3.1 COMPUTER AIDED DRAFTING

L	T	P
-	-	7

RATIONALE

The students of diploma programme must have the competency in preparing the drawings with the help of CAD which will be useful while working in the industry.

DETAILED CONTENTS

PRACTICAL EXERCISES

1. Introduction to AutoCAD commands (6 drawing sheets)

    1.1 Concept of AutoCAD, Tool bars in Auto CAD, coordinate system, snap, grid, and ortho mode (Absolute, Relative and Polar)
    1.2 Drawing commands – point, line, arc, circle, ellipse,
    1.3 Editing commands – scale, erase, copy, stretch, lengthen and explode.
    1.4 Dimensioning and placing text in drawing area
    1.5 Sectioning and hatching
    1.6 Inquiry for different parameters of drawing entity

2. Detail and assembly drawing of the following using AUTOCAD (4 sheets)

    2.1 Plummer Block
    2.2 Wall Bracket
    2.3 Stepped pulley, V-belt pulley
    2.4 Flanged coupling
    2.5 Machine tool Holder (Three views)
    2.6 Screw jack or knuckle joint

3. Isometric Drawing by CAD using Auto CAD (one sheet)

    Drawings of following on computer:
    - Cone
    - Cylinder
    - Isometric view of objects

4. Modelling (01 sheet)

    3D modelling, Transformations, scaling, rotation, translation

5. Introduction to other CAD softwares;

    (Pro Engineer/CATIA / Inventor/Unigraphics/Solid Work: Salient features, simple drawing of components (2 D and 3D)(At least one software)

INSTRUCTIONAL STRATEGY

1. Teachers should show model or realia of the component/part whose drawing is to be made.

2. Emphasis should be given on cleanliness, dimensioning, & layout of sheet.

3. Teachers should ensure use of IS codes related to drawing.

RECOMMENDED BOOKS

1. Engineering Drawing with AutoCAD 2000 by T. Jeyapooran; Vikas Publishing House, Delhi.
2. AutoCAD for Engineering Drawing Made Easy by P. Nageswara Rao; Tata McGraw Hill, New Delhi.
3. AutoCAD 2000 for you by Umesh Shettigar and Abdul Khader; Janatha Publishers, Udupi.
4. Auto CAD 2000 by Ajit Singh, TMH, New Delhi.
5. Designing with Pro Engineer, Sham Tickoo by Dream Tech Publications, New Delhi.
6. Designing with CATIA, by Sham Tickoo, Dream Tech. Publications, New Delhi.

3.2 APPLIED MECHANICS

L	T	P
3	-	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 by the students for further understanding of other allied subjects. The subject enhances the analytical ability of the students.

DETAILED CONTENTS

1. Introduction (04hrs)

   1.1 Concept of engineering mechanics definition of mechanics, statics, dynamics, application of engineering mechanics in practical fields. Definition of Applied Mechanics.

   1.2 Definition, basic quantities and derived quantities of basic units and derived units

   1.3 Different systems of units (FPS, CGS, MKS and SI) and their conversion from one to another for density, force, pressure, work, power, velocity, acceleration

   1.4 Concept of rigid body, scalar and vector quantities

2. Laws of forces (9 hrs)

   2.1 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

   2.2 Different force systems (coplanar and non-coplanar), principle of transmissibility of forces, law of super-position

   2.3 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

   2.4 Free body diagram

   2.5 Equilibrant force and its determination

   2.6 Lami's theorem (concept only)

   [Simple problems on above topics]

3. Moment (9 hrs)

3.1 Concept of moment

3.2 Moment of a force and units of moment

3.3 Varignon's theorem (definition only)

3.4 Principle of moment and its applications (Levers – simple and compound, steel yard, safety valve, reaction at support)

3.5 Parallel forces (like and unlike parallel force), calculating their resultant

3.6 Concept of couple, its properties and effects

3.7 General conditions of equilibrium of bodies under coplanar forces

3.8 Position of resultant force by moment

[Simple problems on the above topics]

4. Friction (9 hrs)

4.1 Definition and concept of friction, types of friction, force of friction

4.2 Laws of static friction, coefficient of friction, angle of friction, angle of repose, cone of friction

4.3 Equilibrium of a body lying on a horizontal plane, equilibrium of a body lying on a rough inclined plane.

4.4 Calculation of least force required to maintain equilibrium of a body on a rough inclined plane subjected to a force:

a) Acting along the inclined plane Horizontally
b) At some angle with the inclined plane

