BANGLADESH TECHNICAL EDUCATION BOARD
Agargoan, Dhaka-1207.

4-YEAR DIPLOMA-IN-ENGINEERING PROGRAM
SYLLABUS (PROBIDHAN-2016)

MECHANICAL TECHNOLOGY

TECHNOLOGY CODE: **670**

3rd SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

MECHANICAL TECHNOLOGY (670)

3rd SEMESTER

Sl. No	Subject Code	Name of the subject	T	P	C	Marks				Total
						Theory		Practical		
						Cont. assess	Final exam	Cont. assess	Final exam	
1	67031	Machine Shop Practice-2	1	6	3	20	30	50	50	150
2	66822	Electronic Engineering Fundamentals	2	3	3	40	60	25	25	150
3	65722	Communicative English	1	3	2	20	30	50	0	100
4	65931	Mathematics -3	3	3	4	60	90	50	0	200
5	65922	Physics -2	3	3	4	60	90	25	25	200
6	66611	Computer Application	0	6	2	0	0	50	50	100
7	67032	Foundry & Pattern Making	2	3	3	40	60	25	25	150
			12	27	21	240	360	275	175	1050

67031 MACHINE SHOP PRACTICE-II T P C
1 6 3

AIMS

• To enable to understand the features of specialized machine tools.

• To enable to develop skill in the set up and operation of specialized machine tools.

• To enable to understand and perform advanced operations on machine tools.

• To produce engineering parts using the machine tools.

- To enable to develop skill in the set up and operation of CNC machine.

SHORT DESCRIPTION

Advanced lathe operations; Turret lathe & Capstan lathe; Cutting data; Cutting tools; Coolant; Milling Machine: different attachments, cutters, process, Indexing, Gear teeth cutting; Specification of machine tools; CNC machine; measuring techniques.

DETAIL DECRIPTION

Theory;

1 Understand the special operations on lathe machine.

1.1 Explain the multi-start threads.
1.2 Identify the work done by using four-jaw chuck and face plate.
1.3 Distinguish between single point and multi point cutting tools.
1.4 Study the specification of center lathe.

2 Understand the Cemented carbide tools.

2.1 Define carbide tools and its use.
2.2 Explain the fixing procedure of carbide tips on a shank/holder.
2.3 Show the tool angle nomenclature of carbide tipped tools.
2.4 Explain the chip breakers for various types of machining.

3 Understand the application of cutting fluids for machining operation.

3.1 Define cutting fluid.
3.2 Explain the necessity of cutting fluid.
3.3 Identify different types of cutting fluid.
3.4 Identify cutting fluid used for cutting different metals.

4 Understand the features of turret and capstan Lathe.

4.1 List the principal parts of turret and capstan lathe and their use.
4.2 Describe the method of holding jobs on the turret lathe.
4.3 Mention the different attachment used on turret lathe.
4.4 List the advantages of using turret and capstan lathe.

5 Understand the features of the milling machine.

5.1 State the meaning of milling.
5.2 Identify different types of milling machines.
5.3 Identify the principal parts of milling machine.
5.4 Distinguish among plain, universal and vertical milling machine.
5.5 Mention the specification of milling machine.

6. Understand the features of the milling attachments
6. 1 Identify the principal attachments used in milling machine.
6.2 Describe the methods of milling.
6.3 Describe setting up the milling machine.

7. Understand the features of milling cutters.
7.1 Identity the various types of milling cutter
7.2 Mention the use of various milling cutter.
7.3 Mention the care and maintenance of milling cutters.

8. Understand the milling process.
8.1 Differentiate clamp milling with conventional milling.
8.2 Select the cutting speed, depth of cut, feed and width of cut for milling operation of different metals/non-metals.

9. Understand the concept of indexing.
9.1 State the meaning of indexing.
9.2 Explain the purpose of indexing.
9.3 Describe the methods of indexing for simple, compound, differential and angular operations.
9.4 Calculate the correct hole on indexing plate, appropriate plate and turns for indexing.

