

**SECOND SEMESTER**

Sr. No.	SUBJECTS	STUDY SCHEME		Credits	MARKS IN EVALUATION SCHEME						Total Marks of Internal & External
		Periods/Week			INTERNAL ASSESSMENT			EXTERNAL ASSESSMENT			
		L	P		Th	Pr	Total	Th	Pr	Total	
2.1	* Fundamentals of IT	2	4	2+2=4	40	40	80	60	60	120	200
2.2	* Applied Physics-II	2	2	2+1=3	40	40	80	60	60	120	200
2.3	*Applied Mathematics-II	4	-	4+0=4	40	-	40	60	-	60	100
2.4	Civil Engineering Practices	-	6	0+3=3	-	40	40	60	-	60	100
2.5	Construction Material	2	4	2+2=4	40	40	80	60	60	120	200
2.6	***Applied Mechanics	3	2	3+1=4	40	40	80	60	60	120	200
2.7	*Environmental Studies & Disaster Management	2	-	2+0=2	40	-	40	60	-	60	100
	#Student Centred Activities	-	2	-	-	-	-	-	-	-	-
	<b>Total</b>	<b>15</b>	<b>20</b>	<b>15+9=24</b>	<b>240</b>	<b>200</b>	<b>440</b>	<b>420</b>	<b>240</b>	<b>660</b>	<b>1100</b>

\* **Common with other diploma programmes**

\*\*\* Common with Mechanical Engineering.

# Student Centered Activities will comprise of co-curricular activities like extension lectures on Constitution of India, Games, Yoga, Human Ethics, Knowledge of Indian System, Hobby clubs e.g. Photography etc., Seminars, Declamation contests, Educational field visits, N.C.C., NSS, Cultural Activities and self study etc.

**Summer Internship/In-house Training: After 2<sup>nd</sup> semester, students shall undergo Summer Internship of 4 weeks.**

## 2.1 FUNDAMENTALS OF IT

**L P**  
**2 4**

### RATIONALE

Information technology has great influence on all aspects of life. Almost all work places and living environment are being computerized. In order to prepare diploma holders to work in these environments, it is essential that they are exposed to various aspects of information technology such as understanding the concepts of information technology and its scope, operating a computer: use of various office management tools, using internet and mobile applications etc. 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 OUTCOMES

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

- CO1: Explain the basic components of Computers, Internet and issues of abuses/attacks on information and computers
- CO2: Handle the computer/laptop/mobiles/Internet Utilities and Install/Configure OS
- CO3: Assemble a PC and connect it to external devices
- CO4: Manage and Use Office practiced Automation Tools
- CO5: Develop worksheets and Prepare presentations

### DETAILED CONTENTS

#### UNIT I

##### Basics of Computer

Brief history of development of computers, Definition of Computer, Block diagram of a Computer, Hardware, Software, Booting: Cold and Hot Booting, Interaction between the CPU and Memory with Input/output devices, Function of CPU and major functional parts of CPU. Memory, Bit, Nibble, Byte, KB, MB, GB, TB, PB, Functions of memory, Use of storage devices in a Computer, List types of memory used in a Computer, Importance of cache memory, CPU speed and CPU word length

## UNIT II

### Basic Internet Skills

Understanding browser, Introduction to WWW, efficient use of search engines, awareness about Digital India portals (state and national portals) and college portals. Advantages of Email, Various email service providers, Creation of email id, sending and receiving emails, attaching documents with email and drive.

Effective use of Gmail, G-Drive, Google Calendar, Google Sites, Google Sheets, Online mode of communication using Google Meet & WebEx.

## Unit III

### Basic Logic building

Introduction to Programming, Steps involved in problem solving, Definition of Algorithm, Definition of Flowchart, Steps involved in algorithm development, differentiate algorithm and flowchart, symbols used in flowcharts, algorithms for simple problems, flowcharts for simple problems, Practice logic building using flowchart/algorithms

## Unit IV

### Office Tools

Office Tools like Libre Office/Open Office/MsOffice.

Open Office Writer – Typesetting Text and Basic Formatting, Inserting Images, Hyperlinks, Bookmarks, Tables and Table Properties in Writer

Introducing Libre Office/Open Office *Calc*, Working with Cells, Sheets, data, tables, using formulae and functions, using charts and graphics.

Open Office Impress – Creating and Viewing Presentations, Inserting Pictures and Tables, Slide Master and Slide Design, Custom Animation.

## Unit V

### Use of Social Media

Introduction to Digital Marketing – Why Digital Marketing, Characteristics of Digital Marketing, Tools for Digital Marketing, , Effective use of Social Media like LinkedIn, Google+, Facebook, Twitter, etc.: Features of Social media, Advantages and Disadvantages of Social Media.