5. Centre of Gravity (8 hrs)

5.1 Concept, definition of centroid of plain figures and centre of gravity of symmetrical solid bodies

5.2 Determination of centroid of plain and composite lamina using moment method only, centroid of bodies with removed portion

5.3 Determination of center of gravity of solid bodies - cone, cylinder, hemisphere and sphere; composite bodies and bodies with portion removed

[Simple problems on the above topics]

6. Simple Machines (9 hrs)

6.1. Definition of effort, velocity ratio, mechanical advantage and efficiency of a machine and their relationship, law of machines

6.2. Simple and compound machine (Examples)

6.3. Definition of ideal machine, reversible and self locking machine

6.4. Effort lost in friction, Load lost in friction, determination of maximum mechanical advantage and maximum efficiency

6.5. System of pulleys (first, second, third system of pulleys), determination of velocity ratio, mechanical advantage and efficiency

6.6. 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 [Simple problems on the above topics]

LIST OF PRACTICALS

1. Verification of the polygon law of forces using gravesend apparatus.
2. To verify the forces in different members of 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 case of an inclined plane.
5. To find the mechanical advantage, velocity ratio and efficiency of a screw jack.
6. To find the mechanical advantage, velocity ratio and efficiency of worm and worm wheel.
7. To find mechanical advantage, velocity ratio and efficiency of single purchase crab.
8. To find out center of gravity of regular lamina.
9. To find out center of gravity of irregular lamina.
10. To determine coefficient of friction between three pairs of given surface.

RECOMMENDED BOOKS

1. A Text Book of Applied Mechanics by S Ramamurtham,Dhanpat Rai Publishing Co. Ltd.
2. Applied Mechanics by Col. Harbhajan Singh, TL Singla and Parmod Kumar Singla Published by Abhishek Publication, Chandigarh

3. A Text Book of Engineering Mechanics (Applied Mechanics) by RK Khurmi; S Chand and Co. Ltd., New Delhi.
4. A Text Book of Applied Mechanics by RK Rajput; Laxmi Publications, New Delhi..
5. Text Book of Applied Mechanics by Birinder Singh, Kaption Publishing House, New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	4	8
2	9	20
3	9	20
4	9	18
5	8	16
6	9	18
Total	**48**	**100**

3.3 ELEMENTS OF ELECTRICAL AND ELECTRONICS ENGINEERING

L	T	P
3	-	2

RATIONALE

The objective of this subject is to impart fundamental knowledge and skills regarding basic electrical and electronics engineering, which diploma holders will come across in their professional life. This course will provide the students to understand the basic concepts and principles of d.c. and a.c. fundamentals, electromagnetic induction, batteries, transformers, motors distribution system, domestic installation, electrical safety etc. The students will also learn basic electronics including diodes and transistors and their applications.

DETAILED CONTENTS

1. Application and Advantage of Electricity (03 hrs)

   Difference between ac and dc, various applications of electricity, advantages of electrical energy over other types of energy

2. Basic Electrical Quantities (04 hrs)

   Definition of voltage, current, power and energy with their units, name of instruments used for measuring above quantities, connection of these instruments in an electric circuit

3. AC Fundamentals (04 hrs)

   Electromagnetic induction-Faraday's Laws, Lenz's Law; Fleming's rules, Principles of a.c. Circuits; Alternating emf, Definition of cycle, frequency, amplitude and time period. Instantaneous, average, r.m.s and maximum value of sinusoidal wave; form factor and Peak Factor. Concept of phase and phase difference. Concept of resistance, inductance and capacitance in simple a.c. circuit. Power factor and improvement of power factor by use of capacitors. Concept of three phase system; star and delta connections; voltage and current relationship (no derivation)

4. Transformers (06 hrs)

   Working principle and construction of single phase transformer, transformer ratio, emf equation, losses and efficiency, cooling of transformers, isolation transformer, CVT, auto transformer (brief idea), applications.