10. Understand the concept of CNC machine.
10.1 Define CNC machine.
10.2 State different types of CNC machine.
10.3 Distinguish between NC and CNC.
10.4 Mention major components of CNC machine.
10.5 Explain the axis of motion.
10.5 Specification of CNC Lathe Machine.

11. Understand the operation of CNC machine.
11.1 Show the block diagram of a CNC system.
11.2 Identify machining function available in a CNC machine.
11.3 Study features on CNC panel.
11.4 Address characters for CNC machine.
11.5 Explain typical work offset and tool offset setup.
11.6 Study CNC programming for Lathe operation.

Practical:

1. Practice special operation on Lathe machines.
1.1 Cut the multi-start ‘V’ threads.
1.2 Cut the multi-start ‘square’ threads.
1.2 Grind the cutting tool-bit for cutting ‘V’ and square threads.
1.4 Set up the face plate.
1.5 Face turn and bore a work piece using face plate.
1.6 Set up a four-jaw chuck with a work piece set eccentrically using dial indicator.
1.7 Set up a long circular work piece between lathe centers and adjusting tailstock to produce Morse taper.
1.8 Turn the Morse taper by tailstock offsetting.

2. Milling setting operation.

2.1 Set up the machine vice and hold work piece to produce a flat surface using a milling cutter.
2.2 Produce the parallel, square and slotted work piece using appropriate cutters.
2.3 Calculate and set the dividing head for a wide a range of indexing for 2 to 40 divisions, odd and even numbers.
2.4 set up the dividing head and hold work piece to produce a multi-sided work piece, bolt head: square, hexagonal or octagonal.
2.5 Cut a spur gear.
2.6 Make a rack.

3. Demonstrate CNC Lathe operation.

3.1 Check machine connection before starting.
3.2 Setup machine zero (Axes).
3.3 Setup work offset.
3.4 Setup tool offset.
3.5 Load the tool and hold the work piece.
3.5 Program Lathe operation (Job).
3.6 Practice various operation (Turning, facing, drilling etc.)

Reference:

1. Technology of Machine Tools - S.F krar.
2. Production Technology - R.k.jain.
3. Machine Tool operation part-1
4. Machine Tool operation part-2 tlenty D. Burghardt. Auron Axelrod, and james Anderson.
5. Machine Shop Practice- Somenath De.

66822	**Electronics Engineering Fundamental**	**T**	**P**	**C**
		2	**3**	**3**

OBJECTIVES

- To provide understanding soldering technique and color code.
- To provide understanding and skill on the basic concept of semiconductor and to identify physically a range of semiconductor diodes.
- To develop comprehensive knowledge and skill on special diodes and devices.
- To develop the abilities to construct different rectifier circuits.
- To provide understanding of the basic concept and principle of transistor and toidentify physically a range of transistor.
- To provide understanding and skill on oscillator.
- To provide the understanding skills on Multivibrator.

SHORT DESCRIPTION

Color code and soldering; Semiconductor; P-N junction diode; Special diodes and devices; Power supply; Transistor; Transistor amplifier; Oscillator, Multivibrator.

DETAIL DESCRIPTION

Theory:

1 Soldering and Color Code.

1.1 Define soldering.
1.2 List the materials needed in soldering.
1.3 Mention the properties of a good soldered joint.
1.4 Multi layered Printed circuit board.
1.5 Mention the function of resistor, capacitor and inductor in electronic circuits.
1.6 Describe the procedure of determining the value of Capacitor, & Resistor using numeric and color code.

2 Semiconductor

2.1 Define Conductor, Semiconductor and Insulator.
2.2 Describe Semiconductor with atomic structure.
2.3 Explain the energy band diagram of Conductor, Semiconductor and Insulator.
2.4 Classify Semiconductor.
2.5 Describe the formation of P-type & N-Type Semiconductor material.
2.6 Explain the majority & minority charge carrier of P-type & N-Type Semiconductor.

