

**BS-212 \*APPLIED MATHEMATICS-II**

|          |   |   |   |
|----------|---|---|---|
|          | L | T | P |
| Pds/Week | 4 | 2 | - |

**RATIONALE**

The course aims at developing analytical abilities in basics of applied mathematics such as: differential and integral calculus and solution of first order differential equations. Besides applications of the above elements in engineering, the course of study will also provide continuing education base to them.

**NOTE:** Weightage of each topic for external examination is given in the brackets

1. **DIFFERENTIAL CALCULAS.** (40%)

Functions, concept of evaluation of following limits.

$$\text{Limit}_{x \rightarrow 0} \frac{\sin x}{x}, \quad \text{Limit}_{x \rightarrow a} \frac{x^n - a^n}{x - a},$$

$$\text{Limit}_{x \rightarrow 0} \frac{(1+x)^x}{x}, \quad \text{Limit}_{x \rightarrow a} \frac{a^x - 1}{x},$$

- (i) Differential coefficient. Its physical application. As rate measure, Geometric interpretation as slope of a curve. Differentiation from first prim of functions like  $x^n$ ,  $a^x$ ,  $\log x$ ,  $\sin x$ ,  $\cos x$  and  $\tan x$ . Differentiation of sum, product and quotient of functions.
- (ii) Differentiation of Trigonometric and inverse Trigonometric functions. Differentiation of function of a function, Implicit functions, parametric functions, Logarithmic differentiation.
- (iii) Application of differentiation in finding errors, Tangent and normal of curves. Maxima of functions.

3. **INTEGRAL CALCULAS.** (35%)

- (i) Integration as inverse operation of differentiation. Integral of standard functions. Integration by substitution, by parts and by partial fractions.
- (ii) Evaluation of integral of rational and irrational functions of the form.
 
$$\frac{dx}{ax^2 + bx + c} \quad \frac{dx}{ax^2 + bx + c}$$
- (iii) Simple definite integrals and properties. Evaluation of  $\int_0^{\pi/2} \sin^n x \, dx$ ,  $\int_0^{\pi/2} \cos^n x \, dx$ ,
- (iv) Applications of integration to finding area under a curve and axes, volume of solid of revolution of area about axes (simple problems). Mean value and R.M.S. value of a function.
- (v) Numerical integrations. Approximate evaluation of definite integral by Trapezoidal rule and by Simpson's rule (without proof).

4. **PARTIAL DIFFERENTIATION.** (10%)

- (i) First order and second order partial derivatives of functions of two variables.
- (ii) Newton's forward and backward interpolation.

5. **SOLUTION OF ORDINARY DIFFERENTIAL EQUATIONS.** (15%)

- (i) Order and degree of a differential equation. Solving first order first degree differential equation – variable separable form, Homogeneous form and linear differential equation.

## 2.6 ENGINEERING DRAWING – II

L T P  
2 - 6

### RATIONALE

Drawing is said to be the language of engineers and technicians. Reading and interpreting engineering drawing is their day-to-day responsibility. The course is aimed at developing basic graphic skills so as to enable them to use these skills in preparation of engineering drawings, their reading and interpretation SP 46 – 1988 should be followed

- Note:
1. First angle projection is to be followed
  2. Instructions relevant to various drawings may be given along with appropriate demonstration, before assigning drawing practice to the students