## PRACTICAL EXERCISES

1. Browser features, browsing, using various search engines, writing search queries
2. Visit various e-governance/Digital India portals, understand their features, services offered

3. Read Wikipedia pages on computer hardware components, look at those components in lab, identify them, recognize various ports/interfaces and related cables, etc.
4. Using Administrative Tools/Control Panel Settings of Operating Systems
5. Connect various peripherals (printer, scanner, etc.) to computer, explore various features of peripheral and their device driver software.
6. Explore features of Open Office tools and MS-Office, create documents, create presentation, create spread sheet, using these features, do it multiple times
7. Working with Conversion Software like pdfToWord, WordToPPT, etc.
8. Working with Mobile Applications – Searching for Authentic Mobile app, Installation and Settings, Govt. of India Mobile Applications
9. Creating email id, sending and receiving mails with attachments.
10. Using Google drive, Google calendar
11. Create Flow chart and Algorithm for the following
  - a. Addition of n numbers and display result
  - b. To convert temperature from Celsius to Fahrenheit
  - c. To find Area and Perimeter of Square
  - d. Swap Two Numbers
  - e. find the smallest of two numbers
  - f. Find whether given number is Even or Odd
  - g. To print first n even Numbers
  - h. find sum of series  $1+2+3+\dots+N$
  - i. print multiplication Table of a number
  - j. generate first n Fibonacci terms  $0,1,1,2,3,5\dots n$  ( $n>2$ )
  - k. sum and average of given series of numbers
  - l. Factorial of number n ( $n!=1\times 2\times 3\times \dots n$ )
  - m. Armstrong Number
  - n. Find whether given number is Prime or not

## RECOMMENDED BOOKS

1. R.S. Salaria, “Computer Fundamentals” Khanna Publishing House
2. Ramesh Bangia, “PC Software Made Easy – The PC Course Kit” Khanna Publishing House
3. Online Resources, Linux man pages, Wikipedia
4. Mastering Linux Shell Scripting: A practical guide to Linux command-line, Bash scripting, and Shell programming, by Mokhtar Ebrahim, Andrew Mallett
5. Vikas Gupta, “Comdex Hardware and Networking Course Kit” Dream Tech press, New Delhi, 2008

6. SumitabhaDas,“UNIX concepts and applications” Tata McGraw Hill, New Delhi, 4<sup>th</sup> Edition, 2008

### **SUGGESTED WEBSITES**

1. <https://nptel.ac.in/courses/106/106/106106222/> - NPTEL Course on Modern Application Development
2. [https://onlinecourses.swayam2.ac.in/aic19\\_de01/preview](https://onlinecourses.swayam2.ac.in/aic19_de01/preview) -
3. <https://spoken-tutorial.org/> - Tutorials on Introduction to Computers, HTML, Libre Office Tools, etc.
4. NOTEPAD++
5. <https://tms-ousource.com/blog/posts/web-development-ide/>

### **INSTRUCTIONAL STRATEGY**

This is a skill based subject and topics taught in the class should be practiced in the Lab regularly for development of required skills in the students. This subject contains five units of equal weightage.

## 2.2 APPLIED PHYSICS-II

<b>L</b>	<b>P</b>
<b>2</b>	<b>2</b>

### RATIONALE

Applied physics includes the study of a large number of diverse topics all related to things that go on in the world around us. It aims to give an understanding of this world both by observation and by prediction of the way in which objects will behave. Concrete use of physical principles and analysis in various technical fields are given prominence in the course content to prepare students for various technical applications.

### COURSE OUTCOMES

At the end of this course, the students will be able to:

- CO1: Differentiate between types of waves and their motion.
- CO2: Illustrate laws of reflection and refraction of light.
- CO3: Demonstrate competency in phenomena of electrostatics and electricity.
- CO4: Characterize properties of material to prepare new materials for various technical applications.
- CO5: Demonstrate a strong foundation on Modern Physics to use at various technical applications.

### DETAILED CONTENTS

#### UNIT I

##### Wave Motion and its Applications

- 1.1 Waves: definition, types (mechanical and electromagnetic wave)
- 1.2 Wave motion- transverse and longitudinal with examples, terms used in wave motion like displacement, amplitude, time period, frequency, wavelength, wave velocity; relationship among wave velocity, frequency and wave length
- 1.3 Simple harmonic motion (SHM): definition, examples
- 1.4 Cantilever: definition, formula of time period (without derivation)
- 1.5 Free, forced and resonant vibrations with examples
- 1.6 Sound waves: types (infrasonic, audible, ultrasonic) on the basis of frequency, noise, coefficient of absorption of sound, echo

**UNIT II****Optics**

- 2.1 Reflection and refraction of light with laws, refractive index
- 2.2 Lens: introduction, lens formulae (no derivation), power of lens and simple numerical problems
- 2.3 Total internal reflection and its applications, critical angle and conditions for total internal reflection
- 2.4 Superposition of waves (concept only), definition of Interference, Diffraction and Polarization of waves
- 2.5 Introduction to Microscope, Telescope and their applications

