7051	APPLIED MECHANICS – II	T	P	C
		3	3	4

AIMS :

- To enable to understand the laws of friction and the coefficient of friction.
- To provide the ability of computing frictional forces of reactions of surfaces.
- To provide to understanding of deriving support reactions and types of loading of beam and trusses.
- To facilitate the understanding of work, power, energy, projectile lifting machine and gear trains.

SHORT DESCRIPTION :

Friction, support reactions, frame and truss, projectiles, work, power and energy, lifting machine, gear trains.

THEORY

1. Understand the principles of friction.

1.1. Define friction.
1.2. Identify the types of friction.
1.3. State the laws of static and dynamic friction.
1.4. Explain the angle of friction.
1.5. Explain coefficient of friction.

2. Understand the application of friction.

2.1. Explain free body diagrams of a body lying on horizontal, inclined and vertical surfaces, ladder and wedge.
2.2. Determine the frictional force of a body lying on an horizontal and inclimed surfaces.
2.3. Identify the methods of solving the problems of ladder
2.4. Identify the methods of solving the problems of wedge.

3. Understand the fundamentals of support reaction on beams.

3.1. Explain support reactions.
3.2. Identify types of beam.
3.3. Explain the types of loading on beams.
3.4. Determine the support reactions of simple and cantilever beam with different loading condition.
3.5. Determine the support reactions of roller supported beam.

4. Understand the fundamentals of support reaction on truss.

4.1. Define frame.
4.2. Identify the frames and trusses with their end supports.
4.3. State the method of finding support reactions and forces on the member of the frame.
4.4. Calculate the support reactions and forces on different end support of simple truss by joint method and section method.
4.5. Identify the nature of force on the members of trusses analytically and graphically.

5. Understand the features of projectile.

5.1. Describe projectile.

5.2. Give example of projectiles.
5.3. Describe the term relating to projectiles.
5.4. Identify the motion of a body thrown horizontally in the air.
5.5. Describe the motion of a projectile.

6. Understand the principle of projectiles.

6.1. Express the derivation of the equation of the path of a projectile.
6.2. Express the derivation of the time of flight of a projectile on a horizontal plane.
6.3. Express the derivation of horizontal range of a projectile.
6.4. Express the derivation of the equation of maximum height of a projectile on a horizontal plane.
6.5. Express the derivation of velocity and direction of motion of a projectile after a given interval of time.
6.6. Solve problems related to projectiles.

7. Understand the aspects of work, power and energy.

7.1. Define work, power and energy.
7.2. State the units of work, power and energy.
7.3. Explain the work done in rotation.
7.4. Mention the types of engine power.
7.5. State the meaning of the engine efficiency.
7.6. Mention the types of engine efficiency.
7.7. Mention types of energy.
7.8. Express the derivation of the equation of kinetic energy.
7.9. State the law of conservation of energy.
7.10. Solve problems related to work, power and energy.

8. Understand the simple lifting machines.

8.1. Define lifting machine.
8.2. State Mechanical advantage, velocity ratio, input of a machine, output of a machine, efficiency of a machine.
8.3. Express the relation between efficiency, mechanical advantage and velocity ration of a lifting machine.
8.4. Express the maximum mechanical advantage of a lifting machine by using the equation of law's of machine.
8.5. Describe lifting machine such as simple wheel & axel, differential wheel & axel, weston's differential pulley block and geared pulley block.
8.6. Solve the problems related to above specific objects.

9. Understand the various aspects of gear trains.

9.1. State what is meant by gear.
9.2. Identify the types of gears.
9.3. Identify the simple gear drive.
9.4. Express the derivation of the equation of velocity ratio of simple gear drive.
9.5. Identify the compound gear drive and gear train.
9.6. Identify the equation of power transmitted by simple and compound train.
9.7. Identify the epicyclic gear train.
9.8. Express the derivation of the velocity ratio of an epicyclic gear train.
9.9. Solve problems related to gear trains.

Practical :

1. Determine the co-efficient of friction.

1.1. Set up the friction apparatus.
1.2. Select the materials of which coefficient of friction is to be determined.
1.3. Place the materials over each other.
1.4. Raise one end of the body until the other body slides down.
1.5. Find the angle of friction.
1.6. Find the co-efficient of friction.

2. Determine the action of load on the member of simple frame or truss.

2.1. Select two members of which one end roller and other end pin point.
2.2. Select a tension spring.
2.3. Make a unit as a simple frame or truss.
2.4. Apply the load.
2.5. Read the tension load on spring.

3. Determine the torque of engine by prony brake.

3.1. Set up the prony brake with the engine fly wheel .
3.2. Tighten the hand wheel of prony brake.
3.3. Measure the length of torque arm.
3.4. Start the engine.
3.5. Take the reading of spring scale.
3.6. Find the torque of engine.
3.7. Compare the calculated values with the manufacturers' recommended values.

4. Determine the BHP of an engine by chassis dynamometer.

4.1. Place the vehicle on chassis dynamometer.
4.2. Start the vehicle engine.
4.3. Transmit power at different gear position.
4.4. Find the B. H. P. of the engine by chassis dynamometer at different speeds.
4.5. Compare the experimental value with the manufactures' recommended value.

5. Determine the velocity ratios among the driver and driven gears.

5.1. Set a simple train of gears.
5.2. Compare the velocity ratios of the same.
5.3. Set a compound train of gears.
5.4. Compare the velocity ratios of the same.