3 P-N Junction Diode

3.1 Define PN junction diode
3.2 Describe the formation of depletion layer in PN junction.
3.3 Mention the behavior of PN junction under forward and reverse bias.
3.4 Explain the forward & reverse current voltage (IV) characteristics of PN junction diode.
3.5 Describe the operation of Zener diode.
3.6 Describe the application of Zener diode in voltage stabilization.
3.7 Describe the construction operation and application of (i) varactor diode (ii) LED (iii) LCD (viii) photo diode (ix) Solar cell.
3.8 Describe the construction operation and application of (i) DIAC (ii) TRIAC and (iii) SCR.

4 DC power supplies.

4.1 Define (i) dc power supply (ii) Regulated and Unregulated Power Supply.
4.2 Describe the block diagram of a typical regulated dc power supply.
4.3 Explain the operation of Half wave, Full wave and Bridge rectifier.
4.4 Mention ripple factor of Half wave, Full wave and Bridge rectifier.
4.5 Explain the operation of different types filter circuits with wave shape.

5 Bipolar Junction Transistor (BJT)

5.1 Define Transistor.
5.2 Describe the construction PNP and NPN Transistor.
5.3 State the biasing rules of BJT.
5.4 Explain the mechanism of current flow of PNP and NPN Transistor.
5.5 Draw the three basic transistor configuration circuits (CB, CC, CE).
5.6 Describe the characteristics of transistor in CB, CE, CC configuration.
5.7 Describe current amplification factor α , β and γ.
5.8 Establish the relation among α , β and γ.
5.9 Solve problem related to $I_{E,}$ $I_{C,}$ $I_{B,}\alpha$, β and γ.

6 Transistor biasing and load line.

6.1 Mention the needs for biasing of transistor
6.2 State the conditions for proper biasing of transistor.
6.3 Describe the methods of drawing load line of transistor.
6.4 Explain the Effect of the location of operating point on the output signal.
6.5 Describe the various methods of transistor biasing.

7 Transistor Amplifier

7.1 Define (i) Amplifier (ii) Amplification and (III) Gain
7.2 Mention the classification of Amplifier.
7.3 Describe the principle of operation of a single stage common emitter (CE) Amplifier.
7.4 Draw DC & AC equivalent circuits of the CE amplifier circuit.
7.5 Explain the operation of RC coupledandtransformer coupled multistage amplifier.
7.6 Describe the operation of Push-Pull amplifier.

8 **Field-Effect Transistor(FET).**

8.1 Define field effect transistor(FET).
8.2 Mention the types of FET
8.3 Describe the construction and operation Junction Field Effect Transistor (JFET).
8.4 Explain characteristics of JFET .
8.5 Describe the parameters of JFET.
8.6 Establish the relationship among FET parameters.
8.7 Describe the DC biasing of JFET and its load line.
8.8 Describe the Construction and operation of DE and E-Only MOSFET.

9. **Sinusoidal Oscillators.**

9.1 Define feedback
9.2 Describe different types of feedback with block diagram.
9.3 Calculate the gain of amplifier with feedback (positive and negative).
9.4 Mention the advantages and disadvantages of negative feedback.
9.5 Explain the principle of operation of a oscillatory tank circuit.
9.6 Describe the essentials of feedback LC oscillators.
9.7 Explain the principle of operation of Hartly, Colpitt andWein-bridge oscillators.
9.8 Explain the principle of operation phase shift & crystal oscillators.

10. **Multivibrator circuits.**

10.1 Define time base circuit.
10.2 Mention the methods of generating time base waveform.
10.3 Explain the generation of saw-tooth wave using charging and discharging of a capacitor.
10.4 Understand the features of multivibrator circuits.
10.5 State what is meant by multivibrator.
10.6 Explain the operation of astable, monostable and bistable mutivibrator circuits with wave shapes.
10.7 Mention the principle of operation of Schmitt trigger circuit.