### DETAILED CONTENTS

1. Detail and Assembly Drawing (2 sheets)
  - 1.1 Principle and utility of detail and assembly drawings
  - 1.2 Wooden joints i.e. corner mortice and tenon joint, Tee halving joint, Mitre faced corner joint, Tee bridle joint, Crossed wooden joint, Cogged joint, Dovetail joint, Through Mortice and Tenon joint, furniture drawing - freehand and with the help of drawing instruments.
2. Screw threads and threaded fasteners (8 sheets)
  - 2.1 Thread Terms and Nomenclature
    - 2.1.1 Types of threads-External and Internal threads, Right and Left hand threads (Actual and Conventional representation), single and multiple start threads.
    - 2.1.2 Different Forms of screw threads-V threads (B.S.W threads, B.A thread, American National and Metric thread), Square threads (square, Acme, Buttress and Knuckle thread)
  - 2.2 Nuts and Bolts
    - 2.2.1 Different views of hexagonal and square nuts and hexagonal headed bolt
    - 2.2.2 Assembly of Hexagonal headed bolt and Hexagonal nut with washer.
    - 2.2.3 Assembly of square headed bolt with hexagonal and with washer.
  - 2.3 Locking Devices
    - 2.3.1 Different types of locking devices-Lock nut, castle nut, split pin nut, locking plate, slotted nut and spring washer.
    - 2.3.2 Foundations bolts-Rag bolt, Lewis bolt, curved bolt and eye bolt.

- 2.4 Drawing of various types of machine screw, set screw, studs and washers
3. Keys and Cotters (3 sheets)
- 3.1 Various types of keys and cotters and their practical application and preparation of drawing of various keys and cotters showing keys and cotters in position
- 3.2 Various types of joints (3 sheets)
- Spigot and socket joint
  - Gib and cotter joint
  - Knuckle joint
4. Rivets and Riveted Joints (4 sheets)
- 4.1 Types of general purpose-rivets heads (4 Sheets)
- 4.2 Caulking and fullering of riveted joints
- 4.3 Types of riveted joints
- (i) Lap joint-Single riveted, double riveted (chain and zig-zag type)
  - (ii) Single riveted, Single cover plate butt joint (chain type)
  - (iii) Single riveted, double cover plate butt joint (chain type)
  - (iv) Double riveted, double cover plate butt joint(chain and zig-zag type)
5. Couplings (2 sheets)
- 5.1 Flange coupling (Protected and non-protected), muff coupling and half-lap muff coupling
6. Symbols and Conventions (2 sheets)
- 6.1 Civil engineering sanitary fitting symbols
- 6.2 Electrical fitting symbols for domestic interior installations
7. AUTO CAD (for practical and viva-voce only)
- 7.1 Concept of AutoCAD, Tool bars in AutoCAD, coordinate system, snap, grid, and ortho mode
- 7.2 Drawing commands – point, line, arc, circle, ellipse
- 7.3 Editing commands – scale, erase, copy, stretch, lengthen and explode

**Note:** Minimum 20 drawing sheets will be prepared by the students.

## RATIONALE

Information technology has great influence on all aspects of our life. Primary purpose of using computer is to make the life easier. Almost all work places and living environment are being computerized. The subject introduces the fundamentals of computer system for using various hardware and software components. 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 concept of information technology and its scope; operating a computer; use of various tools of MS Office/Open Office and internet form the broad competency profile of diploma holders. This exposure will enable the students to enter their professions with confidence, live in a harmonious way and contribute to the productivity.

### Note:

Explanation of Introductory part should be dovetailed with practical work. Following topics may be explained in the laboratory along with the practical exercises. There will not be any theory examination.

## TOPICS TO BE EXPLAINED THROUGH DEMONSTRATION

1. Information Technology – its concept and scope, applications of IT, ethics and future with information technology
2. Impact of computer and IT in society.-- Computer application in office, book publishing, data analysis, accounting, investment, inventory control, graphics, air and railway ticket reservation, robotics, military, banks, Insurance financial transactions and many more
3. Generations of computer, block diagram of a computer, CPU, memory, data – numeric data, alpha numeric data, processing of data.
4. Computers for information storage, information seeking, information processing and information transmission, computer organization, computer hardware and software; primary and secondary memory: RAM, ROM, PROM etc. Input devices; keyboard, mouse, scanner, etc ; output devices ; VDU and Printer(Impact and non-Impact printers), Plotter etc. Primary and Secondary Storage (Auxiliary Storage), Secondary storage; magnetic disks – tracks and sectors, optical disk (CD, CD-RW and DVD Memory)
5. Introduction to Operating Systems such as MS-DOS and Windows, difference between DOS and Windows
6. Basics of Networking – LAN, MAN, WAN