REFERENCE BOOKS

1	Applied Mechanics	–	R. S. Khurmi
2	Applied Mechanics	–	R. K. Jain
3	Applied Mechanics	–	Fairries
4	Analytical Mechanics	–	Faires & Nash
5	Mechanics of Materials	–	Morgan

7052	MECHANICAL ESTIMATING	T	P	C
		2	3	3

AIMS

- *To be able to understand the concepts and working definition of technical terms used in mechanical estimation.*
- To be able to understand the concepts and techniques of estimating & costing including the elements of costs, direct and indirect expenses of a particular product .

SHORT DESCRIPTION

Mechanical estimating; Costing; Cost of materials; Cost of labor; Expenses as a term of estimating; Cost of components; Idleness; Deprecation; Calculation of areas; volumes & weights; Job estimation of sheet metal shop, machine shop, welding shop and foundry shop; Project planning; Material cost economics.

DETAIL DESCRIPTION

Theory :

1 Understand the scope and concept of mechanical estimating.
- 1.1 Explain the term mechanical estimating.
- 1.2 Describe the scope of mechanical estimating.
- 1.3 Explain – administration, management, organization, bill of materials, idle time, scraps, waste, spoilage, by product, bonus and capital.

2 Understand the importance of mechanical estimating.
- 2.1 Explain estimating and its importance.
- 2.2 Illustrate organization set up of estimating department.
- 2.3 Explain the function of estimating.
- 2.4 Describe the qualities of estimating.
- 2.5 Describe the estimating procedure.
- 2.6 Explain the constituents of estimation.

3 Understand the costing.
- 3.1 Explain costing.
- 3.2 Explain standard cost.
- 3.3 Describe costing methods of material.
- 3.4 Explain the three elements that control the cost.
- 3.5 Distinguish between estimating and costing.

4 Understand the cost of materials.
- 4.1 Explain the meaning of material costing.
- 4.2 Distinguish between direct and indirect material cost.
- 4.3 Explain the procedure of costing material.

5 Understand the cost of labor.
- 5.1 Explain labor costing.
- 5.2 Distinguish between direct and indirect labor cost.
- 5.3 Describe Time and Motion study.
- 5.4 Explain the procedure of estimating labor cost.

6 Understand the expenses as a term in estimating.

6.1 Explain the term expenses.
6.2 Distinguish between direct and indirect expenses.
6.3 Distinguish between fixed and variable overhead.
6.4 Explain the different types of indirect expenses.

7 Understand the components of cost.

1.1 Explain the meaning of components of cost.
1.2 Describe different components of cost.
1.3 Describe the steps for calculating selling price.

8 Understand the idleness

8.1 Explain idleness.
8.2 Name different types of idleness.
8.3 Explain the causes of idleness.

9 Understand the methods of determining depreciation.

9.1 Define depreciation.
9.2 Distinguish between depreciation and obsolescence.
9.3 Explain the causes of depreciation.
9.4 Describe he methods of estimating depreciation.
9.5 Determine depreciation by straight line method, sinking fund method ,diminishing method, annuity charging method, sum of years digits method and machine hour basis method.

10 Understand the application of formulae of mensuration to find the area, volume and weight of engineering parts.

10.1 Determine area and volume of different geometrical figures.
10.2 Calculate the weight of different engineering parts.
10.3 Solve problems involving volume and weight.

11 Understand the methods of job estimate in the Fitting shop.

11.1 Estimate the material cost of divider, wrench, bucket, funnel, mug.
11.2 Estimate the labor cost of the jobs.
11.3 Estimate the overhead cost of the jobs.
11.4 Determine the total cost of the job.

12 Understand the methods of job estimating in the machine shop.

12.1 Estimate the material cost of ball peen hammer, vee block, center punch.
12.2 Estimate the labor cost of the job.
12.3 Estimate the overhead cost of the job.
12.4 Determine the total cost of the job.

13 Understand the method of job estimating in the welding shop.

13.1 Estimate the material cost of lap, butt and pipe welding.
13.2 Estimate the labor cost.
13.3 Estimate the overhead cost.
13.4 Determine the total cost of the job.

14 Understand the methods of job estimating in the pattern and foundry shop.

14.1 Estimate the pattern cost of pully, flange, bracket.
14.2 Estimate the overhead cost.
14.3 Estimate the total cost of the job.

15. Understand Project planning.

15.1 Concept of project planning.
15.2 Describe the steps of project planning.

16 Understand the material cost economics.

16.1 Explain the role of material cost in the net profit of a production industry.
16.2 Mention the steps of material cost economics that help to increase the profit in a production industry.
16.3 Estimate the selling price of cost iron gear. (frome pattern making to packaging)

Practical :

1 Prepare drawing and estimate the cost of divider, wrench, bucket, funnel, mug and duct.
2 Estimate the making cost of divider, wrench, bucket, funnel, mug.
3 Prepare drawing and estimate the cost of hammer, Vee block, center punch.
4 Prepare drawing of pully, flange, bracket.
5 Estimate the making cost of pully, flange, bracket..
6 Prepare detail drawing of screw jack or bench vise or tail stock.
7 Estimate the making cost of screw jack bench vise or tail stock.
8 Estimate the making cost of wooden pattern such as pully, flange and lever.

