student and further checked and validated by faculty and lab staff.

**Evaluation Scheme:**

| Exams | Marks | Coverage |
|---|---|---|
| **P-1** | **15 Marks** | **Based on Lab Exercises: 1-6** |
| **P-2** | **15 Marks** | **Based on Lab Exercises: 6-12** |

| | | | |
|---|---|---|---|
| **Day-to-Day Work** | Viva | 20 Marks | **70 Marks** |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| **Total** | | **100 Marks** | |

**Learning Resources:**

Tutorials sheets, lecture slides and handwritten notes on Electrical circuit, Electrical Science and Basic Electronics (will be added from time to time): Digital copy will be available on the JUET server.

**Text Books:**


[10] "Basic Electrical Engineering", D.C. Kulshreshtha, McGraw Hill Education, 2009.

[11] "Engineering Circuit Analysis", W.H. Hayt, J. E. Kemerlay and S.M. Durbin, 6th edition, McGraw Hill, 2006.

[12] "Introduction to Electric Circuits", R.C. Dorf & J.A. Svoboda, John Wiley, 2004.

[13] J. Milliman and C.C.Halkias: Integrated Electronics, Mc Graw Hill

[14] R. Bolleystead, Electronic Devices and Circuits

[15] Ramakant A.Gayakwad: Op-Amps and Linear Integrated Circuits, P.H.I.

[16] B. L. Threja "Electrical Technology",S. Chand & Co

[17] V. K. Mehta "Basic Electronics", S. Chand & Co.

[18] Morris Mano, Digital Logic and Computer Design, PHI


**Reference Books:**


[3] David A. Bell: Electronics Devices & Circuits, PHI

[4] J B Gupta: Electronics Devices & Circuits


**Web References:**


[1] https://www.electrical4u.com/electrical-engineering-objective-questions-mcq/

[2] https://www.pdfdrive.com/basic-electric-circuit-analysis-books.html

[3] https://lecturenotes.in/subject/842

## Course Description

**Title: Engineering Mechanics Lab** **Code: DCE202**

**L-T-P scheme: 0-0-2** **Credits: 1**

**Prerequisite:** None

**Objectives:**
1. To develop knowledge of different types of forces and their application

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** basic concepts of applied mechanics |
| CO2 | **Describe and Implement** the equilibrium of forces in structures. |
| CO3 | **Develop** the knowledge of various terms used in calculation of engineering mechanics problems |
| CO4 | **Identify** the static and dynamic equilibrium of forces in structural elements. |
| CO5 | **Apply** y the concepts of equilibrium of structures to solve common problems. |
| CO6 | **Demonstrate** the structural equilibrium in real life problems. |

**Course Content:**

**List of Experiments**:
1. To find the Law of triangular of forces by gravensand's Apparatus.
2. To find the law of parallelogram of forces by gravensand's Apparatus
3. To verify the law of polygon of forces by gravensand's Apparatus
4. To verify Lami's theorem by Jib crane apparatus
5. To find the forces in Jib crane apparatus
6. To find coefficient of friction between two surfaces on a horizontal surface
7. To find coefficient of friction between two surfaces on a inclined plane
8. To verify support reaction by parallelogram force apparatus
9. To find the forces in a member of a triangular truss
10. To find the resultant of forces graphically

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of mechanics. This course has ten experiments to help a student gain more experience on the subject. This theory course is well complemented by a laboratory course under the name 'Engineering Mechanics lab' in the same semester that helps a student to learn more practical knowledge and experience.

**Evaluation Scheme:**

| Exams | | Marks | Coverage |
|---|---|---|---|
| P-1 | | 15 Marks | Based on Lab Exercises: 1-5 |
| P-2 | | 15 Marks | Based on Lab Exercises: 6-10 |
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| Total | | 100 Marks | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**

1. Beer, F.P and Johnston Jr. E.R., "Vector Mechanics for Engineers (In SI Units): Statics and Dynamics", 8th Edition, Tata McGraw-Hill Publishing company, New Delhi (2004).
2. Vela Murali, "Engineering Mechanics", Oxford University Press (2010) REFERENCES:
1. Hibbeller, R.C and Ashok Gupta, "Engineering Mechanics: Statics and Dynamics", 11th Edition, Pearson Education (2010).
3. Irving H. Shames and Krishna Mohana Rao. G., "Engineering Mechanics – Statics and Dynamics", 4 th Edition, Pearson Education (2006)

**REFERENCE BOOKS:**

1. Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House, New Delhi.
2. Test Book of Applied Mechanics by AK Upadhya, SK Kataria & Sons, New Delhi

## Course Description

**Title: Environmental Science** **Code: DGE001**

**L-T-P scheme: 2-0-0** **Credits: 0**

**Prerequisite:** High School Science

**Objectives:**

1. Solve various engineering problems applying ecosystem to produce eco – friendly products.
2. Use relevant air and noise control method to solve domestic and industrial problems.
3. Use relevant water and soil control method to solve domestic and industrial problems.
4. To recognize relevant energy sources required for domestic and industrial applications.
5. Solve local solid and e-waste problems.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** the ecosystem and terminology and solve various engineering problems applying ecosystem knowledge to produce eco-friendly products. |
| CO2 | **Describe** the natural and manmade sources of air pollution noise pollution. |
| CO3 | **Develop** the methods to control the environmental pollution. |
| CO4 | **Identify** the different type's new energy sources. Applications of Hydrogen energy, Ocean energy resources, Tidal energy conversion. |
| CO5 | **Apply** new ideas to control metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries |
| CO6 | **Demonstrate** the environmental management in fabrication industry. |

**Course Content:**

**Unit-1 Ecosystem**

Structure of ecosystem, Biotic & Abiotic components Food chain and food web Aquatic (Lentic and Lotic) and terrestrial ecosystem Carbon, Nitrogen, Sulphur, Phosphorus cycle. Global warming -Causes, effects, process, Green House Effect, Ozone depletion

**Unit– 2 Air and, Noise Pollution**

Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refriger- ants, I.C., Boiler) Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator) Gaseous Pollution Control: Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., and Boiler. Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000

**Unit- 3 Water and Soil Pollution**

Sources of water pollution, Types of water pollutants, Characteristics of water pollutants Turbidity, pH, total suspended solids, total solids BOD and COD: Waste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis). Causes, Effects and Preventive measures of Soil Pollution: Causes- Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste.

**Unit– 4 Renewable sources of Energy**
Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air). Theory of flat plate collector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer. Solar stills. Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogas production mechanism. Utilization and storage of biogas. Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy. New Energy Sources: Need of new sources. Different types new energy sources. Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) Concept, origin and power plants of geothermal energy

**Unit-5 Solid Waste Management, ISO 14000** Solid waste generation- Sources and characteristics of: Municipal solid waste, E- waste, biomedical waste. Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries. Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous Waste.

**Unit-6 Environmental Management**
Air quality act 2004, air pollution control act 1981 and water pollution and control act1996. Structure and role of Central and state pollution control board.
Concept of Carbon Credit, Carbon Footprint. Environmental management in fabrication industry. ISO14000: Implementation in industries, Benefits.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**


1. S.C. Sharma & M.P. Poonia, Environmental Studies,Khanna Publishing House,NewDelhi
2. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
3. Arceivala, Soli Asolekar, Shyam, Waste Water Treatment for Pollution Control and

4. Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099-

**REFERENCE BOOKS:**

1. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000,ISBN 10: 0471144940.
2. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi
3. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publica-

   tion, 2007, ISBN: 81-224-1835-X.
4. Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New delhi, 1988, ISBN: 0-07-451871-8.
5. Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York ; 1978,ISBN: 9780070354760.

# THIRD SEMESTER

**Course Description**

**Title: Construction Material** **Code: DCE102**

**L-T-P scheme: 3-0-0** **Credits: 3**

**Prerequisite:** Nil

**Objectives:**

1. To learn about various construction materials, and understand their relevant characteristics.
2. To be able to identify suitability of various materials for different construction purposes.
3. To know about natural, artificial, and processed materials available for various purposes of construction activities.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** the various available conventional and newer construction materials and techniques. |
| CO2 | **Develop** the concept of selection of suitable material for various structural elements. |
| CO3 | **Describe** the pros and cons of different materials and techniques. |
| CO4 | **Identify** the suitability of different material for different constructions |
| CO5 | **Demonstrate** the structural aspects of different materials. |
| CO6 | **Apply** the concepts special and processed material to real life problems. |

**Course Content:**

**Unit – I:** Overview of Construction Materials

Scope of construction materials in Building Construction, Transportation Engineering, Environmental Engineering, Irrigation Engineering (applications only). Selection of materials for different civil engineering structures on the basis of strength, durability, Eco friendly and economy. Broad classification of materials , Natural, Artificial, special, finishing and recycled.

**Unit – II:** Natural Construction Materials

Requirements of good building stone; general characteristics of stone; quarrying and dressing methods and tools for stone. Structure of timber, general properties and uses of good timber, different methods of seasoning for preservation of timber, defects in timber, use of bamboo in construction. Asphalt, bitumen and tar used in construction, properties and uses. Properties of lime, its types and uses. Types of soil and its suitability in construction. Properties of sand and uses Classification of coarse aggregate according to size

**Unit- III:** Artificial Construction Materials

Constituents of brick earth, Conventional / Traditional bricks, Modular and Standard bricks, Special bricks –fly ash bricks, Characteristics of good brick, Field tests on Bricks, Classification of burnt clay bricks and their suitability, Manufacturing process of burnt clay brick, fly ash bricks, Aerated concrete blocks. Flooring tiles – Types, uses Manufacturing process of Cement - dry and wet (only flow chart), types of cement and its uses. field tests on cement. Pre-cast concrete blocks- hollow, solid, pavement blocks, and their uses. Plywood,

particle board, Veneers, laminated board and their uses. • Types of glass: soda lime glass, lead glass and borosilicate glass and their uses. Ferrous and non-ferrous metals and their uses.

**Unit– IV**: Special Construction Materials
Types of material and suitability in construction works of following materials: Water proofing, Termite proofing; Thermal and sound insulating materials. Fibers – Types – Jute, Glass, Plastic Asbestos Fibers, (only uses). Geopolymer cement: Geo-cement: properties, uses.

**Unit– V**: Processed Construction Materials
Constituents and uses of POP (Plaster of Paris), POP finishing boards, sizes and uses.
Paints- whitewash, cement paint, Distempers, Oil Paints and Varnishes with their uses. Situations where used). Industrial waste materials- Fly ash, Blast furnace slag, Granite and marble polishing waste and their uses. Agro waste materials - Rice husk, Bagasse, coir fibres and their uses. Special processed construction materials; Geosynthetic, Ferro Crete, Artificial timber, Artificial sand and their uses.

**Teaching Methodology:**
The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, |
| Test-2 | 25 Marks | Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**

1. Ghose, D. N., Construction Materials, Tata McGraw Hill, New Delhi.

2. S.K. Sharma, Civil Engineering Construction Materials, Khanna Publishing House, Delhi
3. Varghese, P.C. , Building Materials, PHI learning, New Delhi.
4. Rangwala, S.C., Engineering Materials, Charator publisher, Ahemdabad.

**REFERENCE BOOKS:**

1. Somayaji, Shan, Civil Engineering Materials, Pearson education, New Delhi.
2. Rajput, R.K, Engineering Materials, S. Chand and Co., New Delhi.
3. Sood H., Laboratory Manual on Testing of Engineering Materials, New Age Publishers, New Delhi.
4. Sharma C. P., Engineering Materials, PHI Learning, New Delhi.
5. Duggal, S. K, Building Materials, New International, New Delhi.

## Course Description

**Title: Basic Surveying** **Code: DCE103**

**L-T-P scheme: 2-0-0** **Credits: 2**

**Prerequisite:** NIL

**Objectives:**
• To understand the types of surveying works required.
• To know the types of methods and equipment to be used for different surveys.
• To know the use and operational details of various surveying equipment

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** the principle of various methods of surveying. |
| CO2 | **Identify** the suitable surveying technique for a given field problem. |
| CO3 | **Analyze** the data collection methods and prepare field notes. |
| CO4 | **Describe** the principle of working of survey instruments. |
| CO5 | **Determine** the errors and plot the data to scale. |
| CO6 | **Apply** the concepts of surveying to interpret the data and compute areas and volumes |

**Course Content:**

**Unit – I Overview and Classification of Survey**
Survey- Purpose and Use. Types of surveying—primary and Secondary; Classification: plane, Geodetic, Cadastral, Hydrographic, Photogrammetry, and Aerial. Principles of Surveying. Scales: Engineer's scale, Representative Fraction (RF), and diagonal scale.

**Unit– II Chain Surveying**

Instruments used in chain survey: Metric Chain, Tapes, Arrow, ranging rod, Line ranger, Offset rod, Open cross-staff, Optical square. Chain survey Station, Base line, check line, Tie line, Offset, Tie station. Ranging: Direct and Indirect Ranging. Methods of Chaining, obstacles in chaining. Errors in length: Instrumental error, personal error, error due to natural cause, random error. Principles of triangulation. Types of offsets: Perpendicular and Oblique. Conventional Signs, Recording of measurements in a field book.

**Unit– III Compass Traverse Survey**

Compass Traversing—open, closed. Technical Terms: Geographic/ True Magnetic Meridians and Bearings, Whole Circle Bearing system and Reduced Bearing system and examples of converting a given bearing to another bearing (from one form to another), Fore Bearing and Back

Bearing, Calculation of internal and external angles from bearings at a station, Dip of Magnetic needle, Magnetic Declination. • Components of Prismatic Compass and their Functions, Methods of using Prismatic Compass- Temporary adjustments and observing bearings. Local attraction. Methods of correction of observed bearings—correction at station and correction to included angles. • Methods of plotting a traverse and closing error, Graphical adjustment of closing error.

**Unit– IV Levelling and Contouring**

Basic terminologies: Level surfaces, Horizontal and vertical surfaces, Datum, Bench Marks- GTS, Permanent, Arbitrary and Temporary, Reduced Level, Rise, Fall, Line of collimation, Station, Backsight, Foresight, Intermediate sight, Change point, Height of instruments, Types of levels: Dumpy, Tilting, Auto level, Digital level, Components of Dumpy Level and its fundamental axes, Temporary adjustments of Level, Types of Levelling Staff: Self-reading staff and Target staff. • Reduction of level by Line of collimation and Rise and Fall Method, Levelling Types: Simple, Differential, Fly, Profile and Reciprocal Levelling.

**Unit– V Contour plotting**

Contour, contour intervals, horizontal equivalent, Uses of contour maps, Characteristics of contours, Methods of Contouring: Direct and indirect.

**Unit– VI Measurement of Area and Volume**

Components and use of Digital planimeter. • Measurement of area using digital planimeter., Measurement of the volume of the reservoir from a contour map.

**Teaching Methodology:**

- The course delivery pattern and prerequisites of the subject will be discussed at the start of the course.
- Lecture may be conducted with the aid of a multi-media projector, whiteboard, OHP, etc.

- Attendance is compulsory in lectures which carries marks.
- At regular intervals, assignments will be given. Students should submit all assignments during the given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries marks.
- There will be assignments and quizzes at regular intervals, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% of coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

The NPTEL site offers regular class notes, tutorials, study material, videos, and expert lectures and slides.

**TEXT BOOKS:**

1. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying I, Laxmi Publications, New Delhi.
2. Basak, N. N., Surveying and Levelling, McGraw Hill Education, New Delhi.
3. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling volume I, Pune Vidyarthi Gruh Prakashan.
4. Duggal, S. K., Survey I, McGraw Hill Education, New Delhi.
5. Saikia, M D.; Das. B.M.; Das. M.M., Surveying, PHI Learning, New Delhi.
6. Subramanian, R., Fundamentals of Surveying and Levelling, Oxford University Press. New Delhi.
7. Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning New Delhi.

**REFERENCE BOOKS:**

1. Bhavikatti, S. S., Surveying and Levelling, Volume 1, I. K. International, New Delhi.

2. Arora K R , Surveying Vol. I, Standard Book House.

## Course Description

**Title: Mechanics of Materials** **Code: DCE104**

**L-T-P scheme: 2-0-0** **Credits: 2**

**Prerequisite:** Nil

**Objectives:**

1. To learn properties of area and structural material properties.
2. To understand the concept of stress and strain.
3. To calculate shear force, bending moment for different shapes of structural elements and corresponding stresses.
4. □o understands the concept of buckling loads for short and long columns.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | Outline the practical applications of moment of inertia of symmetrical and unsymmetrical structural sections |
| CO2 | Describe the structural behaviour of materials under various loading conditions |
| CO3 | Develop the shear force and bending moment diagrams for various types of beams and loading conditions |
| CO4 | Identify the bending and shear stresses in beams under different loading conditions |
| CO5 | Apply the concepts of mechanics for the evaluation of forces in beams and columns |
| CO6 | Demonstrate the Concept of working load/safe load, design load and factor of safety |

**Course Content:**

**Unit – I: Moment of inertia (M.I.):** Definition, M.I. of plane lamina, Radius of gyration, section modulus, Parallel and Perpendicular axes theorems (without derivations), M.I. of rectangle, square, circle, semi-circle, quarter circle and triangle section (without derivations). M.I. of symmetrical and unsymmetrical I-section, Channel section, T-section, Angle section,

Hollow sections and built-up sections about centroidal axes and any other reference axis. Polar Moment of Inertia of solid circular sections.

**Unit– II: Simple Stresses and Strains:** Definition of rigid, elastic and plastic bodies, deformation of elastic body under various, forces, Definition of stress, strain, elasticity, Hook's law, Elastic limit, Modulus of elasticity. Type of Stresses-Normal, Direct, Bending and Shear and nature of stresses i.e. Tensile and Compressive stresses. Standard stress strain curve for tor steel bar under tension, Yield stress, Proof stress, Ultimate stress, Strain at various critical points, Percentage elongation and Factor of safety. Deformation of body due to axial force, forces applied at intermediate sections, Maximum and minimum stress induced, Composite section under axial loading. Concept of temperature stresses and strain, Stress and strain developed due to temperature variation in homogeneous simple bar (no composite section) Longitudinal and lateral strain, Modulus of Rigidity, Poisson's ratio, Biaxial and tri-axial
stresses, volumetric strain, change in volume, Bulk modulus (Introduction only). Relation between modulus of elasticity, modulus of rigidity and bulk modulus (without derivation).

**Unit– III : Shear Force and Bending Moment:** Types of supports, beams and loads. Concept and definition of shear force and bending moment, Relation between load, shear force and bending moment (without derivation). Shear force and bending moment diagram for cantilever and simply supported beams subjected to point loads, uniformly distributed loads and couple (combination of any two types of loading), point of contra flexure.

**Unit– IV: Bending and Shear Stresses in beams:** Concept and theory of pure bending, assumptions, flexural equation (without derivation), bending stresses and their nature, bending stress distribution diagram. Concept of moment of resistance and simple numerical problems using flexural equation. Shear stress equation (without derivation), relation between maximum and average shear stress for rectangular and circular section, shear stress distribution diagram. Shear stress distribution for square, rectangular, circle, hollow, square, rectangular, circular, angle sections, channel section, I-section, T section. Simple numerical problems based on shear equation.

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

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of mechanics and forces.

**Evaluation Scheme:**

| Exams | Marks | Coverage |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |

| | | |
|---|---|---|
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| Total | 100 Marks | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**

1. Bedi D.S. , Strength of Materials, Khanna Publishing House, Delhi, Ed. 2018
2.
3. Khurmi, R.S., Strength of Materials, S Chand and Co. Ltd. New Delhi.
4.
5. Punmia B C, Strength of Materials, Laxmi Publications (p) Ltd. New Delhi.
6. Rattan S.S., Strength of Materials, McGraw Hill Education; New Delhi.
7. Bansal R K, Strength of Materials, Laxmi Publications.

**REFERENCE BOOKS:**

1. Timoshenko, S., Strength of Materials, Vol. I, CBS, New Delhi.
2. Subramaniam R, Strength of Materials, Oxford University Press.
3. Ramamurtham, S, Strength of Materials, Dhanpat Rai and sons, New Delhi.