**UNIT III****Electrostatics and Electricity**

- 3.1 Electric charge, unit of charge, conservation of charge
- 3.2 Coulomb's law of electrostatics
- 3.3 Electric field, electric lines of force (definition and properties), electric field intensity due to a point charge
- 3.4 Definition of electric flux, Gauss law (statement and formula)
- 3.5 Capacitor and capacitance (with formula and unit)
- 3.6 Electric current and its SI Unit, direct and alternating current
- 3.7 Resistance, conductance (definition and unit)
- 3.8 Series and parallel combination of resistances
- 3.9 Ohm's law (statement and formula)

**UNIT IV****Classification of Materials and their Properties**

- 4.1 Definition of energy level, energy bands
- 4.2 Types of materials (conductor, semiconductor, insulator and dielectric) with examples, intrinsic and extrinsic semiconductors (introduction only)
- 4.3 Introduction to magnetism, type of magnetic materials: diamagnetic, paramagnetic and ferromagnetic materials with examples
- 4.4 Magnetic field, magnetic lines of force, magnetic flux
- 4.5 Electromagnetic induction (definition)

## UNIT V

### Modern Physics

- 5.1 Laser: introduction, principle, absorption, spontaneous emission, stimulated emission, population inversion
- 5.2 Engineering and medical applications of laser
- 5.3 Fibre optics: introduction to optical fibers (definition, principle and parts), light propagation, fiber types (mono-mode, multi-mode), applications in medical, telecommunication and sensors
- 5.4 Nanotechnology: introduction, definition of nanomaterials with examples, properties at nano scale, applications of nanotechnology (brief)

### PRACTICAL EXERCISES

1. Familiarization with apparatus (resistor, rheostat, key, ammeter, voltmeter, telescope, microscope etc.)
2. To find the time period of a simple pendulum.
3. To study variation of time period of a simple pendulum with change in length of pendulum.
4. To determine and verify the time period of Cantilever.
5. To verify Ohm's laws by plotting a graph between voltage and current.
6. To study colour coding scheme of resistance.
7. To verify laws of resistances in series combination.
8. To verify laws of resistance in parallel combination.
9. To find resistance of galvanometer by half deflection method.
10. To verify laws of reflection of light using mirror.
11. To verify laws of refraction using glass slab.
12. To find the focal length of a concave lens, using a convex lens.

### RECOMMENDED BOOKS

1. "Text Book of Physics for Class XII (Part-I, Part-II)", N.C.E.R.T., Delhi.
2. Dr. H.H.Lal, "Applied Physics, Vol. I & II", TTTI Publications, Tata McGraw Hill, Delhi.
3. AS Vasudeva, "Applied Physics – II", Modern Publishers, Jalandhar.
4. R A Banwait, "Applied Physics – II", Eagle Prakashan, Jalandhar.
5. N Subrahmanyam, Brij Lal and Avadhanulu, "A text book of OPTICS", S Chand Publishing, New Delhi.
6. E-books/e-tools/relevant software to be used as recommended by AICTE/ HSBTE/



NITTTR.

7. M H Fulekar, “Nanotechnology: Importance and Applications”, IK International Publishing House (P) Ltd., New Delhi.
8. C. L. Arora, “Practical Physics”, S Chand Publication.

### **SUGGESTED WEBSITES**

1. <http://swayam.gov.in>

### **INSTRUCTIONAL STRATEGY**

This is hands-on practice based subject and topics taught in the class should be practiced in the Lab regularly for development of required skills in the students. This subject contains five units of equal weightage. Teacher may use various teaching aids like models, charts, graphs and experimental kits etc. for imparting effective instructions in the subject. Students need to be exposed to use of different sets of units and conversion from one unit type to another. Software may be used to solve problems involving conversion of units. The teacher should explain about field applications before teaching the basics of mechanics, work, power and energy, rotational motion, properties of matter etc. to develop proper understanding of the physical phenomenon. Use of demonstration can make the subject interesting and develop scientific temper in the students.

Teachers should give examples of engineering/technology applications of various concepts and principles in each topic so that students are able to appreciate learning of these concepts and principles. In all contents, SI units should be followed. Working in different sets of units can be taught through relevant software.

## 2.3 APPLIED MATHEMATICS – II

**L P**  
**4 -**

### RATIONALE

Applied mathematics forms the backbone of engineering students. Basic elements of Differential calculus, Integral calculus and Differential Equations have been included in this course. This will develop analytical abilities to apply in engineering field and will provide continuing educational base to the students.

### COURSE OUTCOMES

After undergoing the subject, the students will be able to:

- CO1: Formulate the engineering problems into mathematical format with the use of differential equations and differential
- CO2: Use the differentiation and Integration in solving various Mathematical and Engineering problems.
- CO3: Calculate the approximate area under a curve by applying integration and numerical methods.
- CO4: Understand the purposes of measures of central tendency and calculate the measures of central tendency (mode, median, mean) for a set of data.
- CO5: Learn about basic fundamentals about MATLAB/ SciLab and mathematical calculation with MATLAB/ SciLab software.