Reference Books

1. Mechanical Estimating – T.R BONGA.
S.C SHARMA

2. Mechanical Estimating—TTTC, Dhaka.

7053	ADVANCED WELDING	T	P	C
		2	6	4

AIMS

- To be able to understand the concepts, principles and techniques of various welding such as gas welding, electric welding and special welding methods.
- To be able to practice welding of various metals, such as steel, cast iron, alloy steels and non-ferrous metals.
- To be able to understand the various welding processes, testing welding joint and their defects.
- To be able to perform the welding joints of metals & alloys.

SHORT DESCRIPTION

Scope and importance of welding; Safety rules; Arc welding; Electrodes & function of coating; Principles of arc welding process; Principle of gas welding; Principle of gas cutting; Resistance welding process; Special welding process; Defects of welding; Test of welding joints.

DETAIL DESCRIPTION

Theory :

1 Understand the scope and importance of welding.

1.1 Describe the scope and importance of welding.
1.2 Identify the different welding processes.
1.3 Explain the superiority of welding processes.
1.4 Define weldability.
1.5 Describe weldability of metals.
1.6 Explain the metallurgy in welding.

2 Understand the arc welding processes.

2.1 State the principles of arc welding.
2.2 Describe the process of operation of arc welding set.
2.3 Explain the effects of striking voltage, arc voltage and open circuit voltage.
2.4 Explain the voltage and current regulation of the arc welding set.
2.5 Describe the specification of electrodes.
2.6 Explain the function of electrodes coating.
2.7 Describe the ingredients used in coating on electrode.
2.8 Describe the selection procedure of electrode.
2.9 Define and identify Polarity.
2.10 Explain the effect of polarity.

3 Understand the gas welding.

3.1 Explain the operating principles of regulators.
3.2 Explain the operating principles of welding torches.
3.3 Describe the uses of different types of welding torches.
3.4 Identify different types of torch tips.
3.5 Describe selection procedure of torch tips.
3.6 Explain the uses of flux in gas welding.

3.7 Explain the uses of filler rod in gas welding.
3.8 Describe oxy- acetylene gas welding.
3.9 Mention the uses of oxy-acetylene and oxy-Natural gas welding.

4 Understand the principles of gas cutting.
4.1 Describe the construction of gas cutting torch
4.2 Explain the selection of gas cutting torch tip.
4.3 Distinguish between a gas welding torch and a gas cutting torch.
4.4 Describe flame machining and gouging.
4.5 Distinguish between gas cutting and arc cutting.

5 Understand the resistance welding processes.
5.1 Describe the principles of resistance welding.
5.2 Describe the construction of resistance welding machine.
5.3 Describe the operation of resistance welding machine.
5.4 Identify the different types of resistance welding processes.
5.5 Describe the different types of resistance welding processes.
5.6 Outline the limitations of resistance welding process.
5.7 Distinguish between resistance welding with other welding processes.

6 Understand thermit wilding.
6.1 Define thermit.
6.2 Describe thermite wilding.

7 Understand the TIG welding.
7.1 Identify TIG welding machines and equipment.
7.2 Classify the TIG welding electrodes .
7.3 Describe the safety to be taken for the machines and equipment .
7.4 Describe the sequences of operation of TIG welding .
7.5 Mention the importance of cleaning and preparation of TIG welding joints.
7.6 Describe the techniques of TIG welding

8 Understand the MIG welding.
8.1 State the principles of MIG welding .
8.2 Describe the specific advantage of MIG welding .
8.3 Mention different types of metal transfer.
8.4 Describe the power supply system in MIG welding .
8.5 Describe the wire feed mechanism .
8.6 Identify the shielding gases used in MIG welding
8.7 Describe the techniques of MIG welding.
8.8 Identify the safety measure to be taken during and after welding.

9 Understand the techniques of Various G- position welding.
9.1 Describe the G-position welding technique.
9.2 Describe 1G & 2G position for plate and pipe welding.
9.3 Describe 3G & 4G position for plate welding.
9.4 Describe 5G & 6G position for pipe welding.
9.5 Mention the care and safety needed for various G-position plate and pipe welding.

10 Understand the concept of plasma arc cutting.
10.1 Mention the importance and applications of plasma arc cutting.
10.2 Describe various components of plasma torch.

10.3 Distinguish between plasma heat and arc heat.
10.4 Describe the operational sequence of Plasma Arc cutting.
10.5 Identify the cutting techniques of plasma arc cutting.

11 Understand basic concept of laser welding.

11.1 State the importance and uses of laser welding.
11.2 Describe the special advantages of laser welding.
11.3 Mention the limitations of laser welding.
11.4 Describe the theory of laser beam.

12 Understand the techniques of under water welding.

12.1 Define under water welding.
12.2 Identify the plant and equipment of under water welding.
12.3 Describe the operational techniques of under water welding.
12.4 Mention the safety needed for under water welding.