## LIST OF PRACTICALS

1. Identify and list functions of various components and peripherals of given computer.
2. Installation of operating system viz. \* Windows XP, \*Windows 2007 etc.
3. Installing a computer system by giving connection and loading the system software and application software and various sources to install software
4. Exercises on entering text and data (Typing Practice)

5. Features of Windows as an operating system:
- a) Start , shutdown and restore
  - b) Creating and operating on the icons
  - c) Opening, closing and resizing the windows
  - d) Using elementary job commands like – creating, saving, modifying, renaming, finding and deleting a file , creating and operating on a folder
  - e) Introduction to all properties such as changing settings like, date, time, calculator, colour (back ground and fore ground)
  - f) Using short cuts

6. **Word Processing (MS Office/Open Office)**

a) File Management:

Opening, creating and saving a document, locating files, copying contents in some different file(s)

b) Editing a document:

- Entering text, cut, copy, paste using toolbars
- Use of spell check
- PDF file and its conversion in different file formats (MS Word/Excel etc.)
- Scanning, editing and printing of a document

c) Formatting a document:

- Using different fonts, changing font size and colour, changing the appearance through bold/ italic/ underlined, highlighting a text, changing case, using subscript and superscript, using different underline methods
- Aligning of text in a document, justification of document ,Inserting bullets and numbering
- Formatting paragraph, inserting page breaks and column breaks, line spacing
- Use of headers, footers, inserting footnote, end note, use of comments
- Inserting date, time, special symbols, importing graphic images, drawing tools

d) Tables and Borders:

- Creating a table, formatting cells, use of different border styles, shading in tables, merging of cells, partition of cells, inserting and deleting a row in a table
- How to change docx file to doc file
- Print preview, zoom, page set up, printing options
- Using Find, Replace options

7. **Spread Sheet Processing (MS Office/Open Office)**

a) Starting Excel

open worksheet, enter, edit data, formulae to calculate values, format data, create chart, printing chart, save worksheet, switching between different spread sheets

b) Menu commands:

Create, format charts, organize, manage data, solving problem by analyzing data, creating graphs

c) Work books:

- Managing workbooks (create, open, close, save, rename), working in work books
- Editing a worksheet: copying, moving cells, pasting, inserting, deleting cells, rows, columns, find and replace text, numbers of cells, formatting worksheet

d) Creating a chart:

- Working with chart types, changing data in chart, formatting a chart, use chart to analyze data
- Using a list to organize data, sorting and filtering data in list

e) Formulas:

Addition, subtraction, division, multiplication, percentage and auto sum

8. **Power Point Presentation (MS Office/Open Office)**

a) Introduction to PowerPoint

- How to start PowerPoint
- Working environment: concept of toolbars, slide layout, templates etc.
- Opening a new/existing presentation
- Different views for viewing slides in a presentation: normal, slide sorter etc.

b) Addition, deletion and saving of slides

c) Insertion of multimedia elements

- Adding text boxes, importing pictures, tables and charts etc.

d) Formatting slides

- Text formatting, changing slide layout, changing slide colour scheme
- Changing background, Applying design template

e) How to view the slide show?

- Viewing the presentation using slide navigator, Slide transition
- Animation effects etc.

9. **Antivirus**

a) What is virus and its types

b) Problems due to virus

c) Installation and updation of antivirus (anyone out of Kaspersky, McAfee, Norton, Quickheal etc).

d) How to scan and remove the virus

10. **Internet and its Applications**

a) Log-in to internet, introduction to search engine

Browsing and down loading of information from internet

- b) **Creating e-Mail Account**
  - Log in to e-mail account and Log out from e-mail account
- c) **Managing e-Mail**
  - Creating a message
  - Sending, receiving and forwarding a message
  - Attaching a file
  - Deleting a message

## **INSTRUCTIONAL STRATEGY**

Since this subject is practical oriented, the teacher should demonstrate the capabilities of computers to students while doing practical exercises. The students should be made familiar with computer parts, peripherals etc. and proficient in making use of MS Office/Open Office in addition to working on internet. The student should be made capable of working on computers independently. This subject should be taught with the help of LCD projector, (while teaching a group) using PowerPoint presentation slides.