## Course Description

**Title: Building Construction** **Code: DCE105**

**L-T-P scheme: 2-0-0** **Credits: 2**

**Prerequisite:** None

**Objectives:**
The objective of this course is to introduce the techniques used in the construction of various civil engineering structures.
**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** various construction techniques available |
| CO2 | **Describe and Implement** the methodologies for construction under different site conditions |
| CO3 | **Develop** the fundamental concepts of construction techniques |
| CO4 | **Identify** the most suitable method for the construction of structure for a given situation |
| CO5 | **Apply** the knowledge of building construction to plan and develop structures. |

**Course Content:**

**Unit – I: Introduction**: Definition of a building, classification of buildings based on occupancy. Different parts of a building.

**Unit– II: Foundation:** Concept of foundation and its purpose. Types of foundation-shallow and deep. Shallow foundation - constructional details of: Spread foundations for walls, minimum depth criteria, thumb rules for depth and width of foundation and thickness of concrete block, stepped foundation for masonry pillars and concrete columns, Raft foundation, combined footing grillage foundation. Introduction to deep foundation and their types. Layout/setting out for surface excavation, cutting and filling. Excavation of foundation, trenches, shoring, timbering and dewatering

**Unit– III: Walls and Masonry**: Purpose of walls. Classification of walls - load bearing, non-load bearing, dwarf wall, retaining, breast walls and partition walls. Classification of walls as per materials of construction: brick, stone, reinforced brick, reinforced concrete, precast, hollow and solid concrete block and composite masonry walls. Partition walls: Constructional details, suitability and uses of brick and wooden partition walls. Scaffolding, construction details and suitability of mason's brick layers and tubular scaffolding, shoring, underpinning. Brick Masonry and stone masonry: Definition of terms like header, stretcher, queen closer, king closer, frog and quoin, course, bond, facing, backing, hearting, jambs, reveals, soffit, plinth, pillars and pilasters. Bond – meaning and necessity; English, flemish bond and other types of bonds. Construction of brick walls –methods of laying bricks in walls, precautions observed in the construction of walls, methods of bonding new brick work with old (toothing, raking, back and block bonding), Expansion and contraction joints. Mortars: types, selection of mortar and its preparation

**Unit– IV: Doors, Windows, Lintels and Ventilators**: Glossary of terms with neat sketches. Classification based on materials i.e. wood, metal and plastic and their suitability for different situations. Different type of doors- panel door, flush door, glazed door, rolling shutter, steel door, sliding door, plastic and aluminum doors. Window – Panel window, glazed windows (fixed and openable) ventilators, sky light window, Louveres shutters, plastic and aluminum windows. Door and window frames – materials and sections, fixtures and fasteners, hold fasts. Lintels: Purpose of lintel. Materials used for lintels. Cast-in-situ and pre-cast lintels. Lintel along with sun-shade or chhajja.

**Unit– V:** Roofs and stairs: Types of roofs, concept of flat, pitched and arched roofs. Glossary of terms for pitched roofs - batten, eaves, facia board, gable, hip, lap, purlin, rafter, rag bolt, valley, ridge, rain water gutter, anchoring bolts False ceilings using gypsum, plaster boards, cellotex, fibre boards. Glossary of terms: Staircase, winders, landing, stringer, newel, baluster, riser, tread, width of staircase, hand-rail, nosing. Classification of staircase on the basis of material – RCC, timber, steel, Aluminum. Planning and layout of staircase: Relations between rise and tread, determination of width of stair, landing etc

**Unit -VI:** Surface finishes and Green building fundamentals: Plastering, pointing, Anti termite treatment techniques, damp proofing, green building, Rain water harvesting/water efficiency, energy efficiency, material efficiency Indoor air quality design and innovation rating system.

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of Building construction. This course has been divided into six units and each section includes theory and numerical exercises to help a student gain more experience on the subject. This theory course is well complemented by a laboratory course under the name 'Construction Materials lab' in the same semester that helps a student to learn more practical knowledge and experience.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**


1. A Text Book of Building Construction by Kulkarni, GJ; Ahmedabad Book Depot
2. A Text Book of Building Construction by Arora, SP and Bindra, SP; Dhanpat Rai and

Sons, New Delhi.

**REFERENCE BOOKS:**


1. Building Construction by Sushil Kumar; Standard Publishers Distributors, Delhi
2. SP – 62 Hand Book of BIS 6 B.I.S. – 6313 Part 1, 2, 3
3. National Building Code 8. Handbook of Civil Engineering by PN Khanna


## Course Description

**Title: Concrete Technology** **Code: DCE106**

**L-T-P scheme: 2-0-0** **Credits: 2**

**Prerequisite:** NIL

**Objectives:**

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

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** and Use different types of cement and aggregates in concrete |
| CO2 | **Identify** and Prepare concrete of desired compressive strength. |
| CO3 | **Analyze** and Prepare concrete of required specification |
| CO4 | **Describe** and Maintain quality of concrete under different conditions |
| CO5 | **Determine** and Apply relevant admixtures for concreting |
| CO6 | **Apply** the concepts of surveying to interpret the data and compute areas and volumes |

**Course Content:**

**Unit – I Cement, Aggregates and Water**

Physical properties of OPC and PPC: fineness, standard consistency, setting time, soundness, compressive strength. Different grades of OPC and relevant BIS codes, Testing of cement: Laboratory tests-fineness, standard consistency, setting time, soundness, compressive strength. Storage of cement and effect of storage on properties of cement, BIS Specifications and field applications of different types of cements: Rapid hardening, Low heat, Portland pozzolana, Sulphate resisting, Blast furnace slag, High Alumina and White cement,

Aggregates: Requirements of good aggregate, Classification according to size and shape, Fine aggregates: Properties, size, specific gravity, bulk density, water absorption and bulking, fineness modulus and grading zone of sand, silt content and their specification as per IS 383. Concept of crushed Sand, Coarse aggregates: Properties, size, shape, surface texture, water absorption, soundness, specific gravity and bulk density, fineness modulus of coarse aggregate, grading of coarse aggregates, crushing value, impact value and abrasion value of coarse aggregates with specifications. • Water: Quality of water, impurities in mixing water and permissible limits for solids as per IS: 456.

**Unit– II Concrete**

Concrete: Different grades of concrete, provisions of IS 456, Duff Abraham water cement (w/c) ratio law, significance of w/c ratio, selection of w/c ratio for different grades, maximum w/c ratio for different grades of concrete for different exposure conditions as per IS 456, Properties of fresh concrete: Workability: Factors affecting workability of concrete. Determination of workability of concrete by slump cone, compaction factor, Vee-Bee Consistometer. Value of workability requirement for different types of concrete works. Segregation, bleeding and preventive measures, Properties of Hardened concrete: Strength, Durability, Impermeability.

**Unit– III Concrete Mix Design and Testing of Concrete**

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

**Unit– IV Quality Control of Concrete**

Concreting Operations: Batching, Mixing, Transportation, Placing, Compaction, Curing and Finishing of concrete, Forms for concreting: Different types of form works for beams, slabs, columns, materials used for form work, requirement of good form work. Stripping time for removal of form works per IS 456, Waterproofing: Importance and need of waterproofing, methods of waterproofing and materials used for waterproofing, Joints in concrete construction: Types of joints, methods for joining old and new concrete, materials used for filling joints.

**Unit– V Chemical Admixture, Special Concrete and Extreme Weather concreting**

Admixtures in concrete: Purpose, properties and application for different types of admixture such as accelerating admixtures, retarding admixtures, water reducing admixtures, air entraining admixtures and super plasticizers, Special Concrete: Properties, advantages and limitation of following types of Special concrete: Ready mix Concrete, Fiber Reinforced Concrete, High performance Concrete Self-compacting concrete and light weight concrete.

**Unit– VI Weather concreting**

Cold weather concreting: effect of cold weather on concrete, precautions to be taken while concreting in cold weather condition, Hot weather concreting: effect of hot weather on concrete, precautions to be taken while concreting in hot weather condition.

**Teaching Methodology:**

- The course delivery pattern and prerequisites of the subject will be discussed at the start of the course.
- Lecture may be conducted with the aid of a multi-media projector, whiteboard, OHP, etc.
- Attendance is compulsory in lectures which carries marks.
- At regular intervals, assignments will be given. Students should submit all assignments during the given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries marks.
- There will be assignments and quizzes at regular intervals, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% of coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

The NPTEL site offers regular class notes, tutorials, study material, videos, and expert lectures and slides.

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

1. Concrete, Prentice Hall, by P. K. Mehta, P J M Monteiro, New Jersey
2. Handbook of Concrete Mixes, Special Publications No 24 BIS New Delhi
3. EFNAARC Guidelines on SCC
4. ACI Special Publications
5. IS Specifications

## Course Description

**Title: Geotechnical Engineering** **Code: DCE107**

**L-T-P scheme: 2-0-0** **Credits: 0**

**Prerequisite:** Engineering Geology

**Objectives:**

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

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline to** rock: Classification based on their genesis (mode of origin), formation. Classification and engineering uses of igneous, sedimentary and metamorphic rocks. |
| CO2 | **Describe the** consistency of soil, Atterberg limits of consistency: Liquid limit, plastic limit and shrinkage limit. Plasticity index. |
| CO3 | **Develop the** Shear failure of soil, concept of shear strength of soil. Components of shearing resistance of soil – cohesion, internal friction. |

| | |
|---|---|
| CO4 | **Identify** Field methods for determination of bearing capacity – Plate load and Standard Penetration Test. |
| CO5 | **Apply** the suitability of various compaction equipments-smooth wheel roller, sheep foot roller, pneumatic tyred roller, Rammer and Vibrator, Difference between compaction and consolidation. |
| CO6 | **Demonstrate** the different methods of soil stabilization. |

**Course Content:**

**Unit – I Overview of Geology and Geotechnical Engineering**

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

**Unit– II Physical and Index Properties of Soil**

Soil as a three phase system, water content, determination of water content by oven drying method as per BIS code, void ratio, porosity and degree of saturation, density index. Unit weight of soil mass – bulk unit weight, dry unit weight, unit weight of solids, saturated unit weight, submerged unit weight. Determination of bulk unit weight and dry unit weight by core cutter and sand replacement method, Determination of specific gravity by pycnometer. Consistency of soil, Atterberg limits of consistency: Liquid limit, plastic limit and shrinkage limit. Plasticity index. Particle size distribution test and plotting of curve, Determination of effective diameter of soil, well graded and uniformly graded soils, BIS classification of soil.

**Unit– III Permeability and Shear Strength of Soil**

Definition of permeability, Darcy's law of permeability, coefficient of permeability, factors affecting permeability, determination of coefficient of permeability by constant head and falling head tests, simple problems to determine coefficient of permeability. Seepage through earthen structures, seepage velocity, seepage pressure, phreatic line, flow lines, application of flow net, (No numerical problems). Shear failure of soil, concept of shear strength of soil. Components of shearing resistance of soil – cohesion, internal friction. Mohr-Coulomb failure theory, Strength envelope, strength equation for purely cohesive and cohesion less soils. Direct shear and vane shear test –laboratory methods.

**Unit– IV Bearing Capacity of Soil**

Bearing capacity and theory of earth pressure. Concept of bearing capacity, ultimate bearing capacity, safe bearing capacity and allowable bearing pressure. Introduction to Terzaghi's analysis and assumptions, effect of water table on bearing capacity. Field methods for determination of bearing capacity – Plate load and Standard Penetration Test. Test procedures as per IS:1888 & IS:2131. Definition of earth pressure, Active and Passive earth pressure for

no surcharge condition, coefficient of earth pressure, Rankine's theory and assumptions made for non-cohesive Soils.

**Unit– V Compaction of soil**

Concept of compaction, Standard and Modified proctor test as per IS code, Plotting of Compaction curve for determining: Optimum moisture content(OMC), maximum dry density(MDD), Zero air voids line. Factors affecting compaction, field methods of compaction – rolling, ram-ming and vibration. Suitability of various compaction equipments-smooth wheel roller, sheep foot roller, pneumatic tyred roller, Rammer and Vibrator, Difference between compaction and consolidation.

**Unit– VI Stabilization of soil**

Concept of soil stabilization, necessity of soil stabilization, different methods of soil stabilization. California bearing ratio (CBR) test - Meaning and Utilization in Pavement Construction, Necessity of site investigation and soil exploration: Types of exploration, criteria for deciding the location and number of test pits and bores. Field identification of soil – dry strength test, dilatancy test and toughness test.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**


1. Punmia, B.C., Soil Mechanics and Foundation Engineering, Laxmi Publication, Delhi.
2. Murthy, V.N.S., A text book of soil mechanics and foundation Engineering, CBS Publishers & Distributors Pvt. Ltd., New Delhi.
3. Ramamurthy, T.N. & Sitharam,T.G., Geotechnical Engineering(Soil

Mechanics), S Chand andCompany LTD., New Delhi.

**REFERENCE BOOKS:**

1. Raj, P. Purushothama, Soil Mechanics and Foundation Engineering, Pearson India, New Delhi.
2. Kasamalkar, B. J., Geotechnical Engineering, Pune Vidyarthi Griha Prakashan, Pune.
3. Arora K R, Soil Mechanics and Foundation Engineering, Standard Publisher.

## Course Description

**Title: Construction Materials Lab** **Code: DCE203**

**L-T-P scheme: 0-0-2** **Credits: 1**

**Prerequisite:** None

**Objectives:**

1. To learn about various construction materials, and understand their relevant characteristics.
2. To be able to identify suitability of various materials for different construction purposes.
3. To know about natural, artificial, and processed materials available for various purposes of construction activities.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** the various available conventional and newer construction materials and techniques. |
| CO2 | **Develop** the concept of selection of suitable material for various structural elements. |
| CO3 | **Describe** the pros and cons of different materials and techniques. |
| CO4 | **Identify** the suitability of different material for different constructions |
| CO5 | **Demonstrate** the structural aspects of different materials. |
| CO6 | **Apply** the concepts special and processed material to real life problems. |

**Course Content:**

**List of Experiments**:

1. Identify various sizes of available coarse aggregates from sample of 10 kg in laboratory and prepare report (60,40, 20,10 mm)
2. Identify the available construction materials in the laboratory on the basis of their sources.
3. Identify the grain distribution pattern in given sample of teak wood in the laboratory and draw the various patterns. (along and perpendicular to the grains)
4. Prepare the lime putty by mixing lime (1 kg) with water in appropriate proportion and pre- pare report on slaking of lime.
5. Identify various layers and types of soil in foundation pit by visiting at least 3 construction sites in different locations of city and prepare report consisting photographs and samples. Part I
6. Identify various layers and types of soil in foundation pit by visiting at least 3 construction sites in different locations of city and prepare report consisting photographs and samples. Part II
7. Select first class, second class and third-class bricks from the stake of bricks and prepare report on the basis of its properties.
8. Measure dimensions of 10 bricks and find average dimension and weight. Perform field tests - dropping, striking and scratching by nail and correlate the results obtained.
9. Identify different types of flooring tiles such as vitrified tiles, ceramic tiles, glazed tiles, mo- saic tiles, anti- skid tiles, chequered tiles, paving blocks and prepare report about the speci- fications.
10. Apply the relevant termite chemical on given damaged sample of timber.
11. Identify the type of glasses from the given samples.
12. Apply two or more coats of selected paint on the prepared base of a given wall surface for the area of 1m x 1m using suitable brush/rollers adopting safe practices. Part I
13. Apply two or more coats of selected paint on the prepared base of a given wall surface for the area of 1m x 1m using suitable brush/rollers adopting safe practices. Part II
14. Prepare the cement mortar of proportion 1:3 or 1:6 using artificial sand as a special pro- cessed construction material.
15. Prepare mortar using cement and Fly ash or Granite/marble polishing waste in the propor- tion 1:6 or 1:3.

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of mechanics. This course has ten experiments to help a student gain more experience on the

subject. This theory course is well complemented by a laboratory course under the name 'Engineering Mechanics lab' in the same semester that helps a student to learn more practical knowledge and experience.

**Evaluation Scheme:**

| Exams | | Marks | Coverage |
|---|---|---|---|
| P-1 | | 15 Marks | Based on Lab Exercises: 1-7 |
| P-2 | | 15 Marks | Based on Lab Exercises: 8-15 |
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| Total | | 100 Marks | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**


1. Ghose, D. N., Construction Materials , Tata McGraw Hill, New Delhi.
2. S.K. Sharma, Civil Engineering Construction Materials, Khanna Publishing House, New Delhi
3. Varghese, P.C. , Building Materials, PHI learning, New Delhi.
4. Rangwala, S.C., Engineering Materials, Charator publisher, Ahemdabad.
5. Somayaji, Shan, Civil Engineering Materials, Pearson education, New Delhi.
6. Rajput, R.K, Engineering Materials, S. Chand and Co., New Delhi.


**REFERENCE BOOKS:**


1. Sood H., Laboratory Manual on Testing of Engineering Materials, New Age Publishers, New Delhi.
2. Sharma C. P., Engineering Materials, PHI Learning, New Delhi.
3. Duggal, S. K, Building Materials, New International, New Delhi.


## Course Description

**Title: Basic Surveying Lab** **Code: DCE204**

**L-T-P scheme: 0-0-2** **Credits: 1**

**Prerequisite:** NIL

**Objectives:**

• To understand the types of surveying works required.
• To know the types of methods and equipment to be used for different surveys.
• To know the use and operational details of various surveying equipment

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** and Select the type of survey required for given situation. |
| CO2 | **Identify** and Compute area of open field using chain, tape and cross staff. |
| CO3 | **Analyze** and Conduct traversing in the field using chain and compass. |
| CO4 | **Describe** and Use levelling instruments to determine reduced level to prepare contour maps |
| CO5 | **Determine** and Use digital planimeter to calculate the areas. |
| CO6 | **Demonstrate** different types of special concrete |

**Course Content:**

List of Practicals to be performed

1. Measure the distance between two survey stations using chain, tape, and ranging rods when the two stations are intervisible. Undertake reciprocal ranging and measure the distance between two stations. Determine the area of open field using chain and cross staff survey.

2. Measure Fore Bearing and Back Bearing of survey lines of open traverse using Prismatic Compass.

3. Measure Fore forebearing and back bearing of a closed traverse of 5 or 6 sides and correct the bearings and included angles for the local attraction.

4. Undertake a Survey Project with chain and compass for a closed traverse on at least five sides around a building.

5. Plot the traverse on an A1-size imperial drawing sheet for the data collected in the Survey Project mentioned at practical No.6.

6. Undertake simple leveling using dumpy level/ Auto level and leveling staff.

7. Undertake differential leveling and determine Reduced Levels by Height of instrument method and Rise and fall method using dumpy level/Auto Level and leveling staff.

8. Undertake fly leveling with a double check using dumpy level/ Auto level and leveling staff.

9. Undertake a Survey Project with a Leveling instrument for Profile leveling and cross-sectioning for a road length of 500 m with a cross-section at 30 m intervals.

10. Plot the L-section with a minimum of 3 cross-sections on an A1-size imperial sheet for the data collected in the Survey Project mentioned at practical No.11.

**Teaching Methodology:**

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Attendance is compulsory in practical which carries marks.
- At regular intervals assignments will be given. Students should submit all assignments during given period.
- Internal exam of 30 marks will be conducted as a part of mid semester evaluation. Experiments shall be performed in the field related to course contents.
- The course includes practical, where students have an opportunity to build an appreciation for the concept being taught in lectures.

**Evaluation Scheme:**

| Exams | | Marks | Coverage |
|---|---|---|---|
| P-1 | | 15 Marks | Based on Lab Exercises: 1-7 |
| P-2 | | 15 Marks | Based on Lab Exercises: 8-14 |
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| Total | | 100 Marks | |

**Learning Resources:**

The NPTEL site offers regular class notes, tutorials, study material, videos, and expert lectures and slides.