13 Understand the defects of welding and their causes.

13.1 Identify the defects of welding.

13.2 Identify the causes of defects in welding.
13.3 Describe the inspection methods of detecting welding defects.

14 Understand the principles of testing of welding joints.

14.1 Explain the necessity of testing the welds.

14.2 Describe the procedures of inspection of welds.

14.3 Describe the non-destructive tests of detecting welding defects.

14.4 Describe the destructive tests of welding.

Practical **:**

1 Perform lap joint and double vee butt joint by arc welding process.
2 Perform the butt joint of aluminium plates.
3 Perform butt joint of cast iron plates.
4 Perform butt joint of GI pipes.
5 Perform lap joint of stainless steel plates.
6 Perform butt joints by oxy-acetylene gas welding of mild steel plates.
7 Perform Lap/butt joint with aluminum bars/plates.
8 Perform lap/butt joint with copper bars/plates
9 Perform lap/butt joint of stainless steel bars with plates
10 Perform Brazing of steel pipes
11 Perform joints of GI and stainless sheet with resistance welding set (welding) :
12 erform the joint of stainless steel plate by TIG.
13 Perform the joints of stainless steel plate by MIG.
14 Perform wilding in 2G, 4G, 5G & 6G position.
15 Perform the work of joining of broken shaft tube well pipe by thermit welding.
16 Perform the Dye penetration test at the welding joints for finding defect.
17 Perform microscopic examination at the welding joint.
18 Perform the radiographic test at the welding joint.
19 Perform the tension test at the welding joint.

AIMS

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- To be able to make the patterns for the parts to be manufactured.
- To be able to prepare the moulding sands for the casting operations.
- To be able to operate the re-melting furnace.
- To be able to produce parts by casting with ferrous and non-ferrous metals.

SHORTS DESCRIPTION

Foundry and safety procedures, patterns and its materials, types of patterns, moulding sand, moulding, core making, moulding machines, melting furnace, melting operation, casting defects, special casting, die casting, mechanization of foundries.

DETAILS DESCRIPTION

Theory :

1 Understand the importance of foundry and safety procedures.

1.1 Explain the importance of foundry in modem industry.

1.2 Develop the habit safety procedures of foundry & pattern making works.

1.3 Describe the cooling tendency of pure metal.

2 Understand pattern and its materials.

2.1 Define pattern.

2.2 Explain the need of pattern.

2.3 Distinguish between pattern and casting.

2.4 Describe the factors which effect the selection of pattern materials.

2.5 Select the appropriate materials for pattern.

3 Understand the different types of pattern and its allowances.

3.1 Classify patterns.

3.2 Describe different types of patterns.

3.3 Select color code of patterns.

3.4 Describe methods of construction of patterns.

3.5 Describe the identification of pattern allowances.

4 Understand the moulding sand.

4.1 Define moulding sand.

4.2 State different types of moulding sand.

4.3 Identify different ingredients of moulding sand.

4.4 Describe the procedures of sand testing for finding moisture content permeability, hardness, clay, content, fineness and sand strength list.

4.5 Identify the defect of sand mixing and distribution.

5 Understand moulding and moulding materials.

5.1 State the different types of moulding.

5.2 Describe moulding processes.

5.3 Select appropriate elements of moulding sand mixture.

5.4 Make a list of moulding tools.

5.5 Explain the functions of different moulding tools.

5.6 Identify the typical moulding problems.

5.7 Identify the defects caused by moulding and core making materials.

6 Understand the core making procedures.

6.1 Explain core.

6.2 Describe the different types of cores.

6.3 State the characteristics of core sand.

6.4 Describe the procedures for core making.

6.5 Explain the process of core drying.

6.6 List core sand.

6.7 Explain the testing of core sand.

7 Understand the function and operation of moulding machines.

7.1 List machines used for moulding.

7.2 Explain the function of moulding machines.

7.3 Describe the operations of different moulding machines.

7.4 Describe the procedure for selection of appropriate mouldind machine for a particular job.

7.5 Mention the advantages and limitations of moulding machines.

8 Understand the melting furnaces and its importance for melting operations.

8.1 Describe the re-melting furnaces like crucible furnace, electric arc furnace, open health furnace, air furnace or reverberatory furnace, cupola furnace etc.

8.2 Explain re-melting procedures of scrap metal.

8.3 Explain working principle and charging of furnaces.

8.4 Calculate the materials charged in different furnaces.

8.5 List the materials used for furnaces.

8.6 Mention the metals and alloys used in furnace for melting.

8.7 Define refractory materials and types of refractory materials.

8.8 Mention the application of refractory materials for furnace lining.

9 Understand the importance of melting operations for different metals.

9.1 Identify melting points of metals and alloys.

9.2 Describe the melting operation of aluminum, zinc, copper, cast iron and cast steel.

9.3 List the equipment used for melting operation.

9.4 Identify the factors effecting the choice of type of furnaces.

10 Understand the casting defects.

10.1 Describe casting defects.

10.2 Explain surface imperfection.

10.3 Identify defects resulting from incomplete melting, gas porosity, external hot tears, cold cracks and warpage, infused chills & chaplets.

10.4 Identify mould defects of the casting.

10.5 Describe the causes of the mould defects.

10.6 Describe the procedures of cleaning and inspection of castings.

10.7 Explain the quality control in foundries.

10.8 Describe the steps for heat treatment of castings.

11 Understand special casting methods.

11.1 Explain special casting methods.

11.2 Describe casting in non-metallic mould.

11.3 Explain the methods of centrifugal and centripetal casting.

11.4 Describe precision casting processes.

11.5 Describe gravity of permanent mould casting.

11.6 Discuss advantages and disadvantages of special casting.

12 Understand die casting procedures and its application.

12.1 Define die casting.

12.2 Identify characteristics of die metal.

12.3 Explain dies and their design considerations in die casting.

12.4 List the types of die casting machines.

12.5 Describe die casting alloys with composition.

12.6 Describe the advantages and disadvantages of die casting.

13 Understand the mechanization of foundries.

13.1 Classify foundry.

13.2 Make plant layout for foundries.

13.3 Describe foundry mechanization.

13.4 Describe moulding sand preparation unit for foundry.

13.5 Describe equipment required for frame and dust extraction.

13.6 Explain the uses of natural gas in cupola furnace.

13.7 Describe cost for using natural gas in furnaces.

Practical :