## **RECOMMENDED BOOKS**

1. **Fundamentals of Computer** by E Balagurusamy, Tata McGraw Hill Education Pvt. Ltd, New Delhi
2. **Fundamentals of Computer** by V Rajaraman; Prentice Hall of India Pvt. Ltd., New Delhi
3. **Fundamentals of Computer** by Sumita Arora by Dhanpat Rai and Co , New Delhi
4. **Computers Today** by SK Basandara, Galgotia Publication Pvt Ltd. Daryaganj, New Delhi.
5. **Internet for Every One** by Alexis Leon and Mathews Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
6. **A First Course in Computer** by Sanjay Saxena; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
7. **Computer Fundamentals** by PK Sinha; BPB Publication, New Delhi
8. **Fundamentals of Information Technology** by Leon and Leon; Vikas Publishing House Pvt. Ltd., Jungpura, New Delhi
9. **Information Technology for Management** by Henery Lucas; Tata McGraw Hill Education Pvt Ltd , New Delhi
10. **MS Office** by BPB Publications, New Delhi

## ES-120 \*APPLIED MECHANICS

|          | L | T | P |
|----------|---|---|---|
| Pds/week | 4 | 2 | 2 |

### RATIONALE

The subject 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 to the students for further understanding of other applied subjects. Hence this course.

**NOTE:** Weightage of each topic for external examination is given in the brackets

### DETAILED CONTENTS

#### 1. Introduction

(5%)

Concept of mechanics and applied mechanics – Explanation of mechanics and applied Mechanics, its importance and necessity, giving suitable examples on bodies at rest and in motion, explanation of branches of this subject.

#### 2. Laws of Forces

(15%)

Force and its effects. Units and measurement of force. Characteristics of force vector representation. Bow's notation. Types of forces, action and reaction, tension & thrust. Force systems: Coplanar and space force systems. Coplanar, concurrent and non-concurrent forces. Free body diagrams. Resultant and components of forces, concept of equilibrium; parallelogram law of forces. Equilibrium of two forces, super-position and transmissibility of forces, Newton's third law, triangle law of forces, different cases of concurrent coplanar, two forces systems, extension of parallelogram law and triangle law to many forces acting at one point-polygon law of forces, method of resolution into orthogonal components for finding the resultant, graphical methods, special case of three concurrent, coplanar forces, Lami's theorem.

#### 3. Moments

(15%)

Concept of moment, Varignon's theorem – statement only. Principle of moments – application of moments to simple mechanism. Parallel forces, like and unlike parallel forces, calculation of their resultant, concept of couple, moving a force parallel to its line of action, general cases of coplanar force system, general conditions of equilibrium of bodies under coplanar parallel forces.

#### 3. Friction

(10%)

Concept of friction, laws of friction, limiting friction and coefficient of friction, sliding friction and rolling friction, inclined plane.

#### 5. Centre of Gravity and Centroid

(15%)

Concept of gravity, gravitational force, centroid and centre of gravity. Centroid for regular lamina and center of gravity for regular solids. Position of centre of gravity of compound bodies and centroid of composite area. CG of bodies and areas with portions removed.

#### 6. Moment of Inertia of Plane Areas

(15%)

Concept of Moment of Inertia and second moment of area and Radius of gyration, theorems of parallel and perpendicular axes, second moment of area of common geometrical sections: rectangle, triangle, circle (without derivations). Second moment of area for L, T and I sections. Section modulus without derivation.

#### 7. Laws of Motion

(15%)

Concept of momentum, Newton's laws of motion, their application, derivation of force equation from second law of motion, numerical problems on second law of motion, piles, lifts, bodies tied with string, Newton's third law of motion numerical problems, conservation of momentum, impulse and impulsive force (definition only). (10%)

8. **Simple Lifting Machines**

Concept of machine, mechanical advantage, velocity ratio and efficiency of a machine, their relationship, law of machine, simple machines (lever, wheel and axle, pulleys, jacks winch crabs only).