**TEXT BOOKS:**

1. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying I, Laxmi Publications, New Delhi.
2. Basak, N. N., Surveying and Levelling, McGraw Hill Education, New Delhi.
3. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling volume I, Pune Vidyarthi Gruh Prakashan.
4. Duggal, S. K., Survey I, McGraw Hill Education, New Delhi.
5. Saikia, M D.; Das. B.M.; Das. M.M., Surveying, PHI Learning, New Delhi.
6. Subramanian, R., Fundamentals of Surveying and Levelling, Oxford University Press. New Delhi.
7. Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning New Delhi.

**REFERENCE BOOKS:**

8. Bhavikatti, S. S., Surveying and Levelling, Volume 1, I. K. International, New Delhi.

9. Arora K R , Surveying Vol. I, Standard Book House.

**Course Description**

Title: **Mechanics of Materials Lab** **Code: DCE205**

**L-T-P scheme: 0-0-2** **Credit: 1**

**Prerequisite:** Nil

**Objectives:**

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

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** Tests of different Civil engineering materials |
| CO2 | **Describe** Analysis structural behaviour of materials under various loading conditions |
| CO3 | **Develop** Interpretation of shear force and bending moment diagrams for various types of beam sections and different loading conditions |
| CO4 | **Identify** the bending and shear stresses in beams under different loading conditions |
| CO5 | **Apply** flexural strength of different types of floor tiles |

**List of Practicals to be performed:**

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

15. Plot Shear force and Bending Moment diagrams for overhanging beams for different types
16. of loads including moment loading.
17. Conduct Flexural test on timber beam on rectangular section in both orientation as per
18. IS:1708, IS:2408.
19. Conduct Flexure test on floor tiles IS:1237,IS:13630 or roofing tiles as per IS:654,IS:2690.

**Teaching Methodology:**

The objective of this course is to know properties of cement, aggregate and water used in concrete, to understand different characteristics of concrete and to learn about role of admixtures in concrete.

**Evaluation Scheme:**

<table>
<tr><td colspan="2">Exam</td><td>Marks</td><td>Coverage</td></tr>
<tr><td colspan="2">P-1</td><td>15 Marks</td><td>Based on Lab Exercises: 1-6</td></tr>
<tr><td colspan="2">P-2</td><td>15 Marks</td><td>Based on Lab Exercises: 7-12</td></tr>
<tr><td rowspan="4">Day-to-Day Work</td><td>Viva</td><td>20 Marks</td><td rowspan="4">70 Marks</td></tr>
<tr><td>Demonstration</td><td>20 Marks</td></tr>
<tr><td>Lab Record</td><td>15 Marks</td></tr>
<tr><td>Attendance & Discipline</td><td>15 Marks</td></tr>
<tr><td colspan="2">Total</td><td colspan="2">100</td></tr>
</table>

**Learning Resources:**

Lab manuals, code books, regular lab demonstration & notes, study material, videos, and expert lecture & slides available in NPTEL site

**TEXT BOOKS:**

**Suggested learning resources:**


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

**REFERENCE BOOKS:**


1. Timoshenko, S., Strength of Materials, Vol. I, CBS, New Delhi.
2. Subramaniam R, Strength of Materials, Oxford University Press.


## Course Description

**Title: Concrete technology Lab** **Code: DCE206**

**L-T-P scheme:** 0-**0-2** **Credits: 1**

**Prerequisite:** NIL

**Objectives:**

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

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** and Identify different types of cement by performing laboratory tests. |
| CO2 | **Identify** and Know the physical properties of fine and coarse aggregates |
| CO3 | **Analyze** and Prepare concrete of required specification. |
| CO4 | **Describe** and Maintain the quality of concrete applying scientific principles. |
| CO5 | **Determine** and Use relevant admixtures for improving the workability of concrete. |
| CO6 | **Demonstrate** different types of special concrete |

**Course Content:**

**List of Practical to be performed:**

1 Determine the fineness of cement by Blaine's air permeability apparatus Or by sieving.

2 Determine specific gravity, standard consistency, and initial and final setting times of cement.

3 Determine the compressive strength of cement.

4 Determine silt content in sand.

5 Determine the bulking of sand.

6 Determine the bulk density of fine and coarse aggregates.
7 Determine water absorption of fine and coarse aggregates.
8 Determine the Fineness modulus of fine aggregate by sieve analysis.
9 Determine the impact value of aggregate
10 Determine the crushing value of aggregate.
11 Determine the abrasion value of aggregate.
12 Determine the elongation and flakiness index of coarse aggregates
13 Determine the workability of concrete by slump cone test.
14 Determine the workability of concrete by compaction factor test.
15 To prepare a concrete mix of a particular grade and determine the compressive strength of concrete for 7 and 28 days.
16 Demonstration of NDT equipment.

**Teaching Methodology:**

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Attendance is compulsory in practical which carries marks.
- At regular intervals assignments will be given. Students should submit all assignments during given period.
- Internal exam of 30 marks will be conducted as a part of mid semester evaluation. Experiments shall be performed in the field related to course contents.
- The course includes practical, where students have an opportunity to build an appreciation for the concept being taught in lectures.

**Evaluation Scheme:**

| Exams | | Marks | Coverage |
|---|---|---|---|
| P-1 | | 15 Marks | Based on Lab Exercises: 1-7 |
| P-2 | | 15 Marks | Based on Lab Exercises: 8-14 |
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| Total | | 100 Marks | |

**Learning Resources:**

The NPTEL site offers regular class notes, tutorials, study material, videos, and expert lectures and slides.

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

1. Concrete, Prentice Hall, by P. K. Mehta, P J M Monteiro, New Jersey
2. Handbook of Concrete Mixes, Special Publications No 24 BIS New Delhi
3. EFNAARC Guidelines on SCC
4. ACI Special Publications
5. IS Specifications

## Course Description

**Title: Geotechnical Engineering Lab** **Code: DCE207**

**L-T-P scheme: 0-0-2** **Credits: 1**

**Prerequisite:** None

**Objectives:**

1. To understand and determine physical and index properties of soil.
2. To learn various compaction methods for soil stabilization.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** basic concepts of applied mechanics |
| CO2 | **Describe and Implement** the equilibrium of forces in structures. |
| CO3 | **Develop** the knowledge of various terms used in calculation of engineering mechanics problems |
| CO4 | **Identify** the static and dynamic equilibrium of forces in structural elements. |
| CO5 | **Apply** y the concepts of equilibrium of structures to solve common problems. |
| CO6 | **Demonstrate** the structural equilibrium in real life problems. |

**Course Content:**

**List of Experiments**:

1. Determine water content of given soil sample by oven drying method as per IS: 2720 (Part- II).
2. Determine specific gravity of soil by pycnometer method as per IS 2720 (Part- III).
3. Determine dry unit weight of soil in field by core cutter method as per IS 2720 (Part- XXIX).
4. Determine dry unit weight of soil in field by sand replacement method as per IS 2720 (Part- XXVIII).
5. Determine Plastic and Liquid Limit along with Plasticity Index of given soil sample as per IS 2720 (Part- V).
6. Determine Shrinkage limit of given soil sample as per IS 2720 (Part- V).
7. Determine grain size distribution of given soil sample by mechanical sieve analysis as per IS 2720 (Part- IV).
8. Determine coefficient of permeability by constant head test as per IS 2720 (Part- XVII).
9. Determine coefficient of permeability by falling head test as per IS 2720 (Part- XVII).
10. Determine MDD and OMC by standard proctor test of given soil sample as per IS 2720 (Part-VII).

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of soils. This course has ten experiments to help a student gain more experience on the subject. This theory course is well complemented by a laboratory course under the name 'Geotechnical Engineering lab' in the same semester that helps a student to learn more practical knowledge and experience.

**Evaluation Scheme:**

| Exams | | Marks | Coverage |
|---|---|---|---|
| P-1 | | 15 Marks | Based on Lab Exercises: 1-5 |
| P-2 | | 15 Marks | Based on Lab Exercises: 6-10 |
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| Total | | 100 Marks | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**

1. Lab manuals.
2. Punmia, B.C., Soil Mechanics and Foundation Engineering, Laxmi Publication
3. Murthy, V.N.S., A text book of soil mechanics and foundation Engineering, CBS Publishers &Distributors Pvt. Ltd., New Delhi.
4. Arora K R, Soil Mechanics and Foundation Engineering, Standard Publisher.

**REFERENCE BOOKS:**

1. Ramamurthy, T.N. & Sitharam,T.G., Geotechnical Engineering(Soil Mechanics), S Chand and Company LTD., New Delhi.
2. Raj, P. Purushothama, Soil Mechanics and Foundation Engineering, Pearson India
3. Kasamalkar, B. J., Geotechnical Engineering, Pune Vidyarthi Griha Prakashan, Pune.

# FOURTH SEMESTER

**Course Description**

**Title: Hydraulics** **Code: DCE108**
**L-T-P scheme: 2-0-0** **Credits: 2**
**Prerequisite: Nil**

**Objectives:**

Following are the objectives of this course:

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

**Learning Outcomes:** After competing this course, student will be able to:

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

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** the fundamental principle of mechanics of fluid. |
| CO2 | **Describe** the static, kinematics and dynamics of flow. |
| CO3 | **Develop** the Understanding of various parameters associated with fluid flow |
| CO4 | **Apply** principles of fluid to various fluid flow phenomenon. |
| CO5 | **Design** the branched pipe systems. |

**Course Content:**

**Unit – I Fluid Properties**

- Technical terms used in Hydraulics –fluid, fluid mechanics, hydraulics, hydrostatics and hydrodynamics - ideal and real fluid, application of hydraulics. Physical properties of fluid – density-specific volume, specific gravity, surface tension, capillarity, viscosity-Newton's law of viscosity.

**Unit – II Pressure measurement and Hydrostatic pressure**

Various types of pressure – Atmospheric Pressure, Gauge Pressure, Absolute Pressure, Vacuum Pressure. Concept of Pressure head and its unit, Pascal's law of fluid pressure and its uses. Measurement of differential Pressure by different methods. Variation of pressure with depth, Pressure diagram, hydrostatic pressure and center of pressure on immersed surfaces and on tank walls. Determination of total pressure and center of pressure on sides and bottom of water tanks, sides and bottom of tanks containing two liquids, vertical surface in contact with liquid on either side

**Unit– III Fluid Flow Parameters**

Types of flow – Gravity and pressure flow, Laminar, Turbulent, Uniform, Non-uniform, Steady, Unsteady flow. Reynolds number. Discharge and its unit, continuity equation of flow. Energy of flowing liquid: potential, kinetic and pressure energy. Bernoulli's theorem : tatement, assumptions, equation.

**Unit– IV Flow through pipes**

Major head loss in pipe: Frictional loss and its computation by Darcy's Weisbach equation, Use of Moody's Diagram and Nomograms. Minor losses in pipe: loss at entrance, exit, sudden contraction, sudden enlargement and fittings. Flow through pipes in series, pipes in parallel and Dupuit's equation for equivalent pipe. Hydraulic gradient line and total energy line. Water hammer in pipes: Causes and Remedial measures. Discharge measuring device for pipe flow: Venturi meter - construction and working. Discharge measurement using Orifice, Hydraulic Coefficients of Orifice.

**Unit– V Flow through Open Channel**

Geometrical properties of channel section: Wetted area, wetted perimeter, hydraulic radi- us for rectangular and trapezoidal channel section. Determination of discharge by Chezy's equation and Manning's equation. Conditions for most economical rectangular and trapezoidal channel section. Discharge measuring devices: riangular and rectangular Notches. Velocity measurement devices: current meter, floats and Pitot's tube. Specific energy diagram, Froudes' Number

**Unit– VI Hydraulic Pumps**

Concept of pump, Types of pump - centrifugal, reciprocating, submersible. Centrifugal pump: components and working Reciprocating pump: single acting and double acting, components and working. Suction head, delivery head, static head, Manometric head Power of centrifugal pump. Selection and choice of pump.

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of fluid mechanics. This course has been divided into six units and each section includes theory and numerical exercises to help a student gain more experience on the subject.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning resources:**


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


## Course Description

**Title: Advanced Surveying** **Code: DCE109**

**L-T-P scheme: 2-0-0** **Credits: 2**

**Prerequisite:** NIL

**Objectives:**

• To know methods of plane surveying and Theodolite surveying and their uses
• To learn tacheometric surveying and curve setting
• To understand the principles of Electronic Distance Measurement equipment and Total station
and their use.
• To know the concept of remote sensing, GPS and GIS

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** and Prepare plans using Plane Table Surveys.. |
| CO2 | **Identify** and prepare plans using Theodolite surveys |
| CO3 | **Analyze** the distances and elevations using a Tachometer |
| CO4 | **Describe** and Prepare plans using the Total Station instrument. |
| CO5 | **Determine** and Locate coordinates of stations using GPS. |
| CO6 | **Apply** the concepts of surveying to interpret the data and compute areas and volumes |

**Course Content:**

**Unit – I Plane Table Surveying**

Principles of plane table survey, Accessories of the plane table and their use, Telescopic alidade. Setting of plane table; Orientation of plane table - Back sighting and Magnetic

meridian method, True Meridian Method, Methods of plane table surveys- Radiation, Intersection, and Traversing. Merits and demerits of plane table survey.

**Unit– II Theodolite Surveying**

Types and uses of Theodolite, Components of transit Theodolite and their functions, Reading the Vernier of transit Theodolite, Technical terms- Swinging, Transiting, Face left, Face right, Fundamental axes of transit Theodolite and their relationship, Temporary adjustment of transit Theodolite, Measurement of horizontal angle- Direct and Repetition method. Errors eliminated by the method of repetition, Measurement of the magnetic bearing of a line, Prolonging and ranging a line, deflection angle, Measurement of vertical Angle, Theodolite traversing by Included angle method and Deflection angle method, Checks for open and closed traverse, Calculations of bearing from angles, Traverse Computation-Latitude, Departure, Consecutive coordinates, Independent coordinates, balancing the traverse by Bowditch's rule and Transit rule, Gale's Traverse table computation.

**Unit– III Tacheometric surveying and Curve setting**

Principles of Tacheometry, Tacheometer and its component parts, Anallatic lens, Tacheometric formula for horizontal distance with telescope horizontal and staff vertical, Field method for determining constants of tacheometer, determining horizontal and vertical distances with tacheometer by fixed hair method and staff held vertical, Limitations of tacheometry.

**Unit– IV**

Types of curves used in roads and railway alignments. Designation of curve, Setting simple circular curves by offsets from long chords and Rankine's method of deflection angles.

**Unit– V Advanced surveying equipment**

Principle of Electronic Distance Meter (EDM), its component parts and their Functions, use of EDM, Use of micro-optic Theodolite and Electronic Digital Theodolite., Use of Total Station, Use of function keys. Measurements of Horizontal angles, vertical angles, distances, and coordinates using Total Station, Traversing, Profile Survey, and Contouring with Total Station.

**Unit– VI Remote sensing, GPS, and GIS**

Remote Sensing – Overview, Remote sensing system, Applications of remote sensing in Civil engineering, land use / Land cover, mapping, and disaster management, Use of Global Positioning System (G.P.S.) instruments, Geographic Information System (GIS): Overview, Components, Applications, Software for GIS, Introduction to Drone Surveying.

**Teaching Methodology:**

- The course delivery pattern and prerequisites of the subject will be discussed at the start of the course.

- Lecture may be conducted with the aid of a multi-media projector, whiteboard, OHP, etc.
- Attendance is compulsory in lectures which carries marks.
- At regular intervals, assignments will be given. Students should submit all assignments during the given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries marks.
- There will be assignments and quizzes at regular intervals, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% of coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**
Regular class notes, tutorials, study material, videos, and expert lectures & slides available on the NPTEL site.

**TEXT BOOKS:**
1. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling Part I and II, Pune Vidyarthi Gruh
Prakashan, Pune.
2. Basak, N. N.,Surveying and Levelling, McGraw Hill Education (India) Pvt. Ltd.,Noida.
3. Duggal, S. K., Survey I and Survey II, Tata McGraw Hill Education Pvt. Ltd., Noida.
4. Saikia, M D.; Das. B.M.; Das. M.M., Surveying PHI Learning Pvt. Ltd., New Delhi.
5. Subramanian, R., Surveying and Levelling, Oxford University Press. New Delhi.
6. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying Vol. I and Surveying Vol. II,
Laxmi Publications Pvt. Ltd., New Delhi.
7. Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning Pvt. Ltd., New Delhi.

8. Venkatramaiah, C, Textbook of Surveying, Universities Press, Hyderabad.
9. Anderson, James M and Mikhail, Edward M, Surveying theory and practice, Mc Graw Hill Education, Noida.
10. De, Alak, Plane Surveying, S.Chand Publications, New Delhi.

**REFERENCE BOOKS:**

11. Bhavikatti, S. S., Surveying and Levelling, Volume 1, I. K. International, New Delhi. 12. Arora K R , Surveying Vol. I, Standard Book House.

## Course Description

**Title: Theory of Structure** **Code: DCE110**

**L-T-P scheme: 2-0-0** **Credits: 2**

**Prerequisite:** NIL

**Objectives:**

- To learn the concept of eccentric loading and stresses in vertical members like columns, chimneys, Dam
- To analyze beams using various methods like slope deflection, three-moment, and moment

Distribution

- To understand different methods of finding axial forces in trusses.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** and Analyze stresses induced in vertical members subjected to direct and bending loads. |
| CO2 | **Identify** and Analyze slope and Deflection in fixed and continuous beams. |
| CO3 | **Analyze** the continuous beam under different loading conditions using the principles of Three Moments. |
| CO4 | **Describe** and Analyze continuous beam using the Moment Distribution Method under different loading conditions. |
| CO5 | **Determine** the Evaluated axial forces in the members of a simple truss. |

| | |
|---|---|
| CO6 | **Apply** the various theories to analyze the real-time problem. |

**Course Content:**

**Unit – I Direct and Bending Stresses in vertical members**

Introduction to axial and eccentric loads, eccentricity about one principal axis only, nature of stresses, Maximum and minimum stresses, resultant stresses, and distribution diagram, Condition for no tension or zero stress at extreme fiber, Limit of eccentricity, core of section for rectangular and circular cross sections, Middle third rule, Chimneys of circular cross section subjected to wind pressure, Maximum and minimum stresses, resultant stresses and distribution diagram at base, Analysis of dams subjected to horizontal water pressure, conditions of stability, Maximum and minimum stresses, resultant stresses and distribution diagram at base.

**Unit – II Slope and Deflection**

Concept of slope and deflection, stiffness of beams, Relation among bending moment, slope, deflection and radius of curvature, (no derivation), Double integration method to find slope and deflection of cantilever and simply supported beams subjected to concentrated load and uniformly distributed load on entire span, Macaulay's method for slope and deflection, application to cantilever and simply supported beam subjected to concentrated and uniformly distributed load on entire span.

**Unit- III Fixed and Continuous Beam**

Concept of fixity, effect of fixity, advantages and disadvantages of fixed beam over simply supported beam, Principle of superposition, Fixed end moments from first principle for beam subjected to point load, UDL over entire span, Application of standard formulae in finding end moments, end reactions and drawing S.F. and B.M. diagrams for a fixed beam, Definition, effect of continuity, nature of moments induced due to continuity, concept of deflected shape, practical examples.

**Unit- IV Three moment theorem**

Clapeyron's theorem of three moments (no derivation), Application of Clapeyron's theorem maximum up to three spans and two unknown support moment only, Support at same level spans having same and uniform moment of inertia subjected to concentrated loads and uniformly distributed loads over entire span, Drawing SF diagrams showing point of contra flexure, shear and BM diagrams showing net BM and point of contraflexure for continuous beams.

**Unit– V Moment distribution method**

Introduction to moment distribution method, sign convention, Carryover factor, stiffness factor, and distribution factor, Application of moment distribution method to various types of continuous beams subjected to concentrated loads and uniformly distributed loads over the entire span having the same or different moment of inertia, supports at the same level, up to

three spans, and two unknown support moments only, Introduction to portal frames – Symmetrical and unsymmetrical portal frames with the concept of Bays and stories.