1 Perform the preparation of pattern

1.1 Select correct materials for pattern.

1.2 Choose the appropriate tools for pattern making.

1.3 Make the working drawing of vee-block, Connecting rod, Rocker Arm and similar parts.

1.4 Make a pattern according to a drawing.

1.5 Finish the surfaces of the pattern.

2 Prepare the test for the strength of moulding sand.

2.1 Take a sample of moulding sand.

2.2 Set the macnine.

2.3 Test the sample.

2.4 Prepare report.

3 Perform the preparation of moulding sand.

3.1 Take different ingredients proportionately for moulding sand.

3.2 Mix up the sand with other ingredients.

3.3 Test the prepared moulding sand.

Perform core making

3.4 Select core materials.

3.5 Choose the appropriate core making box.

3.6 Make the core using correct procedure.

3.7 Put the core in an oven for drying.

4. Perform the test to find the quantity of moisture in moulding sand.

4.1 Select sample of moulding sand.

4.2 Set the testing quipment.

4.3 Test the sample and record the result.

5 Perform the test of permeability of moulding sand.

5.1 Make specimen for permeability test.

5.2 Set the testing machine.

5.3 Test and record the findings.

6 Perform clay content test.

6.1 Take a sample of moulding sand.

6.2 Prepare the sample for the test.

6.3 Dry out the sample.

6.4 Measure the clay content of the sample.

7 Perform mould making for casting.

7.1 Take required pattern for moulding.

7.2 Select appropriate tools for moulding.

7.3 Prepare moulding sand.

7.4 Make the mould.

7.5 Dry the mould.

7.6 Make ready for pouring molten metal.

Perform charging the cupola for casting operation. (Industrial Visit)

7.7 Check temperature from time to time with pyrometer.

7.8 Check and repair the cupola.

7.9 Prepare the cupola bed.

7.10 Determine the quantity of charging materials.

7.11 Fire the cupola.

7.12 Charge the cuopla.

7.13 Check the temperature from time to time with pyrometer.

7.14 Open the tap hole and collect the molten metal in a hot laddle.

REFERENCE BOOKS

1 Foundry Engineering - T R Bangla & R L Agarwal

2. Foundry Practice - Salmon & Simons

3. Exploring Pattern - D Miner & John G Miller Making & Foundry

4 Production Technology - R K Join

7055	HEAT TREATMENT OF METALS	T	P	C
		2	3	3

AIMS

- To be able to understand the basic concepts and principles of physical metallurgy and the theory of alloys.
- To be able to apply the principles of Time-Temp in the processes of heat treatment and surface treating of metals and alloys.
- To be able to understand the concepts principles and techniques of powder metallurgy in making high tech, complicated machine parts.
- To be able to practice in the laboratory on the preparation of specimen, handling of microscope and interpreting micro-structure of metals and alloys.
- To be able to maintain the metallurgical tools and equipment.

SHORT DESCRIPTION

Physical metallurgy; Theory of alloys; Heat treatment processes; Surface treatment; Treatment of alloy steel; Microscopic examination; Application of alloy steel; Selection specification and code number of metal.

DETAIL DESCRIPTION

Theory:

1 Understand the physical metallurgy.

- 1.1 Describe the scope of physical metallurgy.
- 1.2 Describe the metallic state of pure metals.
- 1.3 Describe the structure of the atom with neat sketch.
- 1.4 Explain the phenomena of metallic bonding.
- 1.5 Explain crystalline state of metals with sketch.
- 1.6 Describe the manner of crystallization.
- 1.7 Explain the deformation of metals.
- 1.8 Explain in brief the recrystallization, germination & cold crystallization and their effects on the properties of metal.
- 1.9 Describe the models of body centred, face centred and hexagonal pattern with the help of the tennis ball.

2 Understand the theory of alloys.

- 2.1 Describe thermal and cooling curves for binary alloys with neat sketch.
- 2.2 Explain the zero equilibrium diagram.
- 2.3 Explain the thermal equilibrium diagram for binary and ternary alloys.
- 2.4 Explain the thermal equilibrium diagrams and their construction.
- 2.5 Explain the lever rule for constructing equilibrium diagram.
- 2.6 Explain the iron and iron-carbon equilibrium diagram.
- 2.7 Draw three phase iron carbon equilibrium diagram.
- 2.8 Explain the grain structure of 0.25%carbon steel with neat diagram.
- 2.9 Explain the uses of equilibrium diagram.

3 Understand the heat treatment processes.

- 3.1 Define heat treatment.
- 3.2 Explain the importance of heat treatment.
- 3.3 Mention objectives of heat treatment.
- 3.4 Explain the critical temperature diagram of plain carbon steel and its role in the heat treatment.
- 3.5 Explain in detail the following heat treating processes with diagram:

annealing, normalizing, quench hardening, tempering, austempering and martempering.

3.6 Describe different types of media for annealing.
3.7 Describe different types of quenching media for hardening.
3.8 Explain in brief the functions of quenching media.
3.9 Describe in brief the various heat treating furnaces and equipment.
3.10 Describe the construction of muffle type furnace and its advantages over other furnace.
3.11 Describe different types of pyrometers.
3.12 Construction of thermocouple pyrometers.
3.13 Uses of different types of pyrometers.