### DETAILED CONTENTS

#### UNIT I

##### Differential Calculus

- 1.1 Definition of function; Concept of limits (Introduction only) and problems related to four standard limits only.
- 1.2 Differentiation of  $x^n$ ,  $\sin x$ ,  $\cos x$ ,  $e^x$  by first principle.
- 1.3 Differentiation of sum, product and quotient of functions.

**UNIT II****Differential Calculus and Its Applications**

- 2.1 Differentiation of trigonometric functions, inverse trigonometric functions. Logarithmic differentiation, successive differentiation (upto 2nd order)
- 2.2 Application of differential calculus in:
- (a) Rate measures                      (b) Maxima and minima

**UNIT III****Integral Calculus**

- 3.1 Integration as inverse operation of differentiation with simple examples.
- 3.2 Simple standard integrals and related problems, Integration by Substitution method and Integration by parts.
- 3.3 Evaluation of definite integrals with given limits.

$$\text{Evaluation of } \int_0^{\pi/2} \sin^n x \, dx, \quad \int_0^{\pi/2} \cos^n x \, dx, \quad \int_0^{\pi/2} \sin^m x \cos^n x \, dx$$

using formulae without proof (m and n being positive integers only) using pre-existing mathematical models.

**UNIT IV****Application of Integration, Numerical Integration and Differential Equations**

- 4.1 Applications of integration: for evaluation of area under a curve and axes (Simple problems).
- 4.2 Numerical integration by Trapezoidal Rule and Simpson's 1/3<sup>rd</sup> Rule using pre-existing mathematical models.

**Differential Equations**

- 4.3 Definition, order, degree, Type of differential Equations, linearity, Formulation of ordinary differential equation (up to 1<sup>st</sup> order), solution of ODE (1<sup>st</sup> order) by variable separation method.

**UNIT V****Statistics and Software****Statistics**

- 5.1 Measures of Central Tendency: Mean, Median, Mode
- 5.2 Measures of Dispersion: Mean deviation, Standard deviation

**Software**

- 5.3 SciLab software – Theoretical Introduction.

- 5.4 Basic difference between MATLAB and SciLab software,
- 5.5 Calculations with MATLAB or SciLab - (a) Representation of matrix ( $2 \times 2$  order),  
(b) Addition, Subtraction of matrices ( $2 \times 2$  order) in MATLAB or SciLab

### RECOMMENDED BOOKS

1. R. D. Sharma, “Applied Mathematics – I & II for Diploma Courses”, DhanpatRai Publications.
2. “Mathematics for Class XI”, NCERT Publication, New Delhi.
3. “Mathematics for Class XII”, NCERT Publication, New Delhi.
4. H. K Dass, “Applied Mathematics for Polytechnics”, CBS Publishers & Distributers.
5. A Ganesh and G Balasubramanian, “Textbook of Engineering Mathematics –I”, CBS Publisher, New Delhi.
6. A Ganesh and G Balasubramanian, “Textbook of Engineering Mathematics –II”, CBS Publisher, New Delhi.
7. G. B. Thomas, R. L. Finney, “Calculus and Analytic Geometry”, Addison Wesley, Ninth Edition.
8. B S Grewal, “Elementary Engineering Mathematics”, Khanna Publishers, Delhi, Thirty-fifth Edition.
9. R.K. Jain and S.R.K. Iyengar, “Advanced Engineering Mathematics” Narosa Publishing House, New Delhi, Second Edition, 2003.
10. SS Sabharwal & Dr Sunita Jain, “Applied Mathematics Vol. I & II”, Eagle Parkashan, Jalandhar.
11. S Kohli, “Engineering Mathematics Vol. I & II”, IPH, Jalandhar.
12. Reena Garg & Chandrika Prasad, “Advanced Engineering Mathematics”, Khanna Publishing House, New Delhi.
13. R. Pratap, “Getting Started with MATLAB 7”, Oxford University Press, Seventh Edition.
14. E-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

### SUGGESTED WEBSITES

1. <https://www.scilab.org>
2. <http://swayam.gov.in>

## INSTRUCTIONAL STRATEGY

This is theoretical subject and contains five units of 20% equal weightage. Basic elements of Differential Calculus, Integral Calculus, and Differential Equations can be taught in the light of their applications in the field of engineering and technology. By laying more stress on applied part, teachers can also help in providing continuing education base to the students. Students need to be taught the skills needed to use software tools built by experts through multiple problem solving based on the topics that the industry requires. For example they need to know how to use mathematical models that use integration as opposed to learning how integration can be used. Useful authenticated software MATLAB or open source software SciLab can be taught theoretically by books/online literatures and basic operations can be shown practically with practical software laboratory or small mobile apps of these software or authentic Trial version of MATLAB/ SciLab software. Diploma students need to know which tools to use and how to do the job.