**Unit– VI Simple trusses**

Types of trusses (Simple, Fink, compound fink, French truss, pratt truss, Howe truss, North light truss, King post, and Queen post truss), Calculate support reactions for trusses subjected to point loads at joints, Calculate forces in members of the truss using Method of joints and Method of sections.

**Teaching Methodology:**

- The course delivery pattern and prerequisites of the subject will be discussed at the start of the course.
- Lecture may be conducted with the aid of a multi-media projector, whiteboard, OHP, etc.
- Attendance is compulsory in lectures which carries marks.
- At regular intervals, assignments will be given. Students should submit all assignments during the given period.
- Classroom participation and involvement in solving the problems in Tutorial rooms carries marks.
- There will be assignments and quizzes at regular intervals, where students have an opportunity to build an appreciation for the concept being taught in lectures.
- There will be three exams as per the evaluation scheme

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% of coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lectures & slides available on the NPTEL site.

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

1. Strength of Materials by R. K Rajput, S. Chand & Company Ltd.
2. Mechanics of Materials by Dr. B.C Punmia, Dr. Ashok Kumar Jain, and Dr. Arun Kumar Jain.
3. Strength of Materials by R. Subramanian, Oxford University Press

## Course Description

**Title: Building Planning and Drawing** **Code: DCE111**

**L-T-P scheme: 1-0-0** **Credits: 1**

**Prerequisite:** Nil

**Objectives:**

1.To learn basic principles of building planning and drawing.

2.To know graphical representation of various components of buildings.

3.To draw complete plan and elevation of a building.

4.To learn basics of perspective drawings and Computer Aided Drawings.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | Outline and Interpret the symbols, signs and conventions from the given drawing . |

| | |
|---|---|
| CO2 | Estimate and Prepare line plans of residential and public buildings using principles of planning. |
| CO3 | Identify and Prepare submission and working drawing for the given requirement of Load Bearing Structure.. |
| CO4 | Execute the working drawing using CAD for the given requirement of Framed Structure. |
| CO5 | Design two-point perspective drawing for given small objects |

**Course Content:**

**Unit – I Conventions and Symbols**

Conventions as per IS 962, symbols for different materials such as earthwork, brickwork, stonework, concrete ,woodwork and glass. Graphical symbols for doors and windows, Abbreviations, symbols for sanitary and electrical installations. Types of lines-visible lines, centre line, hidden line, section line, dimension line, extension line, pointers, arrow head or dots. Appropriate size of lettering and numerals for titles, sub-titles, notes and dimensions. Types of scale- Monumental, Intimate, criteria for Proper Selection of scale for various types of drawing. Sizes of various standard papers/sheets.

**Unit– II Planning of Building**

Principles of planning for Residential and Public building- Aspect, Prospect, Orientation, Grouping, Privacy, Elegance, Flexibility, Circulation, Furniture requirements, Sanitation, Economy. Space requirement and norms for minimum dimension of different units in the residential and public buildings as per IS 962. Rules and bye-laws of sanctioning authorities for construction work. Plot area, built up area, super built up area, plinth area, carpet area, floor area and FAR (Floor Area Ratio). Line plans for residential building of minimum three rooms including water closet (WC), bath and staircase as per principles of planning. Line plans for public building-school building, primary health centre, restaurant, bank, post office, hostel, Function Hall and Library.

**Unit– III Drawing of Load Bearing Structure**

Drawing of Single storey Load Bearing residential building (2 BHK) with staircase. Data drawing –plan, elevation, section, site plan, schedule of openings, construction notes with specifications, area statement, Planning and design of staircase- Rise and Tread for residential and public building. Working drawing – developed plan, elevation, section passing through staircase or WC and bath. Foundation plan of Load bearing structure.

**Unit– IV Drawing of Framed Structure**

Drawing of Two storied Framed Structure (G+1), residential building (2 BHK) with staircase. Data drawing – developed plan, elevation, section, site plan, schedule of penings, construction notes with specifications, area statement. planning and design of staircase- Rise and Tread for residential and public building. Working drawing of framed Structure – developed plan, elevation, section passing throughstaircase or WC and bath. Foundation plan of Framed Structure. Details of RCC footing, Column, Beam, Chajjas, Lintel, Staircase and slab. Drawing with CAD- Draw commands, modify commands, layer commands.

**Unit– V Perspective Drawing**

Definition, Types of perspective, terms used in perspective drawing, principles used in perspective drawing, Two Point Perspective of small objects only such as steps, monuments, pedestals.

**BOOKS:**

1.Shah. M.G. Kale, CM, Patki, S.Y., Building Drawing, Mcgraw Hill Publishing company Ltd. NewDelhi.

2.Malik and Mayo, Civil Engineering Drawing, Computech Publication Ltd New Asian Publish-ers, New Delhi.

3.M. G. Shah and C. M. Kale, Principles of Perspective Drawing, Mcgraw Hill Publishing compa-ny Ltd. New Delhi.

4.Swamy, Kumara; Rao, N, Kameshwara, A ., Building Planning and Drawing, Charotar Publica-tion, Anand.

5.Bhavikatti, S. S., Building Construction, Vikas Publication House Pvt. Ltd., New Delhi.

6.Mantri, Sandip, A to Z Building Construction, Satya Prakashan, New Delhi.

7.Singh, Ajit, Working with Auto CAD 2000, Mcgraw Hill Publishing company Ltd. New Delhi.

8.Sane, Y.S., Planning and design of Building, Allied Publishers, New Delhi.

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of Building Planning and Drawing. This course has been divided into five units and each section includes theory and numerical exercises to help a student gain more experience as a building planning engineer. This theory course is well complemented by a laboratory course under the name ‘’ Building Planning and Drawing Lab in the same semester that helps a student to learn more practical knowledge and experience.

**Evaluation Scheme:**

| Exams | Marks | Coverage |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| Total | 100 Marks | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

## Course Description

**Title: Water Resources Engineering** **Code: DCE112**

**L-T-P scheme: 2-0-0** **Credits: 2**

**Prerequisite:** Nil

**Objectives:**

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

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** hydrological parameters |
| CO2 | **Estimate** crop water requirements of a command area and capacity of canals. |
| CO3 | **Identify** Minor and Micro Irrigation Schemes. |
| CO4 | **Execute** Select the relevant Cross Drainage works for the specific site conditions. |
| CO5 | **Design**, construct and maintain simple irrigation regulatory structures. |

**Course Content:**

**Unit – I Introduction to Hydrology**

Hydrology: Definition and Hydrological cycle. Rain Gauge: Symons rain gauge, automatic rain gauge, Methods of calculating average rainfall: Arithmetic mean, Isohyetal, and Theissen polygon method. Runoff, Factors affecting Run off, Computation of run–off. Maximum Flood Discharge measurement: Rational and empirical methods, Simple numerical problems. Yield and Dependable yield of a catchment, determination of dependable yield.

**Unit– II Crop water requirement and Reservoir Planning**

Irrigation and its classification. Crop Water requirement: Cropping seasons, Crop period, base period, Duty, Delta, CCA, GCA, intensity of irrigation, factors affecting duty, Problems on water requirement and ca- pacity of canal. Methods of application of irrigation water and its assessment. Surveys for irrigation project, data collection for irrigation project. Area capacity curve. Silting of reservoir, Rate of silting, factors affecting silting and control measures. Control levels in reservoir, Simple numerical problems on Fixing Control levels.

**Unit– III Dams and Spillways**

Dams and its classification: Earthen dams and Gravity dams (masonry and concrete). Earthen Dams – Components with function, typical cross section, seepage through embankment and foundation and its control. Methods of construction of earthen dam, types of failure of earthen dam and preventive measures. Gravity Dams – Forces acting on dam, Theoretical and practical profile, typical cross section, drainage gallery, joints in gravity dam, concept of high dam and low dam. Spillways-Definition, function, location, types and components, Energy dissipaters.

**Unit– IV Minor and Micro Irrigation**

Bandhara irrigation: Layout, components, construction and working, solid and open band-hara. Percolation Tanks – Need, selection of site. Lift irrigation Scheme-Components and their functions, Lay out. Drip and Sprinkler Irrigation- Need, components and Layout. Well irrigation: types and yield of wells, advantages and disadvantages of well irrigation.

**Unit– V Diversion Head Works & Canals**

Weirs – components, parts, types, K.T. weir – components and construction. Diversion head works – Layout, components and their function. Barrages – components and their functions. Difference between weir and Barrage. Canals – Classification according to alignment and position in the canal network, Cross sec- tion of canal in embankment and cutting, partial embankment and cutting, balancing depth, Design of most economical canal section. Canal lining - Purpose, material used and its properties, advantages. Cross Drainage works- Aqueduct, siphon aqueduct, super passage, level crossing. Canal regulators- Head regulator, Cross regulator, Escape, Falls and Outlets

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of water resources engineering. This course has been divided into five units and each section includes theory and numerical exercises to help a student gain more experience as a water resources

engineer. This theory course is well complemented by a laboratory course under the name 'water resources engineering lab' in the same semester that helps a student to learn more practical knowledge and experience.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**


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

**REFERENCE BOOKS:**


1. Mutreja K N, Applied Hydrology, McGraw Hill.
2. Priyani V.B., Irrigation Engineering, Charotar Book Stall, Anand.


## Course Description

**Title: Transportation Engineering** **Code: DCE113**

**L-T-P scheme: 2-0-0** **Credits: 2**

**Prerequisite:** Surveying

**Objectives:**
1. To learn the fundamentals of highways and railways and to implement them in design.
2. To identify the types of roads as per IRC recommendations.
3. To understand the geometrical design features of different highways.
4. To perform different tests on road materials.
5. To understand the importance of railway track.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** the general classification of roads. Selection and factors affecting road alignment. |
| CO2 | **Describe the s**ight distance (SSD), simple numerical. Horizontal, vertical curves. Gradient, Extra widening of roads |
| CO3 | **Develop the** Construction procedure of WBM road,. Construction of Flexible pavements, bitumen, Emulsion, Cutback, Tar, prime coat, tack coat, seal coat, Merits and Demerits of Cement concrete roads |
| CO4 | **Identify** the concepts of Permanent way, Ideal requirement, Components; Rail Gauge, types, factors affecting selection of a gauge. Types of Rails, Rail Joints . Creep of rails, Sleepers |
| CO5 | **Apply** the concepts of permanent land, formation width, side drains, Railway Track Geometrics: Gradient, curves, types and factors affecting, grade compensation, super elevation |
| CO6 | **Demonstrate** the super elevation, cant deficiency, negative cant, coning of wheel, Points and crossings, Track junctions, crossovers, Stations, yards, |

**Course Content:**

**Unit – I: Introduction to Highway Engineering :** Role of transportation, Scope and

Importance of roads in India. Different modes of transportation. land ways, waterways, airways. Merits and demerits of roadway. General classification of roads. Selection and factors affecting road alignment.

**Unit– II: Geometric Design of Highways :** Camber. Kerbs, Road margin, road formation, right of way. Design speed and various factors affecting design speed , Sight distance (SSD), simple numerical. Gradient, Extra widening of roads, Super elevation, Standard cross-sections of National highway in embankment and cutting.

**Unit– III : Construction of Pavements :** Types of road materials and their tests, Tests on aggregates, tests on Bitumen, Structural Components of pavement and their functions, Construction of WBM road. Construction of Flexible pavements, bitumen, Emulsion, Cutback, Tar, prime coat, tack coat, seal coat, Merits and Demerits of Cement concrete roads, methods of construction.

**Unit– IV: Basics of Railway Engineering:** Classification of Indian Railways, zones of Indian Railways. Permanent way: Ideal requirement, Components; Rail Gauge, types, factors affecting selection of a gauge. Types of Rails, Rail Joints . Creep of rails, Sleepers, Rail fixtures and fastenings.

**Unit–V: Track geometrics:** Alignment- Factors governing rail alignment. Track Cross sections, permanent land, formation width, side drains, Railway Track Geometrics: Gradient, curves, grade compensation, super elevation, cant deficiency, negative cant, coning of wheel, Points and crossings, Stations, yards,

**Unit -VI: Construction and Maintenance :** Railway Track construction methods, telescopic method, side track method, American method. Maintenance of tracks, daily maintenance and periodic maintenance of track,

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of highways and railways . This course has been divided into eight units and each section includes theory and numerical exercises to help a student gain more experience as a highway / railway designer. This theory course is well complemented by a laboratory course under the name ‘Transportation engineering lab’ in the same semester that helps a student to learn more practical knowledge and experience.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |

| | | |
|---|---|---|
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**


1. Highway Engineering by 'S.K.Khanna & C E G Justo' Nem Chand & Bros. Roorkee.
2. Transportation Engineering, by 'C.Jotin Khisty & B.Kent Lall; Pearson India education services Pvt. Ltd, Noida, UP.
3. Saxena S C and Arora S P, A Textbook of Railway Engineering, Dhanpat Rai Publication.
4. Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg , Standard Book House, New Delhi.


**REFERENCE BOOKS:**


1 IRC 37 and IRC 58 codes and Manuals.
2. MORTH , IRC publication, New Delhi
3. L.R. Kadiyali, Transportation Engineering, Khanna Book Publishing Co., Delhi Edition 2018
4. Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi.
5 Sharma, S.K., Principles, Practice and Design of Highway Engineering,, S. Chand Publication,New Delhi.
6. Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age Interna-tional (P) Limited, Publishers, New Delhi.
7 Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications,Hyderabad.


## Course Description

**Title: Hydraulics Lab** **Code: DCE208**
**L-T-P scheme: 0-0-2** **Credits: 1**
**Prerequisite: Nil**

**Objectives:**

Following are the objectives of this course:

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

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** the fluid and flow properties |
| CO2 | **Describe** The flow measuring devices used in pipes, channels and tanks |
| CO3 | **Characterize** laminar and turbulent flows |
| CO4 | **Identify** the types of flow and flow measurements. |
| CO5 | **Apply** fundamental principles for flow characterization. |

**List of Practicals to be performed:**

| | |
|---|---|
| 1 | Use piezometer to measure pressure at a given point. |
| 2 | Use U tube differential manometer to measure pressure difference between two given points. |
| 3 | Find the resultant pressure and its position for given situation of liquid in a tank. |
| 4 | Use Reynold's apparatus to determine type of flow. |
| 5 | Use Bernoulli's apparatus to apply Bernoulli's theorem to get total energy line for a flow in a closed conduit of varying cross sections. |
| 6 | Use Friction factor Apparatus to determine friction factor for a given pipe. |
| 7 | Determine minor losses in pipe fittings due to sudden contraction and sudden enlargement. |
| 8 | Determine minor losses in pipe fitting due to Bend and Elbow. |
| 9 | Calibrate Venturi meter to find out the discharge in a pipe. |
| 10 | Calibrate the Orifice to find out the discharge through a tank |
| 11 | Use Current meter to measure the velocity of flow of water in open channel. |
| 12 | Use Pitot tube to measure the velocity of flow of water in open channel. |
| 13 | Use triangular notch to measure the discharge through open channel. |
| 14 | Use Rectangular notch to measure the discharge through open channel. |
| 15 | Determine the efficiency of centrifugal pump. |

**Teaching Methodology:**

This course planned in 14 lab experiment and each experiment having 2 hours practical exposure in Fluid Mechanics lab. Their continuous evaluation will be performed in each week and weightage given during finalizing of the grade sheet. At the end of this course student will be able to: Understand the significance of the fluid mechancis in various field of engineering.

**Evaluation Scheme:**

| Exams | | Marks | Coverage |
|---|---|---|---|
| P-1 | | 15 Marks | Based on Lab Exercises: 1-7 |
| P-2 | | 15 Marks | Based on Lab Exercises: 8-15 |
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| Total | | 100 Marks | |

**Learning resources:**


1. Modi,P. N.and Seth, S.M., Hydraulics and Fluid Mechanics, Standard book house, Delhi.

2. S.S. Rattan, Fluid Mechanics and Hydraulic Machines, Khanna Publishing House, Delhi

3. Ramamrutham, and Narayan, R., Hydraulics, Fluid Mechanics and Fluid Machines, DhanpatRai Publishing Company, New Delhi.

4. Khurmi,R S, Hydraulics, Fluid Mechanics, Hydraulic machines, S Chand Publishers, New Del-hi.

5. Rajput, R K, Fluid Mechanics, S Chand, New Delhi.

6. Ojha, C S P, Berndtsson, R, and Chandramoulli P. N., Fluid Mechanics and Machinery, OxfordUniversity Press, New Delhi.


## Course Description

**Title: Advanced Surveying Lab** **Code: DCE209**

**L-T-P scheme: 0-0-02** **Credits: 1**

**Prerequisite:** NIL

**Objectives:**

• To know methods of plane surveying, Theodolite surveying, and their uses.

• To learn tacheometric surveying and curve setting.

• To understand the principles of Electronic Distance Measurement and Total station and their uses.

• To know the concept of Remote Sensing, GPS, and GIS

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** and Prepare plans using Plane Table Surveys. |
| CO2 | **Identify** and Prepare plans using Theodolite surveys.. |
| CO3 | **Analyze** and Find the distances and elevations using Tachometer. |
| CO4 | **Describe** and Make measurements using Total Station |
| CO5 | **Determine** and Locate coordinates of survey stations using GPS |
| CO6 | **Apply** the concepts of surveying to interpret the data and compute areas and volumes |

**Course Content:**

**List of Practicals to be performed**

1 Use plane table survey to prepare plans of a plot of seven sided closed traverse by Radiation
Method.

2 Use plane table survey to prepare plans and locate details by Intersection Method.

3 Use plane table survey to prepare plans and locate details by Traversing Method.

4 Use plane table survey to carry out Survey Project for closed traverse for a minimum five sides
around a building.

5 Use transit theodolite to measure Horizontal and Vertical angle by Direct Method.

6 Plot the traverse on A1 size imperial drawing sheet for the collected data from preceding Theodolite Survey Project.

7 Use Thedolite as a Tacheometer to compute reduced levels and horizontal distances.

8 Set out a circular curve by Rankine's Method of Deflection Angles.

9 Use micro optic Theodolite to Measure Horizontal angle by Direct Method.

10 Use EDM to measure horizontal distance.

11 Use Total station instrument to measure horizontal distances.

12 Use Total station instrument to measure vertical angle.

13 Use Total station instrument to carry out Survey Project for closed traverse for minimum five sides.

14 Plot the traverse on A1 size imperial drawing sheet for the collected data from preceding Total Station Survey Project.
15 Use GPS to locate the coordinates of a station.

**Teaching Methodology:**

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Attendance is compulsory in practical which carries marks.
- At regular intervals assignments will be given. Students should submit all assignments during given period.
- Internal exam of 30 marks will be conducted as a part of mid semester evaluation. Experiments shall be performed in the field related to course contents.
- The course includes practical, where students have an opportunity to build an appreciation for the concept being taught in lectures.

**Evaluation Scheme:**

| Exams | | Marks | Coverage |
|---|---|---|---|
| P-1 | | 15 Marks | Based on Lab Exercises: 1-7 |
| P-2 | | 15 Marks | Based on Lab Exercises: 8-14 |
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| Total | | 100 Marks | |

**Learning Resources:**

The NPTEL site offers regular class notes, tutorials, study material, videos, and expert lectures and slides.

**TEXT BOOKS:**

1. Punmia, B.C,; Jain, Ashok Kumar; Jain, Arun Kumar, Surveying I, Laxmi Publications, New Delhi.
2. Basak, N. N., Surveying and Levelling, McGraw Hill Education, New Delhi.
3. Kanetkar, T. P.; Kulkarni, S. V., Surveying and Levelling volume I, Pune Vidyarthi Gruh Prakashan.
4. Duggal, S. K., Survey I, McGraw Hill Education, New Delhi.
5. Saikia, M D.; Das. B.M.; Das. M.M., Surveying, PHI Learning, New Delhi.

6. Subramanian, R., Fundamentals of Surveying and Levelling, Oxford University Press. New Delhi.
7. Rao, P. Venugopala Akella, Vijayalakshmi, Textbook of Surveying, PHI Learning New Delhi.