5. Distribution System (06 hrs)

Difference between high and low voltage distribution system, identification of three-phase wires, neutral wire and earth wire in a low voltage distribution system. Identification of voltages between phases and between one phase and neutral. Difference between three-phase and single-phase supply

6. Electric Motor (08 hrs)

Description and applications of single-phase and three-phase motors. Connection and starting of three-phase induction motors by star-delta starter. Changing direction of rotation of a given 3 phase induction motor. Motors used for driving pumps, compressors, centrifuge, dyers etc. Totally enclosed submersible and flame proof motors

7. Domestic Installation (06 hrs)

Distinction between light-fan circuit and single phase power circuit, sub-circuits, various accessories and parts of domestic electrical installation. Identification of wiring systems. Common safety measures and earthing

8. Electrical Safety (04hrs)

Electrical shock and precautions against shock, treatment of electric shock, concept of fuses and their classification, selection and application, concept of earthing and various types of earthing, applications of MCBs and ELCBs

9. Batteries (02 hrs)

Construction, charging and maintenance of load and batteries, maintenance free batteries

10. Basic Electronics (05 hrs)

Basic idea of semiconductors – P and N type; diodes, zener diodes and their applications, transistor – PNP and NPN, their characteristics and uses. Characteristics and applications of a thyristor, characteristics and applications of stepper motors and servo motors in process control.

LIST OF PRACTICALS

1. Connection of a three-phase motor and starter with fuses and reversing of direction of rotation
2. Connection of a single-phase induction motor with supply and reversing of its direction of rotation
3. Charging and testing of a lead – acid battery
4. Troubleshooting in domestic wiring system, including distribution board
5. Connection and reading of an electric energy meter

6. Use of ammeter, voltmeter, wattmeter, and multi-meter
7. Measurement of power and power factor in a given single phase ac circuit
8. Study of different types of fuses, MCBs and ELCBs
9. Study of zener as a constant voltage source and to draw its V-I characteristics
10. Study of earthing practices
11. To draw V-I characteristics of a (i) NPN transistor (ii) thyristor (SCR)
12. Study of construction and working of a (i) stepper motor and (ii) servo motor

INSTRUCTIONAL STRATEGY

The teacher should give emphasis on understanding of concept and various terms used in the subject. Practical exercises will reinforce various concepts.

RECOMMENDED BOOKS

1. Basic Electrical Engineering by PS Dhogal; Tata McGraw Hill Publishers, New Delhi
2. A Text Book of Electrical Technology, Vol. I and II by BL Thareja; S Chand and Co., New Delhi
3. Basic Electricity by BR Sharma; Satya Prakashan, New Delhi
4. Basic Electrical Engineering by JB Gupta, S Kataria and Sons, Delhi
5. Experiments in Basic Electrical Engineering by SK Bhattacharya and KM Rastogi, New Age International Publishers Ltd., New Delhi
6. Basic Electronics by VK Mehta; S Chand and Co., New Delhi
7. Electrical Machines by SK Bhattacharya; Tata McGraw Hill, New Delhi
8. Basic electronics and Linear circuits by NN Bhargava and Kulshreshta, Tata Mc Graw Hill New Delhi.
9. Electronic principles by SK Sahdev, Dhanpat Rai and Sons, New Delhi.
10. Electronic Devices and circuits by Rama Raddy Narora Publishing House Pvt. Ltd. New Delhi.
11. Principles of electrical and electronics Engineering by VK Mehta; S Chand and Co. New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	03	06
2	04	08
3	04	10
4	06	12
5	06	12
6	08	16
7	06	12
8	04	10
9	02	04
10	05	10
Total	**48**	**100**

3.4 MANUFACTURING PROCESSES - I

L	T	P
3	-	6

RATIONALE

Diploma holders are responsible for supervising production processes to achieve production targets and for optimal utilization of resources. For this purpose, knowledge about various machining processes, modern machining methods, tools, jigs and fixtures is required to be imparted. Hence the subject of manufacturing processes.

DETAILED CONTENTS

1. Cutting Tools and Cutting Materials (06 hrs)

   1.1. Cutting Tools - Various types of single point cutting tools and their uses, Single point cutting tool geometry, tool signature and its effect, Heat produced during cutting and its effect, Cutting speed, feed and depth of cut and their effect

   1.2 Cutting Tool Materials - Properties of cutting tool material, Study of various cutting tool materials viz. High-speed steel, tungsten carbide, cobalt steel cemented carbides, stellite, ceramics and diamond.