Practical : (Using Real component and Simulation Software)

1 Show skill in identifying the electronic components.

1.1 Observe the electronic components board and read the manuals.
1.2 Identify the different types of resistors with their values, tolerance and wattage.
1.3 Identify the different types of potentiometers with their values, & wattage.
1.4 Identify the different types of capacitors with their values, dc working voltages and types.
1.5 Identify the different types of diodes & rectifiers with the numbers and specifications.
1.6 Identify the different types of transistors and thyristors with their number and specifications.
1.7 Identify the different types of LED's, IC's and miniature relays with their number & specification.
1.8 Identify different types of transformer with their specification.
1.9 Identify different inductors with their values & current ratings.
1.10 Study the printed circuit boards.
1.11 Sketch the symbols of components used in electronic circuits.
1.12 Describe the basic function of each component.
1.13 Write a report on above activities.

2 Show skill for determining the values of different resistors and capacitors with the help of color code.

2.1 Select color code resistors & capacitors of different values.
2.2 Identify the colors and their numerical numbers.
2.3 Determine the value of resistors with tolerance.
2.4 Determine the value of capacitors and dc working voltage.
2.5 Write a report on above activities.

3 Show skill in performing soldering.

3.1 Select wires (single strand and multi strand) and cut wires to required length.
3.2 Select soldering iron, soldering tag and soldering lead.
3.3 Remove wire insulation to required length.
3.4 Clean and tin both iron and work piece.
3.5 Use a tinned iron in order to transfer adequate heat to the joint.
3.6 Joint two singles& multi stranded wires mechanically and solder.

4 Show skill in soldering & de-soldering of electronic components and wires to the other components and circuit boards.

4.1 Select electronic components, wires and PCB.
4.2 Determine the rating of the soldering iron suitable for the work piece.
4.3 Clean and tin both iron & work piece.
4.4 Feed new soldering materials to the tinned and heated joint, in order to produce a correctly soldering.
4.5 Check the quality of soldering.
4.6 Clean and tin iron and de-solder the joint and components.
4.7 Use solder suckers and solder braid for de-soldering.
4.8 Write a report on the Job.

5 Show skill in checking the semi-conductor diode.

5.1 Collect a range of semi-conductor diodes and manufactures literature.
5.2 Select the digital multi-meter and set the selector switch to ohm range.
5.3 Determine the specification of semi-conductor diode.
5.4 Compare the determined specification with that of manufactures literature.
5.5 Measure forward & reverse resistances of the diode.
5.6 Identify p and p side of the diode.
5.7 Determine the condition of the diode.

6 Show skill in sketching forward and reverse characteristics curves of a semiconductor diode.

6.1 Select meter, power supply, components and materials.
6.2 Complete circuit according to circuit diagram for forward bias.
6.3 Check all connections.
6.4 Measure forward bias and corresponding forward current.
6.5 Record results in tabular form.
6.6 Connect circuit according to circuit diagram of reverse bias.
6.7 Measure reverse bias and corresponding reverse current.
6.8 Record results in tabular form.
6.9 Sketch the curves form data.

7 Show skill in sketching waves of half wave rectifier circuit.

7.1 Select meter, component, oscilloscope and materials.
7.2 Complete circuit of a half wave rectifier according to circuit diagram.
7.3 Check the circuit before operation.
7.4 Measure the input and output voltage and observe wave shapes in the oscilloscope.
7.5 Sketch the output voltage wave shape.

8 Show skill in sketching waves of full wave center tapped rectifier circuit.

8.1 Select meter, component, oscilloscope and materials.
8.2 Complete a full wave rectifier circuit according to circuit diagram.
8.3 Check the circuit supply & polarity of supply.
8.4 Measure the input & output voltages and observe wave shapes in the oscilloscope.
8.5 Sketch the output voltage wave shape.
8.6 Compare the result with half-wave rectifier circuit.