## 2.4 CIVIL ENGINEERING PRACTICES

<b>L</b>	<b>P</b>
-	6

### RATIONALE

Diploma holders in Civil Engineering are expected to supervise construction of buildings and irrigation structures. This subject aims at imparting skills for preparing constructional drawing of various components of building and irrigation engineering drawings to develop competencies for reading and interpreting the drawings, and their execution in their field.

### COURSE OUTCOMES

After undergoing the subject, students will be able to:

- CO1: Layout foundation plan of different types of foundations
- CO2: Prepare details of brick courses in joints
- CO3: Explain the drawing to craftsman
- CO4: Draw the drawing of channel (L-section and cross-section)
- CO5: Draw layout plan of a canal head works
- CO6: Read and interpret the Building and Irrigation Engineering Drawings

### DETAILED CONTENTS CUM PRACTICALS

#### BUILDING DRAWING(Part A)

##### Drawing No. 1

Details of spread footing foundations, load bearing and non-load bearing wall for given thickness of walls with the help of given data or rule of the thumb, showing offsets, position of DPC. The details of the concrete and brick apron have to be shown in the drawing.

##### Drawing No. 2

Plans of 'T' and Corner junction of walls of 1 Brick, 1-1/2 Brick and 2 brick thick in English bond.

##### Drawing No. 3

Drawing plan, elevation of arches: circular arch, segmental arch (one sheet)

##### Drawing No. 4

Elevation, sectional plan and sectional side elevation of flush door, glazed door, panelled door with wire gauge shutter.

**Drawing No. 5**

Drawing details of damp proofing arrangement of roofs and walls as per BIS Code. Show the rain water drainage arrangement also.

**Drawing No. 6**

Drawing Damp Proofing details in basement of buildings

**IRRIGATION ENGINEERING DRAWING (Part B)****Drawing No. 7**

Typical cross-section of a channel

- L-section of a channel for given data
- Typical cross section of an unlined and lined channel in cutting, partly cutting, and partly filling and fully in filling with given design data.

**Drawing No. 8**

Layout plan of a canal head works

**Drawing No. 9**

Draw the typical L-section of a weir

**Drawing No. 10**

Draw the X-section of an Earthen Dam

- i) Homogeneous
- ii) Zoned type
- iii) Diaphragm type

**Drawing No. 11**

Cross section of a tube well

**Drawing No. 12**

Layout and cross section of rain water harvesting system.

**RECOMMENDED BOOKS**

1. “Civil Engineering Drawing” by Loyal JS ; SatyaParkashan, New Delhi
2. “ Civil Engineering Drawings” by Chandel RP
3. “ Civil Engineering Drawing by Kumar NS; IPH, New Delhi
4. “Civil Engineering Drawing” by Malik RS and Meo GA ; Asian Publishing House, New Delhi
5. “Civil Engineering Drawing” by S.K. Garg; Khanna Publishers.
6. E-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

## SUGGESTED WEBSITES

1. <http://swayam.gov.in>

## INSTRUCTIONAL STRATEGY

Teachers are expected to develop skills in preparation and interpretation of building construction and irrigation engineering drawings as per BIS codes of practice. Attention must be paid towards line work, specifications writing, dimensioning, proportioning and accuracy for industrial unit at different intervals of time. Reading and interpreting actual field drawings should also be practiced so as to develop necessary competency in the students.

### **Important Note:**

- i) Paper should be set from Part A of 30 marks and Part B of 30 marks



## 2.5 CONSTRUCTION MATERIALS

<b>L</b>	<b>P</b>
<b>2</b>	<b>4</b>

### RATIONALE

Civil Engineering diploma holders have to supervise construction of various types of civil works involving use of various materials like stones, bricks and tiles, cement and cement based products, lime, timber and wood based products, paints and varnishes, metals and other miscellaneous materials. The students should have requisite knowledge regarding characteristics, uses and availability of various building materials and skills in conducting tests to determine suitability of materials for various construction purposes. In addition, specifications of various materials should also be known (PWD/BIS) for effective quality control.

### COURSE OUTCOMES

After undergoing the subject, the students will be able to:

- CO1: Identify different types of rocks, bricks and tiles
- CO2: Perform laboratory tests of cement to determine properties of cement, bricks, tiles.
- CO3: Identify types of defects of timber
- CO4: Select paints/varnishes for various types of surfaces
- CO5: Identify and use different types of metals/alloys
- CO6: Select different materials used for wall paneling and false ceiling, such PVC, POP etc.

### DETAILED CONTENTS

#### UNIT I

##### 1. Building Stones

- 1.1 Sources of Stones
- 1.2 Quarrying of stones by blasting and its effect on environment
- 1.3 Dressing of stones
- 1.4 Requirements of good building stones
- 1.5 Various uses of stones in construction
- 1.6 Artificial Stones: Procedure of making an artificial stone, forms of artificial stones, advantages of artificial stones.