2. Lathe (14 hrs)

   2.1 Principle of turning
   2.2 Description and function of various parts of a lathe
   2.3 Classification and specification of various types of lathe
   2.4 Drives and transmission
   2.5 Work holding devices
   2.6 Lathe tools: Parameters/Nomenclature and applications
   2.7 Lathe operations :- Plain and step turning, facing, parting off, taper turning, eccentric turning, drilling, reaming, boring, threading and knurling, form turning, spinning.
   2.8 Cutting parameters – Speed, feed and depth of cut for various materials and for various operations, machining time.
   2.9 Speed ratio, preferred numbers of speed selection.
   2.10 Lathe accessories:- Centers, dogs, different types of chucks, collets, face plate, angle plate, mandrel, steady rest, follower rest, taper turning attachment, tool post grinder, milling attachment, Quick change device for tools.

2.11 Brief description of capstan and turret lathe, comparison of capstan/Turret lathe, work holding and tool guiding devices in capstan and turret lathe.

3. Drilling (08 hrs)

3.1 Principle of drilling.
3.2 Classification of drilling machines and their description.
3.3 Various operation performed on drilling machine – drilling, spot facing, reaming, boring, counter boring, counter sinking, hole milling, tapping.
3.4 Speeds and feeds during drilling, impact of these parameters on drilling, machining time.
3.5 Types of drills and their features, nomenclature of a drill
3.6 Drill holding devices.
3.7 Types of reamers.

4. Boring (06 hrs)

4.1 Principle of boring
4.2 Classification of boring machines and their brief description.
4.3 Specification of boring machines.
4.4 Boring tools, boring bars and boring heads.
4.5 Description of jig boring machine.

5. Shaping, Planing and Slotting (10 hrs)

5.1 Working principle of shaper, planer and slotter.
5.2 Type of shapers
5.3 Type of planers
5.4 Quick return mechanism applied to shaper, slotter and planer machine.
5.5 Work holding devices used on shaper, planer and slotter.
5.6 Types of tools used and their geometry.
5.7 Specification of shaper, planer and slotting machine.
5.8 Speeds and feeds in above processes.

6. Cutting Fluids and Lubricants (04 hrs)

6.1 Function of cutting fluid
6.2 Types of cutting fluids
6.3 Difference between cutting fluid and lubricant
6.4 Selection of cutting fluids for different materials and operations
6.5 Common methods of lubrication of machine tools.

PRACTICAL EXERCISES

Turning Shop

Job 1. Grinding of single point turning tool.
Job 2. Exercise of simple turning and step turning.
Job 3. A composite job involving, turning, taper turning, external thread cutting and knurling.

Advance Fitting Shop

Job 1. Exercise on drilling, reaming, counter boring, counter sinking and taping
Job 2. Dove tail fitting in mild steel
Job 3. Radius fitting in mild steel
Job 4. Pipe threading with die

Machine Shop

Job 1. Prepare a V-Block up to ± 0.5 mm accuracy on shaper machine
Job 2. Exercise on key way cutting and spline cutting on shaper machine.

INSTRUCTIONAL STRATEGY

1. Teachers should lay emphasis in making students conversant with concepts and principles of manufacturing processes.
2. Focus should be on preparing jobs using various machines in the workshop

RECOMMENDED BOOKS

1. Workshop Technology by B.S. Raghuwanshi; Dhanpat Rai and Sons; Delhi
2. Elements of Workshop Technology by SK Choudhry and Hajra; Asia Publishing House
3. A Text Book of Production Engineering by PC Sharma; S Chand and Company Ltd. Delhi

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	06	12
2	14	30
3	08	16
4	06	12
5	10	22
6	04	08
Total	**48**	**100**

3.5 PRESS TOOL – DESIGN AND DRAWING

L	T	P
2	-	4

RATIONALE

The subject is intended to make the students understand concepts, principles and procedures of designing and drawing of press tool to be manufactured in workshop. It also aims at acquiring knowledge and skills in designing and drawing various press tools.

DETAILED CONTENTS

Section – A

1. Introduction (2hrs)

   Concept of mass production of sheet metal components, sheet material components and their applications, concept of press tools, press and their applications in mass production of components in industry.

2. Press Tool operations (4hrs)

   a) Concept and principle of shearing operations. Cutting operations and cutting dies such as blanking, piercing, trimming, notching and shaving.
   b) Concept and principle of non- cutting operations such as forming, bending, curling, coining, embossing

3. Elements of Press Tools (5 hrs)

   Press tool parts as Die-set, stripper plate, guiding plate, punch & punch plate, die plate. Selection of material for each element of press tool. BIS standards for die-sets such as Bottom Plate, Top plate, pillars, bushes and types of bushes.