9 Show skill in constructing full wave bridge rectifier.

9.1 Select meter, component, oscilloscope and materials.
9.2 Build the circuit according to the circuit diagram.
9.3 Check the circuit.
9.4 Measure the input and output voltage.
9.5 Observe wave shape.
9.6 Compare the result with other rectifiers.

10 Show skill in identifying the terminals of bipolar junction transistor.

10.1 Select pnp & npn bipolar junction transistors.
10.2 Take AVO meter and manufacture's literature of transistor.
10.3 Identify transistor legs.
10.4 Measure base-emitter, base-collector, forward and reverse resistance.
10.5 Determine the specifications with help of manufacturer's literatures.
10.6 Identify pnp & npn transistor.

11 Show skill in determining input and output characteristics of a transistor in common emitter connection.

11.1 Select component, AVO meters, circuit board and required materials.
11.2 Construct the circuit.
11.3 Adjust the biasing voltage to appropriate point.
11.4 Record input and output voltage and current.
11.5 Plot the curve with recorded data.

12 Show skill in measuring operating points (VCE and IC) for Transistor circuit.

12.1 Select a fixed bias transistor circuit materials.
12.2 Select required equipment.
12.3 Prepare the circuit.
12.4 Check the connections
12.5 Adjust the circuit**.**

13. Demonstrate the operation of a Hartly, Colpitt and R-C oscillator.

13.1 Draw the circuit diagram.
13.2 Select tools, equipment and materials.
13.3 Connect the circuit diagram.
13.4 Check and energize the circuit.
13.5 Observe the output for different frequencies

14. Study the operation of a transistor astable, monostable& bi-stable multivibrator circuit. Select an experiment circuit.

14.1 Select the required tools and materials.
14.1 Build up the circuit as per diagram.
14.1 Switch on the power supply.
14.1 Switch on the trigger signal.
14.1 Observe the wave shapes at each collector & base of the transistor

REFERENCE BOOKS :

1. A Text Book of Applied Electronics - R.S. SEDHA
2. Principles of Electronics - V. K. Mehta

65722 **COMMUNICATIVE ENGLISH** **T P C**
1 3 2

Full Marks: 100 (Practical-50.Theoretical-50)

Introduction

This Course Will Provide A Unique Foundation In The Basic Level For Developing Listening, Speaking, Reading And Writing Skills Into Some Of More Specialized And Advanced Capabilities Of Basic Operation In Communication.

Theory Part

Total Mark: : 50
Continuous Assessment : 20
Final Exam : 30

Objectives:

After The Completion of the Module, Learners Will Be Able To Develop-

Creative Writing Ability
Transferring Information, Ideas And Knowledge
#Communicative Competence Effectively In The Workplace Situation.

1.Comprehension For Reading Task (Mark:10)

(Text May Be Taken From Contemporary Journals, Editorial of News Papers Or From Online Resources)

Test Items:

1. MCQ (Guessing Meaning from Context)
2. Rearranging
3. Gap-Filling (With Clues or Without Clues)
4. Answering Questions
5. Summarizing

2. Composition (Mark: 20)

The Following Are The Topic Title Introduced For Writing Task:

1. Introduce Formal/Informal Greeting &Farewell
2. Describe The Idea Of Communication & Presentation Skills
3. Write Paragraph On The Basis Of Comparison and Contrast
4. Narrate Process, Stories And Interpreted Charts, Graphs.
5. Write Letters to the Print and Electronic Media
6. Write Letters of Advice, Complaints, Inquiry, Order and Cancellation
6. Prepare Seven Days Weather Report.
7. Make An Attractive Poster For The People Giving Advice To Protect The Environment.
8. Prepare A Series Of Questions About Personal Information, Place Of Interest, Foods, Hobby And Employment Opportunity.
9. Write Dialogue On The Following Situations
   # About Exchanging Views With A Person And Introducing One Narrating Daily Activities
   # Meeting At The Train Station & Asking Question About The Departure And Arrival Of The Train To The Station Manager
   # Meeting at The Airport And Asking The Flight Schedule
   # Getting To The Hotel And Asking For A Reservation
   # Social Language for Telephonic Conversation
   # Talking About the Weather, Trips & Sight Seeing
   # Asking Permission and Making Request.
   # Talking About Office and Office Manner
   # Talking About Etiquette and Manner
10. Prepare Job Application With A Complete CV For Job Suitable For You.