## **2. Bricks**

- 2.1 Introduction to bricks
- 2.2 Raw materials for brick manufacturing and properties of good brick making earth
- 2.3 Manufacturing of bricks
  - 2.3.1 Preparation of clay (Manual and Mechanically)
  - \*\*2.3.2 Moulding: Hand moulding and machine moulding brick table; drying of bricks,
- 2.4 Burning of bricks: Bull's Trench Kiln, Hoffman's Kiln and Zig- Zag Kiln (only line diagram of kilns)
- 2.5 Sun dried bricks, Traditional bricks, Refractory bricks, Fly ash bricks, Hollow bricks,
- 2.6 Size and weight of standard brick
- 2.7 Classification and specifications of bricks as per BIS: 1077
- 2.8 Stacking of bricks and tiles at site

## **UNIT II**

### **3. Tiles**

- 3.1 Brick tiles and their uses
- 3.2 Ceramic tiles and their uses
- 3.3 Vitrified tiles and their uses
- 3.4 PVC Tiles and uses,
- 3.5 Paver blocks, interlocking tiles

### **4. Cement**

- \*\*4.1 Introduction, raw materials, flow diagram of manufacturing of cement
- 4.2 Various types of cements, their uses and testing: Ordinary portland cement, rapid hardening cement, White cement, Portland pozzolana cement
- 4.3 Properties of cement
- 4.4 Storage of Cement at site

## **UNIT III**

### **5. Timber and Wood Based Products**

- 5.1 Identification and uses of different types of timber: Teak, Deodar, Shisham, Sal, Mango, Kail, Chir, Fir, Hollock, Champ
- \*\* 5.2 Seasoning of timber: Purpose, methods of seasoning as per BIS Code
- 5.3 Properties of timber and specifications of structural timber
- 5.4 Preservation of timber and methods of treatment as per BIS
- 5.5 Other wood based products, their brief description of manufacture and uses: Laminated Board, Block Board, Fibre Board, Hard board, Sunmica, Plywood, and Veneers

## **6. Paints, Varnishes and Distempers:**

### 6.1 Paints

#### 6.1.1 Purpose and use of paints

#### 6.1.2 Characteristics of an ideal paint

#### 6.1.3 Types of paints: Oil paints, Water paints, Cement paints and Enamel paint\*\*

#### 6.1.4 Covering capacity of paints

### 6.2 Varnishes

#### 6.2.1 Purpose and use of varnishes

#### 6.2.2 Characteristics of an ideal varnish

#### 6.2.3 Types of varnishes

### 6.3 Distemper

#### 6.3.1 Properties of distemper and process of distempering.

## **UNIT IV**

### **7. Metals and Non Metals**

7.1 Ferrous metals: Composition, properties and uses of cast iron, mild steel, HYSD steel, high tension steel as per BIS.

7.2 Commercial forms of ferrous, metals.

7.3 Properties and use of Aluminium

7.4 Properties and use of Stainless Steel.

### **8. Plastics**

8.1 FRP: Introduction, Properties of FRP and Applications of FRP in Building Industry

8.2 PVC wall paneling

8.3 ACP and HPL Sheets

## **UNIT V**

### **9. Miscellaneous Materials**

9.1 Asbestos: Introduction, properties and use of asbestos.

9.2 Types and uses of insulating materials for sound and thermal insulation

9.3 Construction chemicals like water proofing compound, epoxies, polymers

9.4 Water proofing and termite proofing materials – types and uses

9.5 Materials used in interior decoration works like POP, methods of doing POP

9.6 Eco friendly materials for construction of buildings.

NOTE: \*\*A field visit may be planned to explain and show the relevant things

## PRACTICAL EXERCISES

1. To identify the stones used in building works by visual examination
2. To determine the crushing strength of bricks
3. To determine the water absorption of bricks
4. To determine the efflorescence of bricks
5. To conduct a practical for dimensional tolerances of a brick.
6. To perform the following field tests on cement to judge the quality of cement:
7. Date of Packing, Colour, Hand Insertion, Float Test, Smell Test, and Presence of lumps.
8. To identify various types of timbers such as: Teak, Sal, Chir, Shisham, Deodar, Kail&Hollock by visual examination only
9. The students should submit a report work on the construction materials (**at least one per week**) as mentioned below. They will also show the competitive study based upon the **Cost, Brand Name and Sizes** available in the local market.
  - a) Plywood, Veneers, Sunmica
  - b) Paints, Varnishes and Distempers
  - c) Aluminium and Stainless steels
  - d) Water proofing material
  - e) PVC Panels and FRPs
  - f) POP and Asbestos sheets
  - g) Termites, Polymers and Epoxies