**REFERENCE BOOKS:**

1. Bhavikatti, S. S., Surveying and Levelling, Volume 1, I. K. International, New Delhi.

2. Arora K R , Surveying Vol. I, Standard Book House.

## Course Description

**Title: Building Planning and Drawing Lab** **Code: DCE210**

**L-T-P scheme:** 0-**0-4** **Credits: 2**

**Prerequisite:** Nil

**Objectives:**

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

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | Outline the Interpret the symbols, signs and conventions from the given drawing |
| CO2 | Estimate and Prepare line plans of residential and public buildings using principles of planning |
| CO3 | Identify and Prepare working drawing for the given requirement of Load Bearing Structure. |
| CO4 | Execute the Draw two-point perspective drawing for given small objects |
| CO5 | Design, the section of RCC staircase and slab. |

**List of Experiments**:

| | |
|---|---|
| 1 | Draw various types of lines, graphical symbols for materials, doors and windows, symbols |

| | |
|---|---|
| | forsanitary, water supply and electrical installations and write abbreviations as per IS 962. |
| 2 | Write summary of observations of all technical details from the given drawing (One/Two BHK) obtained from the professional architect or civil engineer (Group activity in four students) |
| 3 | a) Measure the units of existing building (Load Bearing / Frame structure). |
| | b) Draw line plan of measured existing building at serial no 3a to the suitable scale. |
| 4 | Draw line plan to suitable scale (Minimum 1BHK, staircase, WC and Bathroom) |
| | a) Residential Bunglows ( Minimum three plans) |
| | b) Apartment ( Minimum two plans) |
| 5 | Draw line plans to suitable scale for any Five Public Buildings from the following (School Building, Primary Health Centre, Bank, Post Office, Hostel, Restaurant, Community Hall and Library). |
| 6 | Draw the following plans for a Framed Structure (One/Two BHK) from given line plan. |
| | a. Developed plan, Elevation |
| | b. Section for above developed plan. |
| | c. Site plan for above drawings including area statement, schedule of opening and construction notes. |
| 7 | Draw submission drawing to the scale 1:100 of a single storey load bearing residential build-<br>ing (2BHK) with flat Roof and staircase showing<br>a)Developed plan and elevation |
| | b) Section passing through Stair **or** W.C. and Bath |
| | c) Foundation plan and schedule of openings. |
| | d) Site plan (1:200), area statement, construction notes. |
| 8 | Draw submission drawing, to the scale of 1:100, of (G+1) Framed Structure Residential Build-ing (2BHK) with Flat Roof and staircase showing:<br>a) Developed plan . |
| | b) Elevation. |
| | c) Section passing through Staircase,WC and Bath |
| | d) Site plan (1:200) and area statement |
| | e) Schedule of openings and Construction Notes. |
| 9 | Draw the above mentioned drawing at serial number (B-2) using CAD software and enclosethe print out.<br>a) Developed plan |
| | b) Elevation. |
| | c) Section passing through Staircase, W.C. and Bath |
| | d) Foundation plan . |
| | e) Site plan (1:200), area statement, Schedule of openings and construction notes. |
| 10 | Draw working drawing for above mentioned drawing at serial number (B-2) showing:<br>a)Foundation plan to the scale 1:50 |
| | b) Detailed enlarged section of RCC column and footing with plinth filling. |
| | c) Detailed enlarged section of RCC Beam, Lintel and Chajjas. |
| | d) Detailed enlarged section of RCC staircase and slab. |

| | |
|---|---|
| 11 | Draw two point perspective drawing of small objects - steps, monuments, pedestals (any one)scale 1:50 |
| | a)Draw plan, elevation, eye level, picture plane and vanishing points |
| | b) Draw perspective view. |

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of Building Planning and Drawing Lab. This course has ten experiments to help a student gain more experience on the subject. This theory course is well complemented by a laboratory course under the name 'Building Planning and Drawing in the same semester that helps a student to learn more practical knowledge and experience.

**Evaluation Scheme:**

| Exams | | Marks | Coverage |
|---|---|---|---|
| P-1 | | 15 Marks | Based on Lab Exercises: 1-5 |
| P-2 | | 15 Marks | Based on Lab Exercises: 6-10 |
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| Total | | 100 Marks | |

**BOOKS:**


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

## Course Description

**Title: Water Resources Engineering Lab** **Code: DCE211**

**L-T-P scheme:** 0**-0-2** **Credits: 1**

**Prerequisite:** Nil

**Objectives:**

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

**Learning Outcomes:**

| **Course Outcome** | **Description** |
|---|---|
| CO1 | **Outline** hydrological parameters |
| CO2 | **Estimate** crop water requirements of a command area and capacity of canals. |
| CO3 | **Identify** Minor and Micro Irrigation Schemes. |
| CO4 | **Execute** Select the relevant Cross Drainage works for the specific site conditions. |
| CO5 | **Design**, construct and maintain simple irrigation regulatory structures. |

**List of Experiments**:

1. To find the Law of triangular of forces by gravensand's Apparatus Calculate average rainfall for the given area using arithmetic mean method.
2. Calculate average rainfall for the given area using isohyetal, Theissen polygon method .
3. Compute the yield of the Catchment area demarcated in **Sr.No.2**.
4. Delineation of contributory area for the given outlet from the given topo-sheet.
5. Estimate crop water requirement for the given data.

6. Estimate capacity of the canal for the given data.
7. Calculate reservoir capacity from the given data.
8. Calculate control levels for the given data for a given reservoir.
9. Draw a labeled sketch of the given masonry/earthen dam section.
10. Draw the theoretical and practical profile of the given gravity dam section.
11. Prepare a presentation on the technical details of any one micro or minor irrigation scheme.
12. Prepare a model of any irrigation structure using suitable material.
13. Prepare a maintenance report for any major/minor irrigation project site in the vicinity of
14. your area, based on field visit.
15. Prepare summary of the technical details of any existing water resource project in the vicin-ity of your area.
16. Draw a labeled sketch of the given diversion head works and Cross Drainage works.
17. Design a canal section for the given conditions with estimation of the quantity of materialrequired for lining.

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of water resources engineering. This course has ten experiments to help a student gain more experience on the subject. This theory course is well complemented by a laboratory course under the name 'Water Resources Engineering lab' in the same semester that helps a student to learn more practical knowledge and experience.

**Evaluation Scheme:**

| Exams | | Marks | Coverage |
|---|---|---|---|
| P-1 | | 15 Marks | Based on Lab Exercises: 1-5 |
| P-2 | | 15 Marks | Based on Lab Exercises: 6-10 |
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| Total | | 100 Marks | |

**Learning Resources:**

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

## Course Description

Title: **Transportation Engineering Lab** **Code: DCE212**
**L-T-P scheme: 0-0-2** **Credit: 1**

**Prerequisite:** Surveying

**Objectives:**

1. To learn the fundamentals and testing procedures of aggregates and bitumen
2. To learn about the quality control techniques in pavements
3. To design bituminous mixes for pavements
4. To identify the types of roads as per IRC recommendations

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** basic tests of aggregate |
| CO2 | **Describe** various tests on bitumen |
| CO3 | **Develop** the concept of assessing quality control test in pavements |

| | |
|---|---|
| CO4 | **Identify** the suitability of aggregate and bitumen for pavements |
| CO5 | **Apply** the IRC concepts in bituminous mix design |
| CO6 | **Demonstrate** the acceptable criteria of each test as per code |

**Course Content:**

**Unit-1:** Aggregate crushing strength test

**Unit-2:** Los Angeles abrasion test

**Unit-3**: Aggregate impact test

**Unit-4:** Flakiness index & elongation index test

**Unit-5**: Penetration test

**Unit-6:** Ductility test

**Unit-7:** Softening point test

**Unit-8:** Flash &fire point test

**Unit-9:** Viscosity test

**Unit-10**: Determination of bitumen content by centrifuge extractor

**Unit-11:** Determination of marshal stability and flow value

**Unit-12**: Determination of rebound deflection of pavement by Benkelman beam

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of high way material testing. This course has been divided into twelve units and each section includes theory and practical exercises to help a student gain more experience in highway material testing. This theory course is well complemented by a theory course under the name 'Highway engineering' in the same semester that helps a student to learn more practical knowledge and field experience.

**Evaluation Scheme:**

| **Exam** | **Marks** | **Coverage** |
|---|---|---|
| P-1 | 15 Marks | Based on Lab Exercises: 1-6 |

| | | | |
|---|---|---|---|
| P-2 | | 15 Marks | Based on Lab Exercises: 7-12 |
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| **Total** | | **100** | |

**Learning Resources:**

Lab manuals, code books, regular lab demonstration & notes, study material, videos, and expert lecture & slides available in NPTEL site

**TEXT BOOKS:**


1. Highway Engineering by 'S.K.Khanna & C E G Justo' Nem Chand & Bros. Roorkee

2. Highway engineering lab manual.

3. Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Broth-ers, Roorkee.

4. Arora, N. L., Transportation Engineering, Khanna Publishers, Delhi. L.R. Kadiyali,

5. Transportation Engineering, Khanna Book Publishing Co., New Delhi (ISBN: 978-93-82609-858) Edition 2018


**REFERENCE BOOKS:**


1.Principles and practices of Highway Engineering, L.R.Kadyali & N.B.Lal, Khanna Publishers, Delhi (2006).

2.Traffic and Transportation engineering by 'Animesh Das and P. Chakraborty', PHI Learning Pvt. Ltd. Delhi.

3.BIS Code books, Bureau of Indian standards, New Delhi.

4.IRC Code books, Indian Road congress, New Delhi.

5.Birdi, Ahuja, Road, Railways, Bridge and Tunnel Engg , Standard Book House, Delhi.

6.Sharma, S.K., Principles, Practice and Design of Highway Engineering,, S. Chand

7.Duggal, Ajay K. and Puri, V. P., Laboratory Manual in Highway Engineering, New Age Interna-tional (P) Limited, Publishers, New Delhi.

8.Subramanian, K.P., Highway, Railway, Airport and Harbour Engineering, Scitech Publications,Hyderabad.


## Course Description

Title: **Essence of Indian Knowledge and Tradition** **Code: DHS001**

**L-T-P scheme: 0-0-2** **Credits: 0**

**Course Outline**

| Unit | Topic |
|---|---|
| 1 | **Introduction to traditional knowledge**<br>Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge |
| 2 | **Protection of traditional knowledge**<br>The need for protecting traditional knowledge Significance of TK Protection, the value of TK in the global economy, Role of Government to harness TK. |
| 3 | **Ancient India, Medieval India, Modern India: Culture, Education, S&T**<br>Different Aspects of Ancient, Medieval and Modern India: Background, Administration, Economy, Society, Culture, Religion, Education, Impact of western Renaissance and Reformation Movements on India. |
| 4 | **Traditional knowledge and intellectual property**<br>Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge. |
| 5 | **Traditional knowledge in different sectors**<br>Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK. |

## FIFTH SEMESTER

### Course Description

**Title: Design of Steel and RCC Structures** **Code: DCE114**

**L-T-P scheme: 3-0-0** **Credits: 3**

**Prerequisite:** Nil

**Objectives:**

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

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** the differences between different philosophies of reinforced concrete and steel design: limit state and working stress methods. |
| CO2 | **Identify** the structural behavior of different structural members in a reinforced concrete and steel structure. |
| CO3 | **Analyze** the design forces and moments in members. |
| CO4 | **Describe** the design process flexure, shear and torsion in beams and slabs. |
| CO5 | **Enumerate** the design steps and their significance for structural design. |
| CO6 | **Design** columns: axial, uniaxial and biaxial |

**Course Content:**

**Unit – I Design of Steel Tension and Compression Members (Limit State Method)**

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

**Unit– II Design of Steel beams (Limit State Method)**

Standard beam sections, bending stress calculations. Design of simple I and channel section. Check for shear as per IS 800.

**Unit– III Design of Reinforced Concrete Beams by Limit State Method**

Concept of Limit state, Stress block diagram, Introduction to singly and doubly reinforced sections, IS 456, Design of singly reinforced beam, concept of under reinforced, over

reinforced and balanced section, Simple numerical problem on ultimate moment of resistance and design of beam section, Design of doubly reinforced sections, stress and strain diagrams, depth of neutral axis, sim- ple numerical problems on ultimate moment of resistance of reinforced beam, Calculation of $A_{st}$ and $A_{sc}$.

**Unit– IV Shear, Bond and Development length in Design of RCC member**

Nominal shear stress in RCC section, Design shear strength of concrete, Design of shear reinforcement, Minimum Shear Reinforcement, Provisions of IS 456, forms of shear reinforcement. Types of bond, Bond stress, check for bond stress, Determination of Development length in tension and compression members and check as per codal provisions, Anchorage value of $90^0$ hook, Lapping of bars. Simple numericals on: Shear reinforcement, Adequacy of section for shear.Introduction to serviceability limit state check

**Unit– V Design of axially loaded RCC Column**

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

**Teaching Methodology:**

The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, |
| Test-2 | 25 Marks | Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**

1. Shah, V. L., and Gore, V., Limit State Design of Steel Structures, Structures Publications, Pune.
2. Dayarathnam P., Design of Steel Structures, S. Chand and Company, Delhi.
3. Subramanian N., Design of Steel Structures, Oxford University Press.
4. Sairam, K.S., Design of Steel Structures, Pearson Publication, Chennai, Delhi.
5. Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures, Structures Publications, Pune,2014.
6. Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co., New Delhi.

**REFERENCE BOOKS:**

1. Krishna Raju, and N. Pranesh, R.N., Reinforced Concrete Design Principles and Practice, New Age International, Mumbai.
2. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill Publications, New Delhi.
3. Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Pri- vate Limited, Delhi

## Course Description

**Title: Estimating, Costing and valuation** **Code: DCE115**

**L-T-P scheme: 2-0-0** **Credits: 2**

**Prerequisite:** Nill

**Objectives:**

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

**Learning Outcomes:**

| Course | Description |
|---|---|

| Outcome | |
|---|---|
| CO1 | **Outline to** Estimating and Costing Meaning, purpose, Administrative approval, Technical Sanction and Budget provision. |
| CO2 | **Describe the** Modes of measurement and desired accuracy in measurements for different items of work. |
| CO3 | **Develop the** Cubical content method, Typical bay method, Approximate quantity method (with simple numerical) |
| CO4 | **Identify** Prime cost, Provisional sum, Provisional quantities, Bill of quantities, Spot items or Site items. |
| CO5 | **Apply** the Categories of labours, their daily wages, types and number of labors for different items ofwork. |
| CO6 | **Demonstrate** the different use of computer for detailed estimate Preparation of Civil Engineering Works |

**Course Content:**

**Unit – I Fundamentals of Estimating and Costing**

Estimating and Costing – Meaning, purpose, Administrative approval, Technical Sanction and Budget provision. Types of estimates – Approximate and Detailed estimate. Types and Uses of Estimates: Revised estimate, Supplementary estimate, Repair and mainte- nance estimate, renovation estimate. Roles and responsibility of Estimator. Checklist of items in load bearing and framed structure.

**Unit– II Approximate Estimates**

Standard formats of Measurement sheet, Abstract sheet, Face sheet. Modes of measurement and desired accuracy in measurements for different items of workas per IS:1200. Rules for deduction in different category of work as per IS:1200. Description / specification of items of building work as per PWD /DSR. Approximate estimate- Definition, Purpose.

**Unit– III Detailed Estimate**

Methods of approximate estimate - Service unit method, Plinth area rate method, Cubical content method, Typical bay method, Approximate quantity method (with simple numeri- cals) Approximate estimate for roads, Railways, bridges/culvert, irrigation projects and water supply projects. Detailed Estimate- Definition and Purpose, Data required for detailed estimate - Civil cost, GST, Contingencies, Supervision charges, Agency charges, Procedure for preparation of de- tailed estimate- Taking out quantities and Abstracting.

**Unit– IV Estimate for Civil Engineering Works**

Methods of Detailed Estimate- Unit quantity method and total quantity method (with simple numericals) Long wall and Short wall method, Centre line method. Bar bending schedule for footing, column, beam, Lintel, chajja and slab elements Provisions in detailed estimate: contingencies, work charged establishment, percentage charges, water supply and sanitary Charges and electrification charges etc. Prime cost, Provisional sum, Provisional quantities, Bill of quantities, Spot items or Site items.

**Unit– V Rate Analysis**

Rate Analysis: Definition, purpose and importance. Lead (Standard and Extra), lift, overhead charges, water charges and contractors' profit, Procedure for rate analysis. Task work- Definition, types. Task work of different skilled labour for different items. Categories of labours, their daily wages, types and number of labours for different items of work. Transportation charges of materials - Lead and Lift, Hire charges of machineries and equipments. Preparing rate analysis of different items of work pertaining to buildings and roads.

**Unit– VI Use of computer programmes**

Earthwork - Quantities for roads, Embankment and canal by – Mid sectional area method, mean sectional area method, Prismoidal and trapezoidal formula method. Detailed estimate for septic tank, Community well. Use of computer /softwares / programmes for detailed estimate Preparation of Civil Engi-neering Works.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**


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


**REFERENCE BOOKS:**

1. Patil,B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.
2. Chakraborti,M., Estimating and costing, specification and valuation in civil engineering, Monojit Chakraborti, Kolkata.
3. PWD Schedule of Rates.
4. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Sched- ule of Rates.
5. Manual of Specifications and Standards for DBFOT projects, EPC works.

## Course Description

**Title: Design of Steel and RCC structure Lab** **Code: DCE213**

**L-T-P scheme: 0-0-2** **Credits: 1**

**Prerequisite:** None

**Objectives:**

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

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** the differences between different philosophies of reinforced concrete and steel design: limit state and working stress methods. |
| CO2 | **Identify** the structural behavior of different structural members in a reinforced concrete and steel structure. |
| CO3 | **Analyze** the design forces and moments in members. |
| CO4 | **Describe** the design process flexure, shear and torsion in beams and slabs. |
| CO5 | **Enumerate** the design steps and their significance for structural design. |
| CO6 | **Design** columns: axial, uniaxial and biaxial |

**Course Content:**

**List of Experiments**:

1 Draw any five commonly used rolled steel sections and five built up sections.

2 Summarize the provisions of IS 800 required for the design of tension member in report form.

3 Compile relevant clauses from IS 800 required for the design of a compression member and submit it in report form.
4 Draw sketches for single & double lacing of given built up columns.
5 Draw sketches for battening of given built up columns.
6 Prepare a report on the IS 800 provisions pertaining to design of lacing & battening along with its significance.
7 Draw cross section, strain diagram & stress diagram for singly reinforced section.
8 Draw cross section, strain diagram & stress diagram for doubly reinforced section.
9 Design simply supported I section steel beam for udl.
10 Design beams section for shear as per IS 800 provisions.
11 Draw sketches of different types of column footings.
12 Interpret the actual RCC Structural Drawings used on site with reference to reinforcement details of various structural elements.
13 Prepare a checklist for reinforcement provided from actual drawings used on site for various structural elements.
14 Prepare a detailed report of site visit for reinforcement detailing of structural elements like beams, columns, staircase & footing.
15 Prepare a detailed report of site visit for study of rolled steel tension & compression members used in various structures.

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of mechanics. This course has ten experiments to help a student gain more experience on the subject. This theory course is well complemented by a laboratory course under the name 'Engineering Mechanics lab' in the same semester that helps a student to learn more practical knowledge and experience.

**Evaluation Scheme:**

| Exams | | Marks | Coverage |
|---|---|---|---|
| P-1 | | 15 Marks | Based on Lab Exercises: 1-7 |
| P-2 | | 15 Marks | Based on Lab Exercises: 8-15 |
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| Total | | 100 Marks | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**

1. Shah, V. L., and Gore, V., Limit State Design of Steel Structures, Structures Publications, Pune.

2. Dayarathnam, P., Design of Steel Structures, S. Chand and Company, Delhi.

3. Subramanian N., Design of Steel Structures, Oxford University Press.

4. Sairam, K.S., Design of Steel Structures, Pearson Publication, Chennai, Delhi.

5. Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures,Structures Publications, Pune,2014.

6. Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co., New Delhi.

**REFERENCE BOOKS:**

1. Krishna Raju, and N.Pranesh, R.N., Reinforced Concrete Design Principles and Practice, NewAge International, Mumbai.

2. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill Publications, NewDelhi.

3. Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Pri-vate Limited, Delhi.

**Course Description**

**Title: Estimating, Costing and valuation Lab** **Code: DCE214**

**L-T-P scheme: 0-0-2** **Credits: 1**

**Prerequisite:** None

**Objectives:**

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

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** detailed estimate of a given structure from the given drawing. |
| CO2 | **Describe the** report on market rates for given material, labour wages, hire charges of tools & equipments required to construct the given structure |
| CO3 | **Develop** the set of drawings using "standard measurement and abstract format" |
| CO4 | **Identify** the the reinforcement quantities from the given set of drawings. |
| CO5 | **Apply** method to estimate of small Septic tank and well from the given set of drawing. |
| CO6 | **Demonstrate** the relevant software to prepare detailed estimate of a residential building. |

**Course Content:**

**List of Experiments**:

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

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of estimation and costing. This course has ten experiments to help a student gain more experience on the subject. This theory course is well complemented by a laboratory course under the name 'Estimating, Costing and valuation lab' in the same semester that helps a student to learn more practical knowledge and experience.

**Evaluation Scheme:**

| Exams | Marks | Coverage |
|---|---|---|
| P-1 | 15 Marks | Based on Lab Exercises: 1-5 |
| P-2 | 15 Marks | Based on Lab Exercises: 6-10 |

| | | | |
|---|---|---|---|
| Day-to-Day Work | Viva | 20 Marks | 70 Marks |
| | Demonstration | 20 Marks | |
| | Lab Record | 15 Marks | |
| | Attendance & Discipline | 15 Marks | |
| Total | | 100 Marks | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**

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

**REFERENCE BOOKS:**

1. Patil,B.S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai.
2. Chakraborti,M., Estimating and costing, specification and valuation in civil engineering, Monojit Chakraborti, Kolkata. 109 Civil Engineering Curriculum Structure
3. PWD Schedule of Rates.
4. Ministry of Road Transport and Highways (MORT&H) Specifications and Analysis of Schedule of Rates.
5. Manual of Specifications and Standards for DBFOT projects, EPC works.

# SIXTH SEMESTER

**Course Description**

**Title: Public Health Engineering** **Code: DCE116**

**L-T-P scheme: 2-0-0** **Credits: 2**

**Prerequisite:** Nil

**Objectives:**

1. To learn the principles for identification of sources of surface and subsurface water
2. To learn calculation of population and requirement of drinking water
3. To understand the plotting of water supply scheme highlighting different features
4. To know evaluation of characteristics and treatment of sewage.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | Outline the water supply schemes. Sources, demand, and quality of water |
| CO2 | Describe the purification methodology of water |
| CO3 | Develop the concept of conveyance and distribution of water |
| CO4 | Identify ssystem of sewerages for domestic sewage and industrial sewage |
| CO5 | Apply the concepts treatment of Sewage |

**Course Content:**

**Unit – I: Sources, Demand and Quality of water:** Water supply schemes - Objectives, components, Sources of water: Surface and Subsurface sources of water, Intake Structures, Definition and types, Factors governing the location of an intake structure, Types of intakes. Demand of water: Factors affecting rate of demand, Variations of water demands, forecasting of population, Methods of forecasting of population, (Simple problems on forecasting of population), Design period, Estimating of quantity of water supply required for city or town. Quality of water**:** Need for analysis of water, Characteristics of water- Physical, Chemical and Biological, Testing of water for Total solids, hardness, chlorides, dissolved Oxygen, pH, Fluoride, Nitrogen and its compounds, Bacteriological tests, E coli, B coli index, MPN, Sampling of water, Water quality standards as per IS 10500.

**Unit– II: Purification of water:** Purification of Water: Objectives of water treatment, Aeration- objects and methods of aeration, Plain sedimentation, Sedimentation with coagulation, principles of coagulation, types of coagulants, Jar Test, process of coagulation, types of sedimentation tanks, Clariflocculator. Filtration-mechanisation of filtration, classification of filters: slow sand filter, rapid sand filter, pressure filter. Construction and working of slow sand filter and rapid sand filter, operational problems in filtration. Disinfection: Objects, methods of disinfection, Chlorination-Application of chlorine, forms of chlorination, types of chlorination practices, residual chlorine and its importance, Flow diagram of water treatment plants. Miscellaneous water Treatments: Introduction to water softening, Defluorination techniques.

**Unit– III : Conveyance and Distribution of water:** Conveyance: Types of Pipes used for conveyance of water, choice of pipe material, Types of joints & Types of valves- their use, location and function on a pipeline. Distribution of water: Methods of distribution of water-Gravity, pumping, and combined system, Service reservoirs - functions and types, Layouts of distribution of Water-Dead end system, grid iron system, circular system, radial system; their suitability, advantages and disadvantages.

**Unit– IV: Domestic sewage and System of Sewerages;** Building Sanitation: **N**ecessity of sanitation, Necessity to treat domestic sewage, Definitions - Sewage, sullage, types of sewage. Definition of the terms related to Building Sanitation Water pipe, Rain water pipe, Soil pipe, Sullage pipe, Vent pipe. Building Sanitary fittings-Water closet – Indian and European type, flushing cistern, wash basin, sinks, Urinals. Trapstypes, qualities of good trap.

Systems of plumbing - one pipe, two pipe, single stack, choice of system. Principles regarding design of building drainage, inspection and junction chambers, their necessity, location, size and shape. Systems of Sewerage and Sewer Appurtenances: Types of Sewers, Systems of sewerage, self-cleansing velocity and non-scouring velocity, Laying, Testing and maintenance of sewers, Manholes and Drop Manhole-component parts, location, spacing, construction details, Sewer Inlets, Street Inlets.

**Unit–V: Characteristics and treatment of Sewage:** Analysis of sewage: Characteristics of sewage, B.O.D., C.O.D. and its significance., Central Pollution Control Board Norms for discharge of treated sewage, Objects of sewage treatment and flow diagram of conventional sewage treatment plant. Treatment of Sewage: Screening, Types of screens, Grit removal, Skimming, Sedimentation of sewage, Aerobic and anaerobic process, Sludge digestion, trickling filters, Activated sludge process, Disposal of sewage, Oxidation Pond, Oxidation ditch. Septic tank, Recycling and Reuse of domestic waste.

**Teaching Methodology:tr**

This course is introduced to help students to know about the fundamental knowledge of planning, design and treatment of sewage.

**Evaluation Scheme:**

| Exams | Marks | Coverage |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| Total | 100 Marks | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**

1. Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
2. Garg, S.K., Environmental Engineering Vol. I and Vol. II, Khanna Publishers
3. Punmia, B C, Environmental Engineering, vol. I and II, Laxmi Publishers
4. Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw
5. Basak N N, Environmental Engineering, McGraw Hill Publishers

**REFERENCE BOOKS:**

1. Birdie, G. S. and Birdie, J. S.Water Supply and Sanitary Engineering, Dhanpat Rai
2. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi
3. Rao, C.S., Environmental Pollution Control Engineering, New Age International

## Course Description

Title: **Public Health Engineering Lab** **Code: DCE215**
**L-T-P scheme: 0-0-2** **Credit: 1**

**Prerequisite:** Nil

**Objectives:**

1. To learn the tests for measuring quality of drinking water.
2. To learn determination of BOD and COD requirement in sewage.
3. To understand the plotting of water supply scheme highlighting different features.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** to perform various tests to assess quality of water |
| CO2 | **Describe** to suspended and dissolved solids as per BIS codes. |
| CO3 | **Develop** water pipeline system for a locality. |
| CO4 | **Identify** BOD and COD of sewage sample |
| CO5 | **Apply** the concept of sewerage and drinking water supply systems |

**List of Practicals to be performed:**

1. Determine pH value of given sample of water.
2. Determine the turbidity of the given sample of water.
3. Determine residual chlorine in a given sample of water.
4. Determine suspended, dissolved solids and total solids of given sample of water.
5. Determine the dissolved oxygen in a sample of water.
6. Undertake a field visit to water treatment plant and prepare a report.
7. Determine the optimum dose of coagulant in a given raw water sample by jar test.

8. Draw sketches of various valves used in water supply pipe line
9. Draw a sketch of one pipe and two pipe system of plumbing
10. Determine B.O.D. of given sample of sewage.
11. Determine pH value of given sample of sewage.
12. Determine suspended solids dissolved and total solids for sample of sewage.
13. Determine the dissolved oxygen in the given sample of sewage.
14. Determine C.O.D. of given sample of sewage.
15. Prepare a report of a field visit to sewage treatment plant

**Teaching Methodology:**

**Evaluation Scheme:**

<table>
<tr><td colspan="2">Exam</td><td>Marks</td><td>Coverage</td></tr>
<tr><td colspan="2">P-1</td><td>15 Marks</td><td>Based on Lab Exercises: 1-6</td></tr>
<tr><td colspan="2">P-2</td><td>15 Marks</td><td>Based on Lab Exercises: 7-12</td></tr>
<tr><td rowspan="4">Day-to-Day Work</td><td>Viva</td><td>20 Marks</td><td rowspan="4">70 Marks</td></tr>
<tr><td>Demonstration</td><td>20 Marks</td></tr>
<tr><td>Lab Record</td><td>15 Marks</td></tr>
<tr><td>Attendance & Discipline</td><td>15 Marks</td></tr>
<tr><td colspan="2">Total</td><td colspan="2">100</td></tr>
</table>

**Learning Resources:**

Lab manuals, code books, regular lab demonstration & notes, study material, videos, and expert lecture & slides available in NPTEL site

**TEXT BOOKS:**

**Suggested learning resources:**

1. Sharma S.C, Environmental Engineering, Khanna Publishing House, New Delhi
2. Garg, S.K., Environmental Engineering Vol. I and Vol. II, Khanna Publishers
3. Gupta, O.P., Elements of Environmental Pollution Control, Khanna Publishing House, Delhi
4. Rao, C.S., Environmental Pollution Control Engineering, New Age International
5. Punmia, B C, Environmental Engineering, vol. I and II, Laxmi Publishers

**REFERENCE BOOKS:**

1. Peavy H S, Rowe D R, and Tchobanoglous G, Environmental Engineering, McGraw

2. Basak N N, Environmental Engineering, McGraw Hill Publishers
3. Birdie, G. S. and Birdie, J. S.Water Supply and Sanitary Engineering, Dhanpat Rai

## Course Description

Title: **Entrepreneurship and Start-ups** **Code: DHS102**
**L-T-P scheme:-3-1-0** **Credit: 4**

**Prerequisite:** Nil

Course Outline

| Unit | Topic |
|---|---|
| **1** | **Enterprise:** Conceptual issues. Entrepreneurship vs. Management. Roles and functions of entrepreneur in relation to the enterprise and in relation to the economy. Entrepreneurship is an interactive process between the individual and the environment. Small business as seedbed of Entrepreneurship. Entrepreneur competencies, Entrepreneur motivation, performance and rewards |
| **2** | **Opportunity scouting and idea generation:** role of creativity and innovation and business research. Sources of business ideas. Entrepreneur opportunities in contemporary business environment, for example opportunities in net-work marketing, franchising, business process outsourcing in the early 21 century. The process of setting up a small business: Preliminary screening and aspects of the detailed study of the feasibility of the business idea and financing/non-financing support agencies to familiarize themselves with the policies/programs and procedures and the available schemes.Preparation of Project Report and Report on Experiential Learning of successful and unsuccessful entrepreneurs. |
| **3** | **Management roles and functions in a small business.** Designing and re-designing business process, location, layout, operations planning and control. Basic awareness on the issues impinging on quality, productivity and environment. Managing business growth. The pros and cons of alternative growth options: internal expansion, acquisitions and mergers, integration and diversification. Crisis in business growth. |
| **4** | **Principles of double-entry book-keeping**: journal entries, cash-book, pass book, and Bank Reconciliation Statement, ledger accounts, trail balance and preparation of final accounts: Trading and Profit and Loss Account; Balance-sheet. Brief introduction to Single-Entry system of record keeping. Sources of risk/venture capital, fixed capital, working capital and a basic awareness of financial services such as leasing and factoring. |
| **5** | **Issues in small business marketing.** The concept and application of product life cycle [PLC], advertising and publicity, sales and distribution management. The idea of consortium marketing, competitive |

| | |
|---|---|
| | bidding/tender marketing, negotiating with principal customers. The contemporary perspectives on Infrastructure Development, Product and Procurement Reservation, Marketing Assistance, Subsidies and other Fiscal and Monetary Incentives. National state level and grass-root level financial and non-financial institutions in support of small business development. |

**Evaluation Scheme:**

| Exams | Marks | Coverage |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| Total | 100 Marks | |

## Course Description

Title: **Indian Constitution** **Code: DHS002**
**L-T-P scheme:-2-0-0** **Credit: 0**

**Prerequisite:** Nil

**Course Outline**

| Unit | Topic |
|---|---|
| **1** | **Historical Background and Making of the Constitution**<br>The Company Rule (1773–1858), The Crown Rule (1858–1947), Composition of the Constituent Assembly, Working of the Constituent Assembly, Committees of the Constituent Assembly,Enactment of the Constitution, Enforcement of the Constitution, Criticism of the Constituent Assembly, Salient Features of the Constitution. |
| **2** | **Preamble, Fundamental Rights, Directive Principles of State Policies** |

| | |
|---|---|
| | Text of the Preamble, Ingredients of the Preamble, Key Words in the Preamble, Significance of the Preamble, Preamble as Part of the Constitution, Amendability of the Preamble, Features of Fundamental Rights, Definition of State, Laws Inconsistent with Fundamental Rights, Writs—Types and Scope, Armed Forces and Fundamental Rights, Martial Law and Fundamental Rights, Effecting Certain Fundamental Rights, Present Position of Right to Property, Exceptions to Fundamental Right, Criticism of Fundamental Rights, Significance of Fundamental Rights. Features of the Directive Principles, Classification of the Directive Principles, New Directive Principles, Sanction Behind Directive Principles, Criticism of the Directive Principles, Utility of Directive Principles, Conflict Between Fundamental Rights and Directive Principles, Implementation of Directive Principles. |
| **3** | **Fundamental Duties, Amendment of Constitution, Basic Structure of Constitution**<br>List of Fundamental Duties, Features of the Fundamental Duties, Criticism of Fundamental, Duties, Significance of Fundamental Duties, Procedure for Amendment, Types of Amendments<br>Criticism of the Amendment Procedure, Emergence of the Basic Structure, Elements of the Basic Structure, Features of Parliamentary Government, Features of Presidential Government, Merits of the Parliamentary System, Demerits of the Parliamentary System, Reasons for Adopting Parliamentary System, Distinction between Indian and British Models |
| **4** | **Emergency Provisions, Various posts in Indian Constitution, Parliament, Judiciary**<br>Emergency Provisions, President, Vice-President, Prime Minister, Central Council of Ministers, Parliament, Supreme Court, High Court |
| **5** | The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmers Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. |

**Evaluation Scheme:**

| Exams | Marks | Coverage |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |

| | | |
|---|---|---|
| Attendance | 5 Marks | |
| Total | 100 Marks | |

# ELECTIVES

**Course Description**

**Title: Precast and Prestressed Concrete** **Code: DCE301**

**L-T-P scheme: 3-0-0** **Credits: 3**

**Prerequisite:** Building construction, Design of Steel and RCC structure

**Objectives:**
The objective of this course is to introduce the techniques used in the construction of various Precast and Prestressed Concrete structures.
**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** various terms involved in Precast and Prestressed Concrete structures |
| CO2 | **Describe and Implement** the methodologies for construction of Precast and Prestressed Concrete structures under different site conditions |
| CO3 | **Develop** the fundamental concepts of Prestressed Concrete structures construction techniques |
| CO4 | **Identify** the most suitable method for the construction of Precast and Prestressed Concrete structures for a given situation |
| CO5 | **Apply** the knowledge acquired for construction of prestressed structures to plan and develop structures. |

**Course Content:**

**Unit – I: Introduction**: Definition of Precast and Prestressed Concrete structures. basic concepts and definitions, Introduction to IS:15916 and IS:1343.

**Unit– II: Need for prefabrication**: Advantages and limitations. Principles of prefabrication – Modular coordination – Standardization- Loads and load combinations- Materials – Production - Transportation – Erection. Design philosophy- Design of cross section based on efficiency of material used

**Unit– III: System of pre-stressing**: pre- tensioning, post-tensioning, Techniques of prestressing

**Unit– IV: Analysis of Prestressed structures**: basic calculations, resultant forces, force diagrams, concept of pressure line, tendon curvatures

**Unit– V:** Load balancing concept, tendon stresses and cracking moments

**Unit -VI:** Losses of prestress and deflection.

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of Precast and Prestressed Concrete structures. This course has been divided into six units and each section includes theory and numerical exercises to help a student gain more experience on the subject.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**


1. Prestressed concrete structures by Krishnaraju, Tata McGraw hill publication.
2. Lewitt,M. ” Precast Concrete- Materials, Manufacture, Properties And Usage ,CRC Press, 2019
3. Alfred Steinle, Hubert Bachmann, Mathias Tillmann, Philip Thrift . “Precast Concrete Structures”, Ernst & Sohn, Berlin, 2019.


**REFERENCE BOOKS:**


1. Koncz T., “Manual of precast concrete construction”, Vol. I, II and III, Bauverlag, GMBH, 1976.
2. “Handbook on Precast Concrete Buildings”, Indian Concrete Institute, 2016.
3. ” Precast concrete connection details”, Structural Design manual, Society for the studies in the use of precast concrete, Netherland Betor Verlag, 2009.

## Course Description

**Title: Construction Management** **Code: DCE302**

**L-T-P scheme:** 3-**0-0** **Credits: 3**

**Prerequisite:** Nil

**Objectives:**
The objective of the Construction technology & management course is to provide graduates with knowledge and skills that are valued and sought by the construction industry profession

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** the contract management and associated labour laws. |
| CO2 | **Understand** the nuances of executing the site layout. |
| CO3 | **Prepare** networks and bar charts for the given construction project. |
| CO4 | **Analyse** the intricacies of disputes, related arbitration and settlement laws. |
| CO5 | **Apply** safety measures at construction projects. |

**Course Content:**

**Unit – I Construction industry and management**

Organization-objectives, principles of organization, types of organization: government/public and private construction industry, Role of various personnel in construction organization. Agencies associated with construction work- owner, promoter, builder, designer, architects. Role of consultant for various activities: Preparation of Detailed Project Report (DPR), monitoring of progress and quality, settlement of disputes.

**Unit – II Site Layout**

Principles governing site layout. Factors affecting site layout. Preparation of site layout. Land acquisition procedures and providing compensation.

**Unit- III Planning and scheduling**

Identifying broad activities in construction work & allotting time to it, Methods of Scheduling, Development of bar charts, Merits & limitations of bar chart. Elements of Network: Event, activity, dummy activities, Precautions in drawing Network, Numbering the

events. CPM networks, activity time estimate, Event Times by forward & backward pass calculation, start and finish time of activity, project duration. Floats: Types of Floats-Free, independent and total floats, critical activities and critical path,

Purpose of crashing a network, Normal Time and Cost, Crash Time and Cost, Cost slope, Optimization of cost and duration. Material Management- Ordering cost, inventory carrying cost, Economic Order Quantity. Store management, various records related to store management, inventory control by ABC technique, Introduction to material procurement through portals (e.g. www.inampro.nic.in)

**Unit IV Construction Contracts and Specifications**

**T**ypes of Construction contracts. Contract documents, specifications, general special conditions. Contract Management, procedures involved in arbitration and settlement (Introduction only)

**Unit– V Safety in Construction**

Safety in Construction Industry—Causes of Accidents, Remedial and Preventive Measures. Labour Laws and Acts pertaining to Civil construction activities (Introduction only)

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of Construction Management. This course has been divided into five units and each section includes theory and numerical exercises to help a student gain more experience as a construction manager.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |

| | | |
|---|---|---|
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**


1. Sharma S C and Deodhar S V, Construction Engineering and Management, Khanna Book Pub- lishing, New Delhi.
2. Gahlot,P.S. and Dhir, B.M Construction planning and management New Age International (P) Ltd. Publishers, New Delhi.
3. Shrivastava, U.K., Construction planning and management, Galgotia Publication Pvt Ltd. New Delhi
4. Mantri, S., The A To Z of Practical Building Construction and its Management, Satya Prakashan, New Delhi
5. Khanna, O.P. , Industrial Engineering and management, Dhanpat Rai New Delhi
6. Punmia, B.C. and Khandelwal, K.K., Project Planning and Controlling with PERT And CPM, Laxmi Publications (P)Ltd.