**LIST OF PRACTICALS**

1. Verification of the laws of polygon of forces.
  2. To verify the forces in the different members of a jib crane.
  3. To verify the reaction at the supports of a simply supported beam.
  4. To find the mechanical advantage, velocity ratio and efficiency in the case of inclined planes
  5. To find the mechanical advantage, velocity ratio and efficiency in the case of Screw Jack
  6. To find the mechanical advantage, velocity ratio and efficiency in the case of worm and worm wheel
  7. To find the mechanical advantage, velocity ratio and efficiency in the case of single winch Crab.
  8. To find out centre of gravity of regular and irregular laminas.
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## RATIONALE

Applied Chemistry has been considered as one of the core subject for diploma holders in engineering and technology to develop in them scientific temper, appreciation of chemical properties of materials and to develop learning to learn skills in the students. This course will deal with metallurgy, corrosion, and fuels. This will equip them to perform various activities effectively. Hence the course.

NOTE: Weightage of each topic for external examination is given in the brackets

## DETAILED CONTENTS

1. **Structure of Atom** (10%)  
Rutherford model of the structure of atom, Boher's theory of H atom and equation deduced. Quantum numbers and their significance, De-Broglie equation and uncertainty principle. Electronic configuration of 1 to 30 elements, effect of temperature on conductivity of germanium and silicon.
2. **Periodic Properties of Elements** (10%)  
Periodic law, periodic table, periodicity in properties like atomic radii and volume, ionic radii, ionization energy and electron affinity. Division of elements into s.p.d. and f block.
3. **Chemical Bonds** (10%)  
Electrovalent, covalent and coordinate bond and their properties. Metallic bonding (electron cloud model) and properties (like texture, conductance, lusture, ductility and malleability). Orbital concept of covalence, hybridization (simple treatment).
4. **Fuel and their Classification** (12%)  
Definition, characteristics, Classification, into solid, liquid and gaseous fuel, Petroleum and brief idea of its refining into various fraction and their characteristics and uses.
5. **Water** (12%)  
Impurities in water, method of their removal, hardness of water, its types, causes and removal, Disadvantage of Hard water in boilers pH value and its determination by calorimetric method.
6. **Metals** (12%)  
Cast iron and its properties, effect of sulphur, silicon and phosphorous as impurities in cast iron. Elementary knowledge of heat treatment of steels-hardening, tempering, annealing, normalizing and case hardening.
7. **Alloys** (12%)  
Definition, classification and necessity for making alloys. Composition, properties and uses of following alloys: Brass, Bronze, Gun-metal and Duralumin. Effect of carbon, nickel, chromium, manganese on steel.
8. **Corrosion** (12%)  
Its meaning, theory of corrosion, prevention of corrosion by various methods using metallic and non-metallic coatings.
9. **Plastics and Polymers** (10%)

Plastics-thermo-plastic and thermo setting. Introduction of Polythene. P.V.C., Nylon, synthetic rubber and phenol-formaldehyde resin. Their application in industry.

### ***LIST OF PRACTICALS***

1. To find the strength in grams per litre of the given solution of sodium hydroxide with the help of standard oxalic acid solution.
  2. Find the strength in grams per litre of given sodium hydroxide solution with the help of standard sodium-carbonate solution and intermediate solution of an acid.
  3. Determine the total alkalinity in ppm in the given sample of water using standard sulphuric acid.
  4. To find the amount of chloride ions present in water using silver nitrate solution (potassium chromate as indicator)
  5. Determine the type of alkalinity in ppm present in a given sample of H<sub>2</sub>O using standard sulphuric acid.
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## RATIONALE

Psychomotor skills are mastered through practice, an opportunity therefore, has been extended to students through this course to refine their skills in different trades. The basic skills developed during first semester will be refined during this course by doing higher order skills jobs. In addition to developing general manual and machining skills in the students, the objective of development of sense of dignity of labour, precision, safety at work places, team working and right attitude among the students will also be met.