4 Understand the surface treatment.

4.1 Describe the purpose of surface treatment.
4.2 Describe the process of electro plating and coating.
4.3 Explain the process of hard facing by flame hardening and induction hardening.
4.4 Explain the following carburizing processes:
Solid or pack carburizing, Liquid bath carburizing and gas carburizing.
4.5 Explain in brief the heat treatment processes after carburizing..
4.6 Explain in brief the advantages and disadvantages of carburizing processes.
4.7 Explain in brief the cyaniding process of surface treatment.
4.8 Explain in brief the advantages and disadvantages of cyaniding process.
4.9 Explain in brief the nitriding process of surface harding.
4.10 Describe the furnace used in nitriding process with neat sketch.
4.11 Explain in brief the advantages and disadvantages of nitriding process.
4.12 Explain in brief the superiority of nitrided steel over other surface hardness steel.
4.13 Explain in brief the uses of surface treated steel by various methods of surface treatment.

5 Understand the heat treatment of alloy steels.

5.1 Explain in brief the behavior and influence of following alloying elements in steel during the heat treatment:
a) Carbon
b) Manganese
c) Silicon
d) Nickel
e) Tungsten
f) Molybdenum
g) Chromium
At the following stages:
i) Pearlitic
ii) Martensitic and
iii) Austenitic

5.2 Explain in brief the behavior of the following alloy steels.
a) Carbon steel.
b) Chromium steel.
c) Nickel steel.
d) Molybdenum steel.
e) Stainless steel.
f) High speed steel

6 Understand the process of microscopic examinations.

6.1 Explain the importance of microscopic examination of metals.

6.2 Describe various components of metallurgical microscope with sketch.
6.3 Describe the process of handling microscope properly for microscopic examination.
6.4 Explain the necessity of preparing specimen before microscopic examination.
6.5 Describe the process of preparing specimen either by hand polishing or machine polishing.
6.6 Describe the process of mounting of specimen.
6.7 Explain necessity of etching of specimen.
6.8 Explain different types of etching agents used for different metals.
6.9 Describe the process of etching before microscopic examination.
6.10 Interpret the micro structure before and after heat treatment.
6.11 Describe the process of maintenance of microscope and equipment for preparing and preserving specimens.

7 Understand various application of alloy steel.

7.1 Explain the reason of using particular alloy steel for a particular industries.
7.2 Classify the suitable alloy steel with reason for using in the following industries:

machine tools, power plant, arms and ammunition, agricultural implements, jute, textile and sugar mills, paper and board industries.

8 Understand the selection specifications and code number of metals.

8.1 Describe the practical purpose of selection, specifications and code number of metals for engineering use.
8.2 Explain the code number of metal.
8.3 Mention the uses of metal hand book

Practical:

1. Make the model of body central and hexagonal pattern with tennis ball.
2. Draw three phase iron-carbon equilibrium diagram.
3. Identify metals by spark test (mild steel, high carbon steel, high speed steel, stainless steel, axel. stud bolt)
4. Perform annealing process on a alloy steel/high carbon steel by using necessary equipment.
5. Perform normalizing process on a mild steel rod by using necessary equipment.
6. Perform quench-hardening and tempering process on a alloy steel/high carbon steel plate by using necessary equipment.
7. Perform electroplating & coating process on a mild steel plate by using necessary equipment.
8. Hard the surface of a mild steel flat ring by carburizing process.
9. Hard the surface of a alloy steel having aluminum & vanadium by nitriding process
10. Identify various components of metallurgical microscope and perform the handling for microscopic examination.
11. Draw the micro structure of a metal before and after heat treatment.

REFERENCE BOOK

1. Metallurgy – by Johnsion.
2. Metallurgy & Heat treatment – by Join
3. Elementary Metallurgy – by Frier.

6659 **Programming in C** **T P C**
2 3 3

OBJECTIVES
- To develop knowledge and skill to prepare programs in C.
- To develop knowledge and skill to create, compile, debug & execute C programs.

SHORT DESCRIPTION
Basics of C program; Data types; Variables; Operators; Expressions; Input-Output statements; Branching and Looping statements; Arrays; preprocessors, Functions, Pointers; Structures and Unions; File operations and Graphics.

DETAIL DESCRIPTION

Theory:
1 Understand fundamentals of C Programming
- 1.1 Describe the historical development of C Programs.
- 1.2 Describe the Basic structure of C program and programming style .
- 1.3 State the difference of C with other high level languages.
- 1.4 Explain the process of program planning.
- 1.5 Describe algorithm and flow chart.
- 1.6 Prepare algorithm and flow chart for simple problems.
- 1.7 State the process of compiling C program.
- 1.8 Write simple programs using basic structure of C program.

2 Understand data types, constants and variables.
- 2.1 Describe the data types in C.
- 2.2 Explain constants and variables in C.
- 2.3 Describe the keywords and identifiers in C.
- 2.4 Mention the use of qualifiers in data types.
- 2.5 Declare variables and asign values to variables.
- 2.6 State the type conversion and type defination in C.
- 2.7 Write simple programs using constants and variables.