4. Classification of Press Tools (8 hrs)

   Concept and description of

   - Cutting dies/tools such as blanking tool, piercing tool, compound tool, progressive tool. Notching tool, trimming tool and shaving tool.
   - Bending tool, forming tool, draw tools.

5. Classification of Presses (3hrs)

a) Concept and working of presses for press tools such as Hand Presses, Hydraulic and Pneumatic presses.
b) Specification of presses.
c) Selection of press for press tool operations.

6. Design Parameters in Press Tool Design (10hrs)

d) Concepts of sheering force, stripping force, cutting clearance, angular clearance. Land and shear angle, concept of die life.
e) Concept of strip layout classifications of strip layout such as piloting & stopping, strip guiding, material condition. Principle of grain direction. Material utilization, feeding mechanism.

Section B

1. Design and Drawing of at least one blanking tool (16 hrs)
2. Design & Drawing of at least one Piercing tool. (16 hrs)
3. Design & Drawing of at least one Bending tool. (16 hrs)
4. Design & Drawing of at least one Progressive tool. (16 hrs)

Note:-

The question paper on the subject will consist of two parts i.e. Section-A and Section-B. Section A will contain Theory contents to the extent of 50%. Section B will contain Design and Drawing to the extent of 50%.

At least, 2 industrial visits of a concerned industry should be arranged.

RECOMMENDED BOOKS

1. Mechanical Presses by Dr. Ing Heinrich Makelt; Edward Arnold (Publishers) Ltd.
2. Machine Tool Design hand book by Central Machine Tool Institute, Banglore; Tata Mc Graw Hill Publishing Company Ltd; New Delhi.
3. Basic Die Making by D. Eugene Ostergaard; Mc Graw Hill Book Co.
4. Press Tool Design & Construction by Prakash H. Joshi ; Wheeler Publishing
5. Fundamental of Tool Design by F.W. Wilson; Prentice Hall of India Pvt. Ltd. , New Delhi
6. Fundamental of Tool Design by Donaldson; Tata McGraw Hill.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1	2	6
2	4	14
3	5	16
4	8	24
5	3	10
6	10	30
Total	**32**	**100**

3.6 ENGINEERING MATERIALS AND HEAT TREATMENT

L T P
3 - 2

RATIONALE

Lot of development has taken place in the field of materials. New materials are being developed and it has become possible to change the properties of materials to suit the requirements. Diploma holders in this course are required to make use of different materials for various applications. For this purpose, it is necessary to teach them basics of metal structure, properties, usage and testing of various ferrous and non ferrous materials and various heat treatment processes. This subject aims at developing knowledge about the characteristics, testing and usage of various types of materials used in industries along with basic concepts of heat treatment.

DETAILED CONTENTS

1. Introduction (04 hrs)

   Overview of different engineering materials and applications, Classification of materials, Thermal, Chemical, Electrical, Mechanical properties of various materials, Present and future needs of materials, Overview of Biomaterials and semi-conducting materials, Various issues of Material Usage-Economical, Environment and Social.

2. Metals And Alloys (10 hrs)

   Introduction: Raw Materials in production of iron and steel, Basic Process of iron-making and steel-making, Classification of iron and steel,

   Cast Iron: Different types of Cast Iron, manufacture and their usage.

   Steels: Steels and alloy steel, Classification of plain carbon steels, Availability, Properties and usage of different types of plain carbon steels, Effect of various alloys on properties of steel, Uses of alloy steels (high speed steel, stainless steel, spring steel, silicon steel)

   Non Ferrous Materials: Properties and uses of Light Metals and their alloys, properties and uses of White Metals and their alloys.

3. Engineering Plastics (03 hrs)

   Important sources of plastics, Classification-thermoplastic and thermo set and their uses, Various Trade names of engg. Plastics, Plastic Coatings.

4. Advanced Materials (02 hrs)

Composites-Classification, properties, applications
Ceramics-Classification, properties, applications

5. Tool and Die Materials (04 hrs)

Overview of Tool and Die materials, classification, properties and application.

6. Introduction to Heat Treatment (02 hrs)

Heat treatment and its applications. Principles of heat treatment such as heating, socking and quenching.

7. Iron Carbon Diagram (06 hrs)

Heating and cooling, allotropic forms of iron; various phases and their constitutes, phase transformation, eutectic and eutectoid points of curves, classification of iron, steel and cast iron group.