## DETAILED CONTENTS (PRACTICAL EXERCISES)

**Note:** The students are supposed to come in proper workshop dress prescribed by the institute. Wearing shoes in the workshop(s) is compulsory. Importance of safety and cleanliness, safety measures and upkeep of tools, equipment and environment in each of the following shops should be explained and practiced. The students should prepare sketches of various tools/jobs in their practical Notebook.

The following shops are included in the syllabus.

1. Carpentry Shop-II
2. Plumbing Shop
3. Welding Shop -II
4. Painting Shop - II
5. Fitting Shop -II

### 1. Carpentry Shop-II

- 1.1 Introduction to joints, their relative advantages and uses.  
Job I Preparation of dovetail joint and glued joint.  
Job II Preparation of mitre joint  
Job III Preparation of a lengthening Joint
- 1.2 Demonstration of job showing use of rip saw, bow saw and tenon saw, method of sharpening various saws.
- 1.3 Demonstration of job on band saw and circular saw, chain and chisel, universal wood working machine, Saw re-sharpening machine, saw brazing unit.
- 1.4 Importance and need of polishing wooden items. Introduction to polishing materials.  
Job V Polishing on wooden items.

### 2. Plumbing Shop

- 2.1 Introduction to various types of threads (internal and external)-single start, multi-start, left hand and right hand threads.
- 2.2 Description and demonstration of various types of drills, taps and dies Selection of dies for threading, selection of drills, taps and reamers for tapping operations.  
Job I Making internal and external threads on a job by tapping and dieing operations (manually)



### 3. **Welding Shop – II**

- 3.1 Introduction to gas welding, spot welding and seam welding and welding techniques. Adjustments of different types of flames in gas welding. demonstration and precautions about handling welding equipments.
- Job I Practice in handling gas welding equipments (Low pressure and High pressure) and welding and tacking practice on simple jobs.
- 3.2 Common welding joints generally made by gas welding.
- Job II Preparation of butt joint by gas welding.
- Job III Exercise of preparing a job on spot/seam welding machine.

### 4. **Painting Shop - II**

- 4.1 Introduction to painting shop and its necessity. Different types of paints. Introduction of powder coating plant and spray painting with their uses.
- Job I Preparation of surface before painting such as cleaning, sanding, applying putty, filling procedure and application of primer coat and painting steel item.
- Job II Painting practice by brush on MS sheet
- Job III Practice of dip painting
- Job IV Practice of lettering: name plates / sign board
- Job V Polishing and painting on wooden and metallic surfaces
- 4.2 Demonstration of powder coating

### 5. **Fitting Shop –II**

- 5.1 Introduction to various types of drilling machines, work & tool holding devices of drilling machines.
- 5.2 Care, maintenance & handling of various types of drilling machines. Precautions while performing drilling operation.
- Job I Drilling practice on ferrous metal e.g. mild steel etc.
- 5.3 Precautions while drilling soft metals, e.g. copper, brass, aluminium etc.
- Job II Drilling practice on soft metals such as aluminum, brass and copper
- Job III Preparation of a job by filing on non-ferrous metal up to an accuracy of  $\pm 0.2\text{mm}$

### **RECOMMENDED BOOKS**

1. Workshop Technology I,II,III, by S K Hajra, Choudhary and A K Choudhary: Media Promoters and Publishers Pvt. Ltd., Bombay
2. Workshop Technology by Manchanda Vol. I,II,III; India Publishing House, Jalandhar.
3. Manual on Workshop Practice by K Venkata Reddy: MacMillan India Ltd. New Delhi
4. Basic Workshop Practice Manual by T Jeyapoovan; Vikas Publishing House (P) Ltd., New Delhi
5. Workshop Technoogy by B.S. Raghuwanshi; Dhanpat Rai and Co., New Delhi
6. Workshop Technology by HS Bawa; Tata McGraw Hill Publishers, New Delhi