Practical Part:

Objectives:

1. **Communicate The Areas That Learners Encounter In Real Life Situation.**
2. **Reinforce The Basic Language Skills Of Listening And Speaking.**
3. **Integrate ICT As Tools In Learning Language.**

Course Content

Unit	Lesson	Title
1. Use Of Dictionary	Define Dictionary	1.1 Know How To Use A Dictionary 1.2 Learn At Least 10 Words In A Day With Correct Pronunciation (Follow The Link : Www.Marriunm-Englishdictionary.Com)
2. Basic Vocabulary Practice	Basic Words For Communication By ODGENS	2.1 Use 10 Most Common Formulas (Structure) To Write Correct Sentence. (Follow The Link: Www.Odgensbasicvocabulary.Com Www.Grammarly.Com)
3.Listening Skill Practice	Listen To The Audio Video Presentation On Current Real Life Situation	3.1 Practice Audio Video Conferencing Activities. 3.2. Communicate With The English Speaking People Online (Link: Www.Speaking24.Com)
4. Speaking Skill Practice (Self Interpretation)	Introduce Yourself With The Vocabulary Prescribed By ODGENS	4.1 Browse Vocabulary Related Phrases To Introduce You. (Link : Www.Youtube.Com/ Let Me Introduce Myself)
5. Listening Skill Practice	Listen To The Weather Reports, Sports Commentary In The English TV Channels.	5.1 Prepare Seven Days Weather Report For The Place You Are Staying. 5.2. Make Some Attractive Poster To Protect The Environment.
6. Speaking Skill Practice	Identify Formal And Informal Social Language	6. 1 Practice Conversation Emphasizing On Greetings & Farewell (Link- Www.Esl.Guide@About.Com) 6.2 Take Part In Audio Video Conferencing Activities 6.3 Ask Questions About Personal Information, Place Of Interest, Food, Hobby, Employment Opportunity With Foreign Friends Using Social Media.
7. Writing Skill Practice	Develop Paragraph	7.1 Develop Paragraph On The Basis Of Comparison, Contrast And Analysis. Check Plagiarism Wordiness By The Correction Software (Www.Grammarly.Com) 7.2. Write E-Mail, Send And Reply E-Mail

8. Listening Skill Practice	Watch Short Films, Documentary And Listen To The English Music(With Lyric) To Practice In A Group	8.1 Listen To Hard Talk, Interview 8.2. Prepare A Series Of Questions To Interview A Celebrity 8.3. Down Load Documentary From Www.Youtube.Com/Education
9.Presentation	Define Presentation	9.1 Edutain/Entertain Yourself Preparing A Documentary In A Group With The Activities Done During The Period Of Class Hours In The Lab For Communicative English.

Evaluation:
Students Can Be Evaluated Individually Or In A Group On The Basis Of Performance Done In The Lab. Furthermore, They May Be Given Online Test Using Authenticated Websites Like Www.Britishcoucil.Org/Education/Blog/Podcast/News/Weather,Www.Englishteststore.Com.Www.Ieltsexam.Com

Lab-Facilitator, 30 Students In A Group:

Physical Facility	Size (In Ft)	Area (In Sq Ft)
Class Room Cum Laboratory	1 5 × 20	300
Library	15 × 20	300
Wash Room	4 × 7	28

Lists Of Equipments And Resources For 30 Learners:

Personal Computers With Accessories	15
Projector Multimedia	01
Printer	01
Scanner	01
Modem	01
Essential Software	01 Set
Internet Connection For Each Computer	Broad Band/Dial Up
Camera (Digital)	01
Video Conferencing Equipments	01 Set
TV Card	01
Satellite Cable Connection	01
Head Phone	15
Related Books And Journals	01
First Aid Box	01