**REFERENCE BOOKS:**


1. Sengupta, B., Guha H., Construction Management and Planning, Tata-McGraw Hill.
2. Harpal, Singh, Construction Management and accounts, Mc-Graw Hill.
3. Sharma, S.C., Industrial Engineering and Management, Khanna Publications, New Delhi

## Course Description

**Title: Rural Construction Technology** **Code: DCE303**

**L-T-P scheme: 3-0-0** **Credits: 3**

**Prerequisite:** Nil

**Objectives:**

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

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | Outline to learn development and planning of rural infrastructure. |
| CO2 | Describe the low cost construction methodology for housing |
| CO3 | Develop the quality, storage, and distribution for rural water supply works. |
| CO4 | Identify pavement layers, types of granular sub-bases and bases |
| CO5 | Apply the concepts low-cost irrigation |

**Course Content:**

**Unit – I: Rural Development and Planning:** Scope; development plans; various approaches to rural development planning, Significance of rural development and Rural development programme/projects.

**Unit– II: Rural Housing:** Low-cost construction material for housing, Composite material-ferro-cement & fly ash, autoclaved calcium silicate bricks and soil-stabilized un-burnt brick; Plinth protection of mud walls, Water-proof and fire-retardant roof treatment for thatch roofs. Pre-cast stone masonry, rattrap bond for walls; Panels for roof, ferro-cement flooring/roofing units. Biomass - types of fuels such as firewood, agricultural residues, dung cakes. Renewable energy and integrated rural energy program - Objectives, Key elements, Implementation, Financial provisions, sources of renewable energy. Working of gobar gas and biogas plants.

**Unit– III : Water Supply and Sanitation for Rural Areas:** Sources of water: BIS & WHO water standards, Quality, Storage and distribution for rural water supply works, Hand pumps-types, installation, operation, and maintenance of hand pumps, Conservation of water-rainwater harvesting, drainage in rural areas, Construction of low cost latrines: Two pit pour flush water seal, septic tank etc. Low-cost community and individual Garbage disposal systems, Ferro-cement storage tanks.

**Unit– IV: Low Cost Rural Roads:** Broad categories of Pavement Layers, types of Granular Sub-Bases and Bases, Guidelines for Surfacing of Rural Road as per relevant IRC codes. Pradhan Mantri Gram Sadak Yojna (PMGSY)- Highlights of Scheme.

**Unit–V: Low Cost Irrigation:** Design consideration and construction of tube-well, drip & sprinkler irrigation systems, Watershed and catchment area development –problems and features of watershed management, Watershed management structures - K. T. weir, Gabian Structure, Cement Plug, Contour Bunding, Farm pond, Bandhara system.

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of mechanics and forces.

**Evaluation Scheme:**

| Exams | Marks | Coverage |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| Total | 100 Marks | |

**Learning Resources:**Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**

1. Madhov Rao A G, and Ramachandra Murthy, D S, Appropriate Technologies for low cost Housing Oxford and IBH Publishing Co. Pvt. Ltd.
2. CBRI, Roorkee, Advances in Building Materials and Constriction.
3. Desai,Vasant , Rural Development in India: Past, Present and Future : a Challenge in the Crisis,
Himalaya Publishing House, Delhi.
4. Rastogi, A.K.Rural Development Strategy, Wide Vision, Jaipur.

**REFERENCE BOOKS:**

1. Singh, Katar, Rural Development Principles, Policies and Management, Sage Publications India
Pvt Ltd.
2. Gaur, Keshav Dev, Dynamics of Rural Development, Mittal Publications, Delhi.
3. Document Published by Ministry of Rural development, Govt. of India, Ministry of Rural development.

## Course Description

**Title: Traffic Engineering** **Code: DCE304**
**L-T-P scheme: 3-0-0** **Credits: 3**

**Prerequisite:** Highway Engineering

**Objectives:**
1. To learn the fundamentals of traffic engineering and to implement them for developing a computer based system for fast and efficient design.
2. To solve problems related to traffic in the existing or new highway areas

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** the Relationship between speed, volume and density of traffic Road user characteristics, Vehicular characteristics |
| CO2 | **Describe** Traffic volume count data- representation and analysis of data. Necessity of Origin and Destination study and its methods. Speed studies Spot speed studies |
| CO3 | **Develop** Traffic control devices types. Road signs - definition. Mandatory, |

| | |
|---|---|
| | Cautionary, informatory signs, Location of cautionary or warning sign in urban and non-urban areas |
| CO4 | **Identify** the traffic signals, pedestrian signals. Types of traffic control signals, Fixed time, manually operated, Compute signal time by fix time cycle, Webster's and IRC method and sketch timing diagram for each phase |
| CO5 | **Apply** the concept of Intersection at grade, basic requirements of good intersection at grade. Grade separated intersection- advantages and disadvantages |
| CO6 | **Demonstrate** Road Accidents-Definition, types and causes for collision and non-collision accidents. Measures to prevent road accidents |

**Course Content:**

**Unit-I Fundamentals of Traffic Engineering**: Traffic engineering- Definition, Relationship between speed, volume and density of traffic Road user characteristics, Vehicular characteristics-width, length, height, weight, speed, efficiency of breaks. design speed, PIEV Theory.

**Unit– II Traffic Studies** : Traffic volume count data- representation and analysis of data. Necessity of Origin and Destination study and its methods. Speed studies Spot speed studies, and its presentation. Need and method of parking study.

**Unit– III Road Signs and Traffic Markings**: Traffic control devices types. Road signs - definition. Mandatory, Cautionary, informatory signs, Location of cautionary or warning sign in urban and non-urban areas, Traffic markings- classification, carriage way, kerb, object marking and reflector markers.

**Unit– IV Traffic Signals and Traffic Islands**: Traffic signals, pedestrian signals. Types of traffic control signals, Fixed time, manually operated, Compute signal time by fix time cycle, Webster's and IRC method and sketch timing diagram for each phase. Traffic islands advantages and disadvantages of providing islands. Types of traffic islands - rotary or central, channelizing. Road intersections or junctions,

**Unit– V Road intersection**: . Intersection at grade, basic requirements of good intersection at grade. Grade separated intersection- advantages and disadvantages, types - flyovers-partial and full Cloverleaf pattern, Diamond intersection, Trumpet type, underpass.

**Unit– VI Road Accident Studies**: Road Accidents-Definition, types and causes for collision and non-collision accidents. Measures to prevent road accidents. Collision and condition diagram. Street lighting,

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of traffic planning and its design. This course has been divided into eight units and each section includes theory and numerical exercises to help a student gain more experience as a planner and designer

of traffic in a city. This subject helps the student to learn more practical knowledge and experience in the field of traffic management**.**

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**Text Books :**

1.Khanna S.K., Justo, C E G and Veeraragavan, A., Highway Engineering, Nem Chand and Broth- ers, Roorkee.

2. Kadiyali L.R., Transportation Engineering, Khanna Book Publishing Co., Delhi

**REFERENCE BOOKS :**

1.Vazirani, V N , Chaondola, S P, Transportation Engineering Vol. I & II, Khanna Publishers. Delhi.

2.Saxena, S C, Traffic planning and design, Dhanpat Rai & Sons Delhi.

3.Kumar R S, Introduction to Traffic Engineering, University Press (India), Pvt. Ltd.

## Course Description

**Title: Solid Waste Management** **Code: DCE305**
**L-T-P scheme: 3-0-0** **Credits: 3**
**Prerequisite:** Nil

**Objectives:**

1. To know various sources of solid.
2. To learn techniques of collection and transportation of solid waste.
3. To know various methods of disposal of solid waste.
4. To understand and identify different biomedical and E-waste and their subsequent disposal techniques.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | Outline the classification of solid waste – hazardous and non- hazardous waste |
| CO2 | Describe the storage, collection, and transportation of municipal solid waste |
| CO3 | Develop the concepts of composting of waste |
| CO4 | Identify the Techniques for Disposal of Solid Waste |
| CO5 | Apply the concepts of Biomedical and E-waste management |

**Course Content:**

**Unit – I: Introduction:** Definition of solid waste, different solid waste – domestic Waste, commercial waste, industrial waste, market waste, agricultural waste, biomedical waste, E-waste, hazardous waste, institutional waste, etc. Sources of solid waste, Classification of solid waste – hazardous and non- hazardous waste, Physical and chemical characteristics of municipal solid waste.

**Unit– II: Storage, Collection and Transportation of Municipal Solid Waste:** Collection, segregation, storage and transportation of solid waste, Tools and Equipment-Litter Bin, Broom, Shovels, Handcarts, Mechanical Road sweepers, Community bin - like movable and stationary bin. Transportation vehicles with their working capacity -Animal carts, Auto vehicles, Tractors or Trailers, Trucks, Dumpers, Compactor vehicles. Transfer station- meaning, necessity, location, Role of rag pickers and their utility for society.

**Unit– III: Composting of Solid Waste:** Concept of composting of waste, Principles of composting process. Factors affecting the composting process. Methods of composting–Manual

Composting – Bangalore method, Indore Method, Mechanical Composting – Dano Process, Vermi composting.

**Unit– IV: Techniques for Disposal of Solid Waste:** Solid waste management techniques – solid waste management hierarchy, waste prevention and waste reduction techniques, Land filling technique, Factors to be considered for site selection, Land filling methods-Area method, Trench method and Ramp method, Leachate and its control, Biogas from landfill, Advantages and disadvantages of landfill method, Recycling of municipal solid waste, Incineration of waste: Introduction of incineration process, Types of incinerators - Flash, Multiple chamber Incinerators, Products of incineration process with their use, Pyrolysis of waste – Definition, Methods.

**Unit–V: Biomedical and E-waste management Columns:** Definition of Bio medical Waste. Sources and generation of Biomedical Waste and its classification, Bio medical waste Management technologies, Definition, varieties and ill effects of E- waste, Recycling and disposal of E- waste.

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of mechanics and forces.

**Evaluation Scheme:**

| Exams | Marks | Coverage |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| Total | 100 Marks | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**

1. Gupta O.P, Elements of Solid Hazardous Waste Management, Khanna Book Publishing Co., Delhi Ed. 2018
2. Bhide, A. D., Solid Waste Management, Indian National Scientific Documentation Centre, New
Delhi.
3. Sasikumar, K., Solid Waste Management, PHI learning, Delhi.

**REFERENCE BOOKS:**

1. George Techobanoglous, Kreith, Frank., Solid Waste, McGraw Hill Publication, New Delhi.
2. Hosetti, B.B., Prospect and Perspectives of Solid Waste Management, New Age International Publisher.

## Course Description

**Title: Advanced Construction Technology** **Code: DCE306**

**L-T-P scheme: 3-0-0** **Credits: 3**

**Prerequisite:** Building construction, Design of Steel and RCC structure

**Objectives:**
The objective of this course is to introduce the advancements made in the techniques for the construction of various structures.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** various terms involved in Advanced Construction Technology |
| CO2 | **Describe and Implement** the advanced methodologies for construction of structures under different site conditions |
| CO3 | **Develop** the fundamentals of modern construction techniques |
| CO4 | **Identify** the most suitable technology for the construction at a given situation |
| CO5 | **Apply** the new knowledge acquired for construction to plan and develop structures. |

**Course Content:**

**Unit – I: Introduction**: Features and functions of the special types of civil engineering structures: Multistoried building, Chimney, Elevated service reservoir, Dams and retaining walls, Bridges and hydraulic structures, Industrial structures, Marine and offshore structures, Tall structures. Effect of lateral forces on building like Wind, Water and Earthquake.

**Unit– II: Advanced Materials**: Admixtures and its Classification. Use of Waste products and Industrial Byproducts in bricks, blocks, concrete and mortar, Composite Material, Ceramics, Phospogypsum panels, bamboo mat board, Red mud polymer jute composites, Dry Wall Panel System

**Unit– III: Temporary Works**: Form work for R.C.C. wall, slab, beam and column, Centering for arches of large spans and dams, design features for temporary works, Slip formwork, False work for bridges, Specialty form work

**Unit– IV:** Modern curing techniques, Introduction to Building Information Model (BIM), Detailing of electrical and plumbing facilities. GRAHA Rating

**Unit– V:** Construction methods: Precast Flat Panel System, 3d Volumetric Construction, Precast Foundations .Fabrication Of Pre Cast Components

**Unit -VI:** Special foundations. Cofferdams, Caissions, Control of Ground Water in Excavations: Methods- pumping, well points, bored wells, electro-osmosis, injections with cement, clays and chemical, freezing process, vibro-flotation.

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of Advanced Construction Techniques. This course has been divided into six units and each section includes theory and numerical exercises to help a student gain more experience on the subject.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**

1. S.P. Arora & S.P. Bindra, A Text Book of Building Construction, Dhanpat Rai & Sons, New Delhi.
2. S.C. Rangwala, Building Construction, Charotar Publication Pvt Ltd. Anand

**REFERENCE BOOKS:**

1. S.K. Sarkar and S. Saraswati, Construction Technology, Oxford University Press, New Delhi.
2. B.C. Punamia, Building Construction, Laxmi Publications, New Delhi

## Course Description

**Title: Pavement Design & Maintenance** **Code: DCE307**

**L-T-P scheme: 3-0-0** **Credits: 3**

**Prerequisite:** Highway Engineering

**Objectives:**
1. To learn the fundamentals of highway materials and highway construction methods.
2. To know the knowledge about quality control, highway maintenances and its management

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** Flexible, Rigid and Semi Rigid Comparison of Rigid and flexible pavement according to Design precision, life maintenance, initial cost, availability of materials, surface characteristics, |
| CO2 | **Describe** various Factors affecting pavement design, design wheel load ,Traffic factors, Environmental factors, Road geometry and material |
| CO3 | **Develop** the design methods from IRC:37 guidelines Factors affecting design of concrete pavement. IRC:81 guidelines for design of concrete pavement Joints |
| CO4 | **Identify** Methods of Pavement evaluation, Visual rating, Pavement serviceability index, roughness measurements, Benkelman Beam deflection method |
| CO5 | **Apply** the Need for inspection and maintenance schedule. Causes of |

| | |
|---|---|
| | pavement failure and remedial measures. Typical flexible and rigid pavement failures |
| CO6 | **Demonstrate** flexible pavement failures, Rutting, fatigue, settlement and upheaval. slurry seal, liquid seal, fog seal, patching, ready mix patch. Types of damages to rigid pavement, |

**Course Content:**

**Unit – I Basics of pavement Design :** Types of pavement, Flexible, Rigid and Semi Rigid Comparison of Rigid and flexible pavement according to Design precision, life maintenance, initial cost, availability of materials, surface characteristics, Functions and characteristics of pavement. Factors affecting selection of type of pavement.

**Unit– II Fundamentals of pavement design:** Factors affecting pavement design, design wheel load ,Traffic factors, Environmental factors, Road geometry and material, Characteristics of soil and Drainage situation.

**Unit– III Design of pavements :** Methods of flexible pavement design, IRC:37 guidelines for design of flexible pavement, Factors affecting design of concrete pavement. IRC:81 guidelines for design of concrete pavement Joints-Need, Types, requirements, spacing of joints

**Unit– IV Pavement evaluation :** Definition and purpose of pavement evaluation Methods of Pavement evaluation, Visual rating, Pavement serviceability index, roughness measurements, Benkelman Beam deflection method

**Unit V - Pavement Maintenance :** Types of pavement maintenance - routine, periodic, and special. Need for inspection and maintenance schedule. Causes of pavement failure and remedial measures. Typical flexibleand rigid pavement failures,

**Unit:VI: Pavement failures :** flexible pavement failures, Rutting, fatigue, settlement and upheaval. slurry seal, liquid seal, fog seal, patching, ready mix patch. Types of damages to rigid pavement, cracking, spalling, slab rocking, settlement, joint seal-ant failure. Methods of repair, repair of joints, full depth reconstruction, dowel and tie bars.

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge on highway materials, highway construction techniques, maintenance and its management of as well. This course has been divided into eight units and each section includes theory and numerical exercises to help a student gain more experience as a planner and designer. This subject helps a student to learn more practical knowledge and experience in the field of highway construction according to IRC and MORT&H specifications**.** Additionally student will gain sound knowledge on quality control techniques in highways.

**Evaluation Scheme:**

| Exams | Marks | Coverage |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**


1. Kadiyali, L.R., Highway Engineering, Khanna Book Publishing House, New Delhi(ISBN: 978-93-86173-133)

2. Chakroborty, Partha Das, Animesh., Principles of Transportation engineering, Prentice-Hallof India Pvt.Ltd

3. Vazirani, V N, Chaondola, S P., Transportation Engineering Vol. I & II, Khanna Publishers. Delhi


**REFERENCE BOOKS:**


1. Yoder, E J, Principles of Pavement Design, Wiley India Pvt Ltd.

2. Bindra, S P., Highway Engineering, Dhanpat Rai Publications (P) Ltd

3. Kumar R S, Pavement Evaluation and Maintenance Management system, University Press (In-dia), Pvt. Ltd.

4. Sharma S K, Principles, Practice and Design of Highway Engineering, S Chand, New Delhi.

## Course Description

**Title: Green Building and Energy Conservation** **Code: DCE308**

**L-T-P scheme: 3-0-0** **Credits: 3**

**Prerequisite:** Building construction, Concrete Technology

**Objectives:**
The objective of this course is to introduce the techniques used in the construction of various Precast and Prestressed Concrete structures.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** the various aspects of Green Building |
| CO2 | **Describe and Implement** the different concepts of design of green and energy efficient building |
| CO3 | **Develop** the fundamental concepts of selecting suitable materials for design of green building |
| CO4 | **Identify** the most suitable techniques for making green building and its rating |
| CO5 | **Apply** the knowledge acquired for construction of energy efficient buildings |

**Course Content:**

**Unit – I: Introduction**: Definition of Green Building, need for Green Building, Benefits of Green Buildings, Green Building Materials and Equipment in India, requisites for Constructing a Green Building, Important Sustainable features for Green Building.

**Unit– II: Green Building Concepts And Practices:** Indian Green Building Council, Green Building Moment in India, Benefits Experienced in Green Buildings, Launch of Green Building Rating Systems, Residential Sector, Market Transformation; Green Building Opportunities And Benefits: Opportunities of Green Building, Green Building Features, Material and Resources, Water Efficiency, Optimum Energy Efficiency, Typical Energy Saving Approach in Buildings, LEED India Rating System and Energy Efficiency

**Unit– III: Green Building Design**: Introduction, Reduction in Energy Demand, Onsite Sources and Sinks, Maximize System Efficiency, Steps to Reduce Energy Demand and Use Onsite Sources and Sinks, Use of Renewable Energy Sources. Eco-friendly captive power generation for factory, Building requirement

**Unit– IV: Air Conditioning**: Introduction, Design philosophy, Design interventions, Energy modeling, HVAC System design, Chiller selection, pump selection, Selection of cooling towers, Selection of air handing units, Pre-cooling of fresh air, Interior lighting system, Key feature of the building. Eco-friendly captive power generation for factory, Building requirement

**Unit– V: Material Conservation** Handling of non process waste, waste reduction during

construction, materials with recycled content, local materials, material reuse, certified wood ,Rapidly renewable building materials and furniture

**Unit -VI: Energy and Energy conservation**: Renewable Energy Resources: Solar Energy, Wind Energy, Ocean Energy, Hydro Energy, Bio- mass Energy. Non-renewable Energy Resources: Coal, Petroleum, Natural Gas, Nuclear Energy, Chemical Sources of Energy, Fuel Cells, Hydrogen, Biofuels. Energy conservation: Introduction, Specific objectives, present scenario, Need of energy conservation, LEED India Rating System and Energy Efficiency

**Teaching Methodology:**

This course is introduced to help students to know about the fundamental knowledge of Green Building and Energy Conservation. This course has been divided into six units and each section includes theory and numerical exercises to help a student gain more experience on the subject.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**


1. Handbook on Green Practices published by Indian Society of Heating Refrigerating and Air conditioning Engineers, 2009.