8. Heat Treatment Processes (05 hrs)

- Different heat treatment processes such as hardening, tempering, annealing and normalizing
- Flame hardening, nitriding, cyaniding, induction hardening,
- Different types of carburizing
- Temperature range of heat treatment process and rate of cooling

9. TTT Curve (Isothermal transformation) (05 hrs)

Concept of TTT Curve in heat treatment, transformation of various phases at constant temperature, procedure to describe transformation into various phases of steel with the help of TTT Curve.

10. Furnaces and Equipment (03 hrs)

Common furnaces used in heat treatment shop. Working principles and selection of furnaces for heat treatment operations.

11. Defects during heat treatment, their causes and prevention (04 hrs)

Concept of defects such as decarburising, quenching cracks, excessive hardness, less hardness, soft spots.

LIST OF PRACTICALS

1. Classification of about 25 specimens of materials/machine parts into
   (i) Metals and non metals
   (ii) Metals and alloys
   (iii) Ferrous and non ferrous metals
   (iv) Ferrous and non ferrous alloys
2. Given a set of specimen of metals and alloys (copper, brass, aluminium, cast iron, HSS, Gun metal); identify and indicate the various properties possessed by them.
3. Study of a metallurgical microscope and a specimen polishing machine.
4. To prepare specimens of following materials for microscopic examination and to Examine the microstructure of the specimens of following materials:
   i) Brass ii)Copper iii)Grey iv)Malleable v)Low carbon steel vi)High carbon steel vii) HSS
5. Hardening of pillars and bushes of die-set and checking their hardness.
6. Prepare list of various types of steels used for tools and dies with BIS and BS designation and codes.
7. Prepare list of composition of various type of steels used for tools and dies.
8. Perform hardening and tempering operation for punch or die, made out of tool steel or equivalent steel and check their hardness.
9. Annealing of a stainless steel job for machining.

INSTRUCTIONAL STRATEGY

While imparting instructions, teacher should show various types of engineering materials to the students. Students should be asked to collect samples of various materials available in the market. Visits to industry should be planned to demonstrate use of various types of materials or Heat Treatment Processes in the industry.

RECOMMENDED BOOKS

1. Text book of Material Science by R.K. Rajput; Katson Pubs, Ludhiana
2. Text book of Material Science by Varinder Kumar, Eagle Publisher, Jalandhar
3. Text book of Material Science by V.K. Manchanda; India Publishing House, Jalandhar.
4. Engg. Metallurgy by R.A. Higgens, Standard Publishers, New Delhi
5. Introduction to Material Science by A.R. Gupta, Satya Prakashan, New Delhi.
6. Material Science by GBS Narang; Khanna Publishers Delhi-6.
7. Introduction to Engg. Materials by B.K. Agarwal; Tata Mc Graw Hill, Publishers Co. Ltd. New Delhi.
8. Material Science by G.K. Narula, K.S. Narula, V.K. Gupta; Tata Mc Graw Hill Publishers Ltd. Co. New Delhi.
9. A text book of Materials and Metallurgy by O.P. Khanna; Dhanpat Rai Publishers Pvt. Ltd. New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Topic No.	Time Allotted (Hrs)	Marks Allotted (%)
1.	04	08
2.	10	22
3.	03	06
4.	02	04
5.	04	08
6.	02	04
7.	06	14
8.	05	10
9.	05	10
10.	03	06
11.	04	08
Total	**48**	**100**

ECOLOGY AND ENVIRONMENTAL AWARENESS CAMP

A diploma holder must have knowledge of different types of pollution caused due to industries and constructional activities so that he may help in balancing the eco system and controlling pollution by pollution control measures. He should also be aware of environmental laws related to the control of pollution.

This is to be organized at a stretch for 3 to 4 days. Lectures will be delivered on following broad topics. There will be no examination for this subject.

1. Basics of ecology, eco system and sustainable development

2. Conservation of land reforms, preservation of species, prevention of advancement of deserts and lowering of water table

3. Sources of pollution - natural and man made, their effects on living and non-living organisms

4. Pollution of water - causes, effects of domestic wastes and industrial effluent on living and non-living organisms

5. Pollution of air-causes and effects of man, animal, vegetation and non-living organisms

6. Sources of noise pollution and its effects

7. Solid waste management; classification of refuse material, types, sources and properties of solid wastes, abatement methods

8. Mining, blasting, deforestation and their effects

9. Legislation to control environment

10. Environmental Impact Assessment (EIA), Elements for preparing EIA statements

11. Current issues in environmental pollution and its control

12. Role of non-conventional sources of energy in environmental protection