Reference:
Www.Britishcouncil.Org,Www.Marium-Websters.Com,Www.Compellingconversation.Com, Www.Esl.Guide@About.Com, Www.Bbc.Com/News, Www.Speaking24.Com, Www.Itutor.Com, Www.Ieltsexam.Com, Www.Englishteststore.Com, Www.Ginger.Com, Www.Grammarly.Com

(Note: This Course May Be Introduced After Fourth Semester Coz It Needs Some Maturity Of The Students To Adopt With The Course Materials And The Contents. These Themes Are Suggestive Not Prescriptive.)

65931	MATHEMATICS -3	T	P	C
		3	3	4

AIMS

- To enable to calculate the areas of regular polygons, hexagons, octagon, hydraulic mean depth (HMD) of a channel, area occupied by water of circular culvert. Excavation work.
- To provide the ability to calculate volume of regular solids like pyramid frustum of pyramid, prismoid, wedge and area of curved surfaces.
- To enable to use the knowledge of gradient of a straight line in finding speed, acceleration etc.
- To enable to use the knowledge of conic in finding the girder of a railway bridge, cable of a suspension bridge and maximum height of an arch.
- To make understand the basic concept and techniques of composition and resolution of vectors and computing the resultant of vectors.

- **SHORT DESCRIPTION**

Menstruation : Area of rectangles, squares, triangles, quadrilaterals, parallelograms, rhombus, trapezium, circle, sector, segment; Volume of rectangular solids, prism, parallelepiped, pyramids, cones, spheres, frustum of pyramid and cone; Area of curved surface of prism, Cylinder cone, pyramid and frustum of cone.

Co-ordinate Geometry: Co-ordinates of a point, locus and its equation, straight lines, circles and conic.

Vector: Addition and subtraction, dot and cross product.

DETAIL DESCRIPTION

MENSURATION:

1 Apply the concept of area of triangle.

1.1 Find the area of triangle in the form,

i) $A=\frac{\sqrt{3}}{4}a^2$, a = length of a side of equilateral triangle.

ii) $A=\frac{c}{4}\sqrt{4a^2-c^2}$, where a = length of equal sides, c = third side.

iii) $A=\sqrt{s\ (s-a)(s-b)(s-c)}$, where a, b, c = length of the sides of a triangle and 2s is the perimeter of the triangle.

1.2 Use formula in 1.1 to solve problems.

2 Apply the concept of finding areas of quadrilateral & Parallelogram & finding areas of rhombus & trapezium.

2.1 Define quadrilateral & Parallelogram.
2.2 Find the areas of quadrilateral when off sets are given.
2.3 Find the areas of a parallelogram.
2.4 Solve problems using above formulae.
2.5 Define rhombus & trapezium.
2.6 Find the areas of rhombus when the diagonals are given.
2.7 Find the areas of trapezium in terms of its parallel sides and the perpendicular distance between them.
2.8 Solve problems related to rhombus & trapezium.

3 Apply the concept of finding areas of regular polygon.

3.1 Define a regular polygon.
3.2 Find the area of a regular polygon of n sides, when

i) The length of one side and the radius of inscribed circle are given.
ii) The length of one side and the radius of circumscribed circle are given.

3.3 Find the area of a regular.
a) Hexagon
b) Octagon when length of side is given.

3.4 Solve problems of the followings types:
A hexagonal polygon 6 m length of each side has a 20 cm width road surrounded the polygon. Find the area of the road.

4 Understand areas of circle, sector and segment.

4.1 Define circle, circumference, sector and segment.
4.2 Find the circumference and area of a circle when its radius is given.
4.3 Find the area of sector and segment of a circle.
4.4 Solve problems related to the above formulae.

5 Apply the concept of volume of a rectangular solid.

5.1 Define rectangular solid and a cube.
5.2 Find geometrically the volume of a rectangular solid when its length, breadth and height are given.
5.3 Find the volume and diagonal of a cube when side is given.
5.4 Solve problems with the help of 6.2 & 6.3.