## RECOMMENDED BOOKS

- 1) "Engineering Materials" by D Sharma, SK and Mathur GC; S. Chand and Co. Jalandhar
- 2) "Engineering Materials" by Surendra Singh; Vikas Publishing House Pvt. Ltd. New Delhi
- 3) "Engineering Materials" by Bahl, SK; , Rainbow Book Co., Delhi
- 4) "Civil Engineering Materials" by TTTI, Chandigarh; Tata McGraw Hill Publication, New Delhi.
- 5) "Engineering Materials" by Shahane; Allied Book Stall, Poona,
- 6) "Engineering materials" by Gurcharan Singh; Standard Publishers Distributors, Delhi..
- 7) "Construction Materials" by SC Rangawala; Charoter Publishers
- 8) "Construction Materials" by Alam Singh
- 9) "Lab Manual in Testing of Engineering Materials" by Dr. HemantSood; New Age International (P) Ltd., New Delhi
- 10) Handbook of Civil Engineering by PN Khanna.
- 11) e-books/e-tools/relevant software to be used as recommended by AICTE/HSBTE/NITTTR.

**SUGGESTED WEBSITES**

1. <http://swayam.gov.in>

**INSTRUCTIONAL STRATEGY**

Teachers are expected to physically show various materials while imparting instructions. Field-visits should also be organized to show manufacturing processes and use of various materials in Civil engineering works. Students should be encouraged to collect sample of various building materials so as to create a museum of materials in the polytechnic. This subject contains five units of equal weightage.

## 2.6 APPLIED MECHANICS

<b>L</b>	<b>P</b>
<b>3</b>	<b>2</b>

### RATIONALE

This course Applied Mechanics deals with basic concepts of mechanics like laws of forces, moments, friction, centre of gravity, laws of motion and simple machines which are required by the students for further understanding of other allied subjects. The subject enhances the analytical ability of the students.

### COURSE OUTCOMES

After undergoing this subject, the students will be able to:

CO1: Draw free body diagrams by analyzing different types of forces acting on a body.

CO2: Determine the resultant of coplanar concurrent forces.

CO3: Solve problems by using principle of moment.

CO4: Calculate the least force required to maintain equilibrium on an inclined plane.

CO5: Determine the centroid/centre of gravity of plain and composite lamina and solid bodies.

CO6: Determine velocity ratio, mechanical advantage and efficiency of simple machines.

### DETAILED CONTENTS

#### UNIT 1

##### 1. Introduction

Concept of mechanics, Classification of mechanics, utility of mechanics in engineering field, Concept of rigid body, scalar and vector quantities.

##### 2. 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, Free body diagram, Composition and resolution of coplanar concurrent forces, resultant force, method of composition of forces, laws of forces, parallelogram law of forces (with derivation), triangle law of forces, polygon law of forces - graphically, analytically, resolution of forces, resolving a force into two rectangular components, Lami's theorem, Simple numericals, Equilibrium of forces and its determination.

**UNIT II****3. Moment**

Concept of moment, Moment of a force and units of moment, Varignon's theorem (definition only), Principle of moment and its applications (Levers – simple and compound, steel yard, safety valve), Simple numericals. Parallel forces (like and unlike parallel force), 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 III****4. 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 and subjected to a force acting at some angle with the inclined plane, Simple numericals.

**UNIT IV****5. Centre of Gravity and Centroid**

Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies. Axis of symmetry, Reference axis. Determination of centroid of plain and composite lamina (T, L, C and I shape) using moment method only, centroid of bodies with removed portion. Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed.

**6. Laws of Motion**

Newton's laws of motion and their applications, Concept of momentum. Derivation of force equation from second law of motion, numerical problems on second law of motion. Bodies tied with string, Newton's third law of motion, numerical problems, conservation of momentum, impulse and impulsive force.

**UNIT V****7. Simple Machines**

Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines, Simple and compound machine (Examples). Definition of ideal machine, reversible and self-locking machine. Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency, Simple numerical.

System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency. Working principle and application of wheel and axle, Weston's Differential Pulley Block, simple screw jack, worm and worm wheel, single and double winch crab. Expression for their velocity ratio and field of their application.

### **PRACTICAL EXERCISES**

1. Verification of polygon law of forces using universal force table/Gravesend apparatus.
2. Verification of Lami's theorem.
3. To verify law of moments by using Bell crank lever.
4. To verify the forces in different members of jib crane.
5. To determine coefficient of friction between three pairs of given surface.
6. To find out center of gravity of regular lamina.
7. To find out center of gravity of irregular lamina.
8. To find the mechanical advantage, velocity ratio and efficiency of a screw jack.
9. To find the mechanical advantage, velocity ratio and efficiency of worm and worm wheel.
10. To find mechanical advantage, velocity ratio and efficiency of single purchase crab.