3 Understand Operators and Expressions.
- 3.1 State C operators and their classification.
- 3.2 Describe the arithmetic, relational, logical, assignment, increment, decrement and conditional operators.
- 3.3 Explain the bitwise and special operators.
- 3.4 Write arithmetic expression & its evaluation.
- 3.5 Describe the precedence of arithmatic operators.
- 3.6 Mention operator precedence and associativity.
- 3.7 Write simple programs using operators and expressions.

4 Understand the input and output operations.
- 4.1. Describe the statement getting input from keyboard.
- 4.2. Describe the statements printing output on screen and by printer.
- 4.3 State the codes used for formatted I/O.Statements.
- 4.4 Mention the escape sequence in C.
- 4.5 Write programs using I/O statements.

5 Understand the Branching and Looping Statements.
- 5.1 Describe the conditional an unconditional branching flow.
- 5.2 State the statement for conditional and unconditional branching.
- 5.3 Explain the format for branching statements.
- 5.4 Describe the conditional an unconditional Looping flow.
- 5.5 State the statement for conditional and unconditional Looping.
- 5.6 Explain the format for looping statements
- 5.7 Write programs using branching and looping statements.

6 Understand arrays
- 6.1 Define arrays
- 6.2 Describe the dimension of arrays.
- 6.3 Initialize arrays.
- 6.4 Write programs using arrays.

7. Understand preprocessor statements in C.

7.1 Describe the preprocessor directives and their functions.
7.2 Define header.
7.3 Describe the process of including header in routine.
7.4 Explain the use of macro.
7.5 Describe the advantage of macros over functions in programs
7.6 Write programs using preprocessor statements.

8 Understand pointer and its application.
8.1 Define pointer.
8.2 Describe the characteristics of pointer.
8.3 Explain pointer expressions.
8.4 Write programs using pointers.

9 Understand Function.
9.1 Explain library function and user defined function.
9.2 Describe the process of calling functionsand returning values from functions in C.
9.3 Describe arguments used in functions.
9.4 Mention function prototype.
9.5 Write programs using library function and user defined function..

10 Understand structure and union.
10.1 Describe structure and union.
10.2 Mention structure and union declaration.
10.3 Distinguish between structure and union.
10.4 Write simple programs using structure and union.

11 Understand file operations.
11.1 Describe file operations.
11.2 State the modes of opening files.
11.3 Describe the functions that support character I/O.
11.4 Explain the routines for performing formatted I/O to files
11.5 Write programs for reading, writing and editing files.

12 Understand graphics elements and its application in C.
12.1 Define Text and Graphics
12.2 Describe how graphics are created in computers.
12.3 State the concept of pixel and resolution of CRT/LCD/LED display.
12.4 State the format and use of line( ),rectangle( ), bar( ), bar3d( ), Circle( ), ellipse( ), fillellipse( ) and sector( ) functions with example
12.5 State the format and use of Arc( ), pieslice( ), drawpoly( ) and fillpoly( ) outtextxy( ) & settextstyle( ), cleardevice( ), delay( ), sound( ) & nosound( ), functions with example
12.6 Mention the use of modified cprintf( ) and cscanf( ) functions for I/O operation.
12.7 Write program for developing color image using above graphics functions.
12.8 State the procedure of saving and loading an image in C.
12.9 Show the procedure to move text string on the screen.
12.10 Describe the statements used to copy and move text and graphics.
12.11 Write programs to create simple graphics.

Practical:

1. Perform the task to create, compile, debug & execute a C programs
a)To print a message.
b)To add two integer/float numbers.
2. Perform the task to create, compile, debug & execute a C programs using constants and variables
a) To calculate the average of N numbers.

b) To convert the given temperature in Fahrenheit to Celsius and vice versa.
c) To calculate the area of a circle.

3. Perform the task to create, compile, debug & execute a C programs using operators and expressions.
   a) To convert days to months and days.
   b) To calculate the area of a triangle.
   c) To compare two integer numbers
4. Perform the task to create, compile, debug & execute a C programs using I/O statements
   a) To read integer/real number.
   b) To find the sum of three floating point numbers from keyboard.
   c) To convert centimeter to inch using scanf () and Printf () statements.
5. Perform the task to create, compile, debug & execute a C programs using Branching Statements.
   a) To select and print the largest number of three numbers.
   b) To compute the roots of a quadratic equation.
   c) To count vowels from a string of ten characters using switch statement.
6 Perform the task to create, compile, debug & execute a C programs using Looping Statements
   a)To print odd or even numbers from N numbers.
   b)To find the maximum or minimum number from a set of numbers.
   c)To search prime numbers.
7 Perform the task to create, compile, debug & execute a C programs using arrays
   a)To sort numbers in ascending or descending order using one dimensional array.
   b)To print numbers in two dimensional form.
   c) for matrix multiplication.
8 Perform the task to create, compile, debug & execute a C programs using preprocessor statements.
   a)To determine hypotenuse of right angled triangle using macro.
   b)To determine the area of a triangle using nested macro.
9 Perform the task to create, compile, debug & execute a C programs using pointers
   a) To illustrate the use of pointers in arithmetic operations.
   b) To compute the sum of all elements stored in an array.
10 Perform the task to create, compile, debug & execute a C programs using functions
   a)To calculate the area of a triangle
   b)To sort an array of integer numbers.
   c)To calculate factorial of any integer using recursive function.
11 Perform the task to create, compile, debug & execute a C programs using structure and union
   a)To store and retrieve data using structure.
   b) To store and retrieve data using union.
12 Perform the task to create, compile, debug & execute a C programs using files
   a)To store/read information to/from sequential file.
   b) To store/read information to/from random file.
   c) To convert lower case to upper case and vise versa.
13 Perform the task to create, compile, debug & execute a C programs using graphics
   a)To draw a line with different styles.
   b)To draw a circle with different colors.
   c)To generate nested ellipse.
14. To develop a complete project using C program that include text, graphics and sound in VGA mode.