2. Green Building Hand Book by Tomwoolley and Samkimings, 2009.


**REFERENCE BOOKS:**


1. Complete Guide to Green Buildings by Trish riley
2. Standard for the design for High Performance Green Buildings by Kent Peterson, 2009

**Course Description**

**Title: Building Services and Maintenance** **Code: DCE309**

**L-T-P scheme: 3-0-0** **Credits: 3**

**Prerequisite:** Nil

**Objectives:**

1. To know the procedure for classifying various types of building services.
2. To know the fire safety requirements for multi-storeyed building.
3. To devise suitable plumbing system for given type of building.
4. To understand the procedure for rain water harvesting and solar water heater.
5. To know the system for designing lighting, ventilation and acoustics for any building.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** Design residential buildings from the point of view of grouping and circulation, lighting and ventilation and fire protection |
| CO2 | **Identify** residential and commercial plumbing systems. |
| CO3 | **Analyze** fire protection, storm water and natural gas utilities. |
| CO4 | **Describe** HVAC fundamentals, pumps, ventilation & cooling, air conditioners, and heating systems. |
| CO5 | **Determine** requirements of power systems and equipments, general requirements & planning of electrical and communication and testing of installations. |
| CO6 | **Apply** concepts for service and distribution, grounding, branch circuits and feeders, lighting, fire alarm system, and low voltage systems. |

**Course Content:**

**Unit – I Overview of Building Services**

Introduction to building services, Classification of buildings as per National Building code, Necessity of building services, Functional requirements of building, Different types of build- ing services i.e. HVAC (Heat, Ventilation and Air Conditioning), Escalators and lifts, fire safety, protection and control, plumbing services, rain water harvesting, solar water heating system, lighting, acoustics, sound insulation and electric installation etc. Role and responsibility of Building Service Engineer, Introduction to BMS (Building Manage- ment Services), Role of BMS, concept of smart building.

**Unit– II Modes of vertical communication**

Objectives and modes of vertical communication in building. Lifts**:** Different types of lifts and its uses, Component parts of Lift- Lift Well, Travel, Pit, Hoist Way, Machine, Buffer, Door Locks, Suspended Rope, Lift Car, Landing Door, Call Indicators, Call Push etc., Design provisions for basic size calculation of space enclosure to accommo- date lift services, Safety measures. Escalators**:** Different Types of Escalators and its Uses, Components of escalators, Design provisions for basic size calculation of space enclosure to accommodate escalator services,Safety measures. Ramp: Necessity, design consideration, gradient calculation, layout and Special features re-quired for physically handicapped and elderly.

**Unit– III Fire Safety**

Fire protection requirements for multi-storeyed building, causes of fire in building, Fire detecting and various extinguishing systems, Working principles of various fire protection systems. Safety against fire in residential and public buildings (multi-storeyed building), National Building Code provision for fire safety, Fire resisting materials and their properties, Fire resistant construction, procedures for carrying out fire safety inspections of existing build- ings, Provisions for evacuation.

**Unit– IV Plumbing Services**

Importance of plumbing, AHJ (Authority Having Jurisdiction) approval, Plumbing Terminol-ogy and fixtures: Terms used in plumbing, Different types of plumbing fixtures, shapes/ sizes, capacities, situation and usage, Traps, Interceptors. System of plumbing for building water supply: storage of water, hot and cold water supply system. System of plumbing for building drainage: Types of drainage system such as two pipe sys- tem, one pipe system, types of Vents and purpose of venting, Concept of grey water and reclaimed water. Different pipe materials, and jointing methods, fittings, hanger, supports and valves used in plumbing and their suitability.

**Unit– V Lighting, Ventilation and Acoustics**

Concept of SWH (Solar water heating), component parts of SWH, various system of SWH (heat transfer, propulsion, passive direct system, active direct system, Do-it-yourself), in- stallation and maintenance. Concept of lighting, types of lighting (natural and artificial), factors influencing the bright- ness of room, factors affecting selection of artificial lighting, installation of light (direct, half-direct, indirect, half-indirect and direct-indirect), types of light control (manual switch, remote switch, timer switch and photo-electric cell switch), types of lamps (incandescent, tungsten halogen and electric discharge), Lamp selection as per room sizes. Concept of ventilation, necessity and Types of ventilation. Building Acoustic, Objectives, acoustic Control in a building, acoustic material (porous absorber and cavity resonator)

**Teaching Methodology:**

The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

**Evaluation Scheme:**

| Exams | Marks | Coverage |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, |
| Test-2 | 25 Marks | Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**


1. Patil, S. M., Building Services, Seema Publication, Mumbai.
2. Mantri and Sandeep., The A to Z of Practical Building Construction and its Management, Satya Prakashan, New Delhi**.**
3. Bag S P, Fire Services in India: History, Detection, Protection, Management, Mittal Publications, New Delhi.
4. Deolalikar,S. G., Plumbing Design and Practice, McGraw-Hill,
5. Akhil Kumar Das., Principles of Fire Safety Engineering: Understanding Fire and Fire Protec- tion, PHI Learning Pvt. Ltd, New Delhi.
6. Shraman N L, Solar panel installation guide & user manual**,** The Memory Guru of India.
7. Gupta M K, Practical handbook on building maintenance - Civil works, Nabhi Publications.


**REFERENCE BOOKS:**


1. BIS., National Building Code Part1, 4, 8, 9., Bureau of Indian Standard, New Delhi

2. BIS., IS 12183(Part 1):1987 Code of practice for plumbing in multistoried buildings., Bureau of Indian Standard, New Delhi

3. BIS., 2008 Uniform plumbing code – India (UPC-I )., Bureau of Indian Standard

## Course Description

**Title: Repairs and Maintenance of Structures** **Code: DCE310**

**L-T-P scheme: 3-0-0** **Credits: 3**

**Prerequisite:** Nil

**Objectives:**

1. To learn about types of maintenance techniques
2. To understand causes of various types of damages.
3. To know about relevant materials for repair.
4. To learn methods of retrofitting for different structures.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** the principles of retrofitting. |
| CO2 | **Describe** the criteria for repair and retrofitting. |
| CO3 | **Apply** the non-destructive techniques for assessment of distressed concrete structures and its repair techniques. |
| CO4 | **Identify** and describe the parameters affecting the durability of concrete. |
| CO5 | **Develop** and design the retrofitting program of bridges and dams and heritage structures. |
| CO6 | **Demonstrate** different special techniques of retrofitting including base isolation as a method of seismic retrofitting |

**Course Content:**

**Unit – I Basics of maintenance**

Types of Maintenances - repair, retrofitting, re-strengthening, rehabilitation and restoration. Necessity, objectives and importance of maintenance. Approach of effective management for maintenance. Periodical maintenance: check list, maintenance manual containing building plan, reinforcement details, material sources, maintenance frequency, corrective maintenance procedures and sources. Pre- and post- monsoon maintenance.

**Unit– II Causes and detection of damages**

Causes of damages due to distress, earthquake, wind, flood, dampness, corrosion, fire, deterioration, termites, pollution and foundation settlement. Various aspects of visual observations for detection of damages. Load test and non-destructive tests (brief description). NDT tests on damaged structure such as rebound hammer, ultrasonic pulse velocity, rebar locator, crack detection micro- scope, digital crack measuring gauge. Chemical test - Chloride test, sulphate attack, carbonation test, pH measurement, resistivity method, Half-cell potential meter (Introduction and demonstration only).

**Unit– III Materials for maintenance and repairs**

Types of repair material, material selection. Essential parameters for maintenance and repair materials such - bond with substrate, durability. Waterproofing materials based on polymer modified cement slurry, UV resistant acrylic polymer, ferro-cement. Repairing materials for masonry: plastic/aluminum nipples, non-shrink cement, polyester putty or 1:3 cement sand mortar, galvanized steel wire fabrics and clamping rods, wire nails, ferro-cement plates. Repairing materials for RCC: epoxy resins, epoxy mortar, cement mortar impregnated with polypropylene, silicon, polymer concrete composites, sealants, fiber reinforcement con- crete, emulsions and paints.

**Unit– IV Maintenance and repair methods for masonry Construction**

Causes of cracks in walls - bulging of wall, shrinkage, bonding, shear, tensile, vegetation. Probable crack location: junction of main and cross wall, junction of slab and wall, cracks in masonry joints. Repair methods based on crack type - For minor & medium cracks (width 0.5 mm to 5mm): grouting and for major cracks (width more than 5mm): fixing mesh across cracks, RCC band, installing ferro-cement plates at corners, dowel bars, propping of load bearing. Remedial measures for dampness & efflorescence in wall.

**Unit– V Maintenance and repair methods for RCC Construction**

Repair stages such as concrete removal and surface preparation, fixing suitable formwork, bonding/passive coat and repair application, various methods of surface preparation. Repair options such as grouting, patch repairs, carbonated concrete, cleaning the corroded steel, concrete overlays, latex concrete, epoxy bonded mortar and concrete, polymer con- crete, corrosion protection such as jacketing. Building cracks and its prevention, common methods for dormant crack repairs such as Epoxy injection, grooving and sealing, stitching, grouting and guniting/ shotcreting. Strengthening methods for live cracks such as addition of reinforcements, Jacketing, brackets, collars, supplementary members i.e. shoring,

underpinning and propping of framed structure.

**Teaching Methodology:**
The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, |
| Test-2 | 25 Marks | Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**


1. Gahlot, P. S., Sharma, S., Building Repair and Maintenance Management, CBS Publishers &Distributors Pvt. Ltd., New Delhi
2. Guha, P. K., Maintenance and Repairs of Buildings, New Central Book Agencies


**REFERENCE BOOKS:**


1. Hutchin Son, B. D., Maintenance and Repairs of Buildings, Newnes-Butterworth
2. Relevant BIS codes

## Course Description

**Title: Advanced Design of Structures** **Code: DCE311**

**L-T-P scheme: 3-0-0** **Credits: 3**

**Prerequisite:** Nil

**Objectives:**

1. To understand the concepts involved in the design of riveted and welded connections.
2. To know the provisions of BIS code for design of built up sections.
3. To analyze T and L shaped beam sections.
4. To understand the concept for design of one way and two way slabs.
5. To identify short and long columns and their design provisions.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline** the properties of structural steel and its properties. |
| CO2 | **Describe** structural member joints through riveting, bolting and welding. |
| CO3 | **Develop** the concepts of compression, tension and flexural member design. |
| CO4 | **Identify** structural steel behavior under different types of loading. |
| CO5 | **Apply** the concept of axial, bending and shear response for steel structure design. |
| CO6 | **Design** various structural components for steel structures. |

**Course Content:**

**Unit – I Design of connections in steel structures**

Types of rivets, Riveted connections, Strength of riveted joints, Design of riveted joints for axially loaded members. Types of weld, welded connections, Permissible stresses in weld, Strength of weld. Advantages and disadvantages of weld, Design of fillet weld and butt weld for axial load. Design of column bases for axially loaded columns only.

**Unit– II Steel Beams**

Different steel sections, Simple and built up sections, Permissible bending stresses, Design of built up sections (symmetrical I section with cover plates only), check for shear and deflection. Introduction to plate girder: Components and functions (no numericals),

**Unit– III Design of RC flanged beam**
General features of T and L beams, Advantages, Effective width as per BIS 456, Design of singly reinforcement T beam, Stress and Strain diagram, Depth of neutral axis, Moment of resistance, T and L beams with neutral axis in flange only. Simple numericals on location of neutral axis, Effective width of flange.

**Unit– IV Design of slab**
Design of simply supported one-way slab for flexure, shear and deflection and checks, as per the provisions of BIS 456. Design of one-way cantilever slab, Chajjas, Flexure including checks for Development length and Shear stress. Design of two-way simply supported slab, Introduction to design of dog-legged staircases.

**Unit– V Design of RCC Column and Footing design: Uni-axial bending**
IS 456 provisions, Column with uni-axial moment, Effective length calculations, Minimum eccentricity. Design of footing for axially loaded column only.

**Teaching Methodology:**
The course will be covered through lectures supported by tutorials. In tutorials, apart from the discussion on the topics covered in lectures, assignments in the form of questions will be given.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, |
| Test-2 | 25 Marks | Based on Unit-2 & Unit-3 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-4 to Unit-5 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**

1. Shah, V. L., and Gore, V., Limit State Design of Steel Structures, Structures Publications,

Pune.

2. Dayarathnam, P., Design of Steel Structures, S. Chand and Company, New Delhi.
3. Subramanian N., Design of Steel Structures, Oxford University Press.
4. Pillai, S.U., and Menon, Devdas, Reinforced concrete Design, McGraw Hill
5. Varghese, P. C., Limit State Design of Reinforced Concrete, Prentice Hall India Learning Pri-vate Limited, Delhi.

**REFERENCE BOOKS:**

1. Sairam, K.S., Design of Steel Structures, Pearson Publication, Chennai, Delhi.
2. Shah, V. L., and Karve, S.R., Limit State Theory and Design of Reinforced Concrete Structures,Structures Publications, Pune.
3. Sinha N.C., and Roy S.K., Fundamentals of Reinforced Concrete, S. Chand & Co.,
4. Krishna Raju, and N.Pranesh, R.N., Reinforced Concrete Design Principles and Practice, NewAge International, Mumbai.

## Course Description

**Title: Tendering and Accounts** **Code: DCE312**

**L-T-P scheme: 3-0-0** **Credits: 3**

**Prerequisite:**

**Objectives:**

1. To understand terminologies in contract and tender document and their significance.
2. To know different types of contracts and their uses.
3. To learn preparation of typical Tender documents for civil engineering work.
4. To get acquainted with rent fixation and valuation of civil structures.

**Learning Outcomes:**

| Course Outcome | Description |
|---|---|
| CO1 | **Outline to** carrying out works contract method, departmental method rate list |

| | |
|---|---|
| | method, piece work method, day's work method, employing labours on daily wages basis. |
| CO2 | **Describe the** advantages, disadvantages and their suitability Lump sum contract, item rate contract, percentage rate contract, cost plus percentage, cost plus fixed fee. |
| CO3 | **Develop the** Procedure of submitting filled tender Documents (Two envelope system), procedure of opening tender. |
| CO4 | **Identify** tender documents Index, tender notice, general instructions, special instructions, Schedule A, Schedule B, Schedule C. |
| CO5 | **Apply** the various account forms and their uses – Measurement Books, E-Measurement book. |
| CO6 | **Demonstrate** the Depreciation, Obsolescence, Sinking Fund, Methods of Calculation of Depreciation. |

**Course Content:**

**Unit – I Procedure to execute the work**

Administrative approval, Technical sanction, budget provision, expenditure sanction.

Methods for carrying out works contract method, departmental method rate list method, piece work method, day's work method, employing labours on daily wages basis.

**Unit– II Contracts**

Definition of contract, objects of contract, requirements of contract, overview of Indian Con- tract Act.

Types of engineering contract with advantages, disadvantages and their suitability Lump sum contract, item rate contract, percentage rate contract, cost plus percentage, cost plus fixed fee, cost plus variable percentage and cost plus variable fee contract, labour contract, demolition contract, target contract, negotiated contract, Engineering Procurement Construction Contract (EPC), Annuity Contract.

Introduction of FIDIC Conditions of contract.

Classification of contractor on basis of financial limits, Requirement of documents for regis- tration of contractor.

Build Operate Transfer (BOT) Project, BOT Toll contract, BOT (Annuity) contract, Design, Build, Finance, Operate and Transfer (DBFOT) contract, Hybrid Annuity contract, Operate Maintain and Transfer (OMT) contract, Operation & Maintenance contract (Introduction only).

**Unit– III Tender**

Definition of tender, necessity of tender, types of tender- Local, Global, Limited.

E -Tendering System – Online procedure of submission and opening of bids (Technical and Financial).

Notice to invite tender (NIT)- Points to be included while drafting tender notice, Drafting of tender notice.

Procedure of submitting filled tender Documents (Two envelope system), procedure of opening tender, comparative statement, scrutiny of tenders, award of contract, letter of award.

Meaning of terms - Earnest Money Deposit (EMD), Performance Security Deposit, Validity period, corrigendum to tender notice and its necessity, Unbalanced bid.

**Unit– IV Tender Documents**

Tender documents Index, tender notice, general instructions, special instructions, Schedule A, Schedule B, Schedule C etc.

Terms related to tender documents contract conditions time limit, time extension, penalty, defective material and workmanship, termination of contract, suspension of work, subletting of contract, extra items, price variation clause(escalation), defect liability Period, liquidated Damages.

Arbitration- Meaning, Qualification of an arbitrator, Appointment, Dispute and Settlement of disputes, Arbitration and Conciliation Act, Arbitration award.

**Unit– V Accounts**

Various account forms and their uses – Measurement Books, E- Measurement book (E-MB), Nominal Muster Roll(NMR), Imprest Cash, Indent, Invoice, Bill, Vouchers, Hand receipt Cash Book, Temporary Advance. Heads of Accounts.

Mode of Payment to the contractor and its necessity, Interim Payment, Advance Payment Secured Advance, Petty advance, Mobilization advance, Running account bill, Final bill, Re- tention money, E - payment.

**Unit– VI Introduction to Valuation**

Definition and purpose of Valuation, role of valuer. Definition - Cost, Price and Value, Char- acteristics of Value, Factors Affecting Value.

Types of Value - Book Value, Scrap Value, Salvage Value, Speculative Value, Distress Value, Market Value, monopoly Value, Sentimental Value. Factors affecting value.

Depreciation, Obsolescence, Sinking Fund, Methods of Calculation of Depreciation – Straight Line Method, Sinking Fund Method, Constant Percentage Method.

Fixation of rent, Lease – types of lease, lease hold property and free hold property. Mortgage Mortgage deed, precautions to be taken while making mortgage.

**Evaluation Scheme:**

| **Exams** | **Marks** | **Coverage** |
|---|---|---|
| Test-1 | 15 Marks | Based on Unit-1, Unit-2 |
| Test-2 | 25 Marks | Based on Unit-3 & Unit-4 and around 30% from coverage of Test-1 |
| Test-3 | 35 Marks | Based on Unit-5 to Unit-6 and around 30% from coverage of Test-2 |
| Assignment | 10 Marks | |
| Tutorials | 5 Marks | |
| Quiz | 5 Marks | |
| Attendance | 5 Marks | |
| **Total** | **100 Marks** | |

**Learning Resources:**

Regular class notes, tutorials, study material, videos, and expert lecture & slides available in NPTEL site.

**TEXT BOOKS:**


1. Datta, B. N., Estimating and Costing in Civil engineering, UBS Publishers Pvt. Ltd., New Delhi
2. Raina, V. K., Construction Management and Contract Practices, Shroff Publishers & Distrib- uters Pvt. Ltd.
3. Rangawala, S. C., Estimating and Costing, Charotar Publishing House PVT. LTD., Gujrat


**REFERENCE BOOKS:**


1. Birdie, G. S., Estimating and Costing, Dhanpat Rai Publishing Company(P) Ltd., New Delhi
2. Patil, B. S., Civil Engineering Contracts and Estimates, Orient Longman, Mumbai
3. Chakraborti, M., Estimating and Costing, Specification and Valuation in Civil Engineering, Monojit Chakraborti, Kolkata.


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