### **RECOMMENDED BOOKS**

1. Birinder Singh, "Text Book of Applied Mechanics", Katson Publishing House, New Delhi.
2. A. K. Upadhyay, "Text Book of Applied Mechanics", SK Kataria & Sons, New Delhi.
3. S. Ramamurtham, "A Text Book of Applied Mechanics", Dhanpat Rai Publishing Company Pvt. Ltd, Delhi.
4. R. S. Khurmi, "A Text Book of Engineering Mechanics (Applied Mechanics)", S Chand and Co. Ltd., New Delhi.
5. R. K. Rajput, "A Text Book of Applied Mechanics", Laxmi Publications, New Delhi.
6. D. S. Bedi, "Engineering Mechanics", Khanna Publishing House, New Delhi.

### **INSTRUCTIONAL STRATEGY**

This is hands-on practice based subject and topics taught in the class should be practiced in the lab regularly for development of required skills in the students. This subject contains five units of equal weightage.



## 2.7 ENVIRONMENTAL STUDIES AND DISASTER MANAGEMENT

<b>L</b>	<b>P</b>
<b>2</b>	<b>-</b>

### RATIONALE

A diploma holder must have knowledge of different types of pollution caused due to industrial and construction activities so that he/she may help in balancing the ecosystem and controlling pollution by various control measures. The course is intended to provide a general concept in the dimensions of environmental pollution and disasters caused by nature beyond the human control as well as the disasters and environmental hazards induced by human activities with emphasis on disaster preparedness, response and recovery.

### COURSE OUTCOMES

After undergoing the subject, the student will be able to:

- CO1: Comprehend the importance of sustainable ecosystem
- CO2: Demonstrate interdisciplinary nature of environmental issues
- CO3: Implement corrective measures for the abatement of pollution.
- CO4: Identify the role of non-conventional energy resources in environmental protection.
- CO5: Manage various types of disasters

### DETAILED CONTENTS

#### UNIT I

##### Introduction

- 1.1 Basics of ecology, eco system- concept, and sustainable development, Sources, advantages, disadvantages of renewable and nonrenewable energy.
- 1.2 Rain water harvesting
- 1.3 Deforestation – its effects & control measures

#### UNIT II

##### Air and Noise Pollution

- 2.1 Air Pollution: Source of air pollution. Effect of air pollution on human health, economy, Air pollution control methods.

2.2 Noise Pollution: Source of noise pollution, Unit of noise, Effect of noise pollution, Acceptable noise level, Different method of minimizing noise pollution.

### **UNIT III**

#### **Water and Soil Pollution**

- 3.1 Water Pollution: Impurities in water, Cause of water pollution, Source of water pollution. Effect of water pollution on human health, Concept of DO, BOD, COD. Prevention of water pollution- Water treatment processes, Sewage treatment. Water quality standard.
- 3.2 Soil Pollution :Sources of soil pollution, Effects and Control of soil pollution, Types of Solid waste- House hold, Industrial, Agricultural, Biomedical, Disposal of solid waste, Solid waste management E-waste, E – waste management

### **UNIT IV**

#### **Impact of Energy Usage on Environment**

Global Warming, Green House Effect, Depletion of Ozone Layer, Acid Rain. Eco-friendly Material, Recycling of Material, Concept of Green Buildings, Concept of Carbon Credit & Carbon footprint.

### **UNIT V**

#### **Disaster Management**

##### **A. Different Types of Disaster:**

Natural Disaster: such as Flood, Cyclone, Earthquakes and Landslides etc.

Man-made Disaster: such as Fire, Industrial Pollution, Nuclear Disaster, Biological Disasters, Accidents (Air, Sea Rail & Road), Structural failures(Building and Bridge), War & Terrorism etc.

##### **B. Disaster Preparedness:**

Disaster Preparedness Plan

Prediction, Early Warnings and Safety Measures of Disaster

Psychological response and Management (Trauma, Stress, Rumour and Panic)

### **RECOMMENDED BOOKS**

1. Environmental Studies by S.C. Sharma & M.P. Poonia, Khanna Publishing House, New Delhi
2. Environmental and Pollution Awareness by Sharma BR; SatyaPrakashan, New Delhi.
3. Environmental Pollution by Dr. RK Khitoliya; S Chand Publishing, New Delhi

4. Environmental Studies by ErachBharucha; University Press (India) Private Ltd., Hyderabad.
5. Environmental Engineering and Management by Suresh K Dhamija; S K Katariaand Sons, New Delhi.
6. E-books/e-tools/relevant software to be used as recommended by AICTE/BTE/NITTTR, Chandigarh.
7. Disaster Management by Dr. Mrinalini Pandey, Wiley India Pvt. Ltd.
8. Disaster Science and Management by Tushar Bhattacharya, McGraw Hill Education (India) Pvt. Ltd.

### **INSTRUCTIONAL STRATEGY**

In addition to theoretical instructions, different activities pertaining to Environmental Studies and Disaster Management like expert lectures, seminars, visits etc. may also be organized This subject contains five units of equal weightage.