Reference books and sites:

1. programming in C – E. Balagurusamy.
2. Teach yourself C _ Herbert Schildt.
3. www.e-booksdirectory.com › Computers & Internet
4. www.freebookcentre.net › Programming Languages Books
5 www.4shared.net/c+**programming**+**ebook**

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BOOK KEEPING & ACCOUNTING **T P C**

2 0 2

AIMS

- To be able to understand the principles and practices of book keeping and accounting.
- To be able to understand the procedures of general accounting, financial accounting and their applications.

SHORT DESCRIPTION

Concept of book keeping and accounting; Transactions; Entry systems; Accounts; Journal; Ledger; Cash book; Trial balance; Final accounts; Cost account & financial accounting; Depreciation; Public works accounts.

DETAIL DESCRIPTION

1 Understand the concept of book keeping and accounting.

1.1 Define book keeping and accountancy.
1.2 State the objectives of book keeping.
1.3 State the advantages of book keeping.
1.4 Differentiate between book keeping and accounting.
1.5 State the necessity and scope of book keeping and accounting.

2 Understand the transactions.

2.1 Define transactions and business transaction.
2.2 Explain the importance of transactions.
2.3 Describe the characteristic features of transactions.
2.4 Discuss the classification of transaction.
2.5 Identify the transaction from given statements stating reasons.

3 Understand the entry system.

3.1 State the aspects of transactions.
3.2 Define single entry system.
3.3 State the objectives of single entry system.
3.4 Discuss the disadvantages of single entry system.
3.5 Define double entry system.
3.6 Discuss the principles of double entry system.
3.7 Justify whether double entry system is an improvement over the single entry system.
3.8 Distinguish between single entry and double entry system of book keeping.

4 Understand the classification of accounts.

4.1 Define accounts.
4.2 State the objectives of accounts.
4.3 Illustrate different type of accounts with example.
4.4 Define “Golden rules of Book keeping”.
4.5 State the rules for “Debit” and “Credit” in each class of accounts.
4.6 Determine Debtor (Dr) and Creditor (Cr.) from given transactions applying golden rules.
4.7 Define accounting cycle.
4.8 State the different steps of accounting cycle.

5 Understand the Journal.

5.1 Define Journal.
5.2 State the object of Journal.

5.3 State the functions of Journal.
5.4 Mention the various names of Journal.
5.5 Interpret the form of Journal.
5.6 Journalize from given transactions.

6 Understand the ledger.

6.1 Define ledger.
6.2 Interpret the form of ledger.
6.3 State the functions of ledger.
6.4 Distinguish between Journal and Ledger.
6.5 Prepare ledger from given transactions.
6.6 Explain why ledger is called the king of all books of accounts.

7 Understand the cash book.

7.1 Define cash book (single, double and triple column).
7.2 Explain cash book as both Journal and Ledger.
7.3 Prepare double column cash book from given transactions showing balances.
7.4 Prepare triple column cash book from given transaction and find out the balances.
7.5 Define petty cash book.
7.6 Prepare analytical and imprest system of cash book.
7.7 Define discount.
7.8 Explain the different types of discount.

8 Understand the trial balance.

8.1 Define trial balance.
8.2 State the object of a trial balance.
8.3 Discuss the methods of preparation of a trial balance.
8.4 Explain the limitations of a trial balance.
8.5 Prepare trial balance from given balance.

9 Understand the final accounts.

9.1 State the components of final account.
9.2 Distinguish between trial balance and balance sheet.
9.3 Identify the revenue expenditure and capital expenditure.
9.4 Select the items to be posted in the trading account, profit & loss account and the balance sheet.
9.5 State the adjustment to be made from the given information below or above the trial balance.
9.6 Prepare trading account, profit & loss account and balance sheet from the given trial balance & other information.

10 Understand the cost and financial accounting.

10.1 Define financial accounting.
10.2 State the objectives of financial accounting.
10.3 Define cost accounting.
10.4 Discuss the relationship between financial Accounting and cost accounting.
10.5 State the elements of direct cost and indirect cost.
10.6 Prepare cost sheet showing prime cost, factory cost, cost of production, total cost and selling price.
10.7 Discuss the capital budgeting
10.8 Discuss the discounted cash flow method
10.9 Explain the following terms:
a. Fixed cost b. Variable cost c. Factory cost d. Overhead cost e. Process cost
f. Direct cost g. Operating cost h. Standard cost

11 Understand the depreciation

11.1 Define depreciation.
11.2 State the objects of depreciation.
11.3 Discuss the necessity for charging depreciation.
11.4 Describe the different methods of determining depreciation.
11.5 Explain the relative merits and demerits of different method of depreciation.

12 Understand the public works accounts.

12.1 State the important aspects of public works accounts.
12.2 Describe the main features of public works accounts.
12.3 Explain “Revenue and Grant”.
12.4 Define Value Added Tex (VAT)
12.5 State the merits and demerits of VAT.
12.6 Define Bill and Voucher.