6 Apply the concept of surface area, volume of a prism, parallelepiped and cylinder.

6.1 Define a prism, parallelepiped and a cylinder.
6.2 Explain the formulae for areas of curved surfaces of prism, parallelepiped and cylinder.
6.3 Explain the formulae for volume of prism, parallelepiped and cylinder when base and height are given.
6.4 Solve problems related to 7.2, 7.3.

7 Apply the concept of the surface area, volume of pyramid, cone and sphere.

7.1 Define pyramid, cone and sphere.
7.2 Explain the formula for areas of curved surfaces of pyramid, cone and sphere.
7.3 Explain the formula for volumes of pyramid, cone and sphere.
7.4 Solve problems related to 8.2, 8.3.

CO-ORDINATE GEOMETRY

8 Apply the concept of co-ordinates to find lengths and areas.

8.1 Explain the co-ordinates of a point.
8.2 State different types of co-ordinates of a point.
8.3 Find the distance between two points (x_1, y_1) and (x_2, y_2).
8.4 Find the co-ordinates of a point which divides the straight line joining two points in certain ratio.
8.5 Find the area of a triangle whose vertices are given.
8.6 Solve problems related to co-ordinates of points and distance formula.

9 Apply the concept of locus & the equation of straight lines in calculating various Parameter.

9.1 Define locus of a point.
9.2 Find the locus of a point.
9.3 Solve problems for finding locus of a point under certain conditions.
9.4 Describe the Equation x=a and y=b and slope of a straight line.
9.5 Find the slope of a straight line passing through two point $(x_1, y_1,)$ and (x_2, y_2).
9.6 Find the equation of straight lines:
(i) Point slope form.
(ii) Slope Intercept form.
(iii) Two points form.
(iv) Intercept form.

(v) Perpendicular form.

9.7 Find the point of intersection of two given straight lines.

9.8 Find the angle between two given straight lines.

9.9 Find the condition of parallelism and perpendicularity of two given straight lines.

9.10 Find the distances of a point from a line.

10 Apply the equations of circle, tangent and normal in solving problems.

10.1 Define circle, center and radius.

10.2 Find the equation of a circle in the form:

(i) $x^2 + y^2 = a^2$

(ii) $(x - h)^2 + (y - k)^2 = a^2$

(iii) $x^2 + y^2 + 2gx + 2fy + c = 0$

10.3 Find the equation of a circle described on the line joining (x_1, y_1) and (x_2, y_2).

10.4 Define tangent and normal.

10.5 Find the condition that a straight line may touch a circle.

10.6 Find the equations of tangent and normal to a circle at any point.

10.7 Solve the problems related to equations of circle, tangent and normal.

11 Understand conic or conic sections.

11.1 Define conic, focus, Directorx and Eccentricity.

11.2 Find the equations of parabola, ellipse and hyperbola.

11.3 Solve problems related to parabola, ellipse and hyperbola.

VECTOR :

12 Apply the theorems of vector algebra.

12.1 Define scalar and vector.

12.2 Explain null vector, free vector, like vector, equal vector, collinear vector, unit vector, position vector, addition and subtraction of vectors, linear combination, direction cosines and direction ratios, dependent and independent vectors, scalar fields and vector field.

12.3 Prove the laws of vector algebra.

12.4 Resolve a vector in space along three mutually perpendicular directions

12.5 Solve problems involving addition and subtraction of vectors.

13 Apply the concept of dot product and cross product of vectors.

13.1 Define dot product and cross product of vectors.

13.2 Interpret dot product and cross product of vector geometrically.

13.3 Deduce the condition of parallelism and perpendicularity of two vectors.

13.4 Prove the distributive law of dot product and cross product of vector.

13.5 Explain the scalar triple product and vector triple product.

13.6 Solve problems involving dot product and cross product.

Reference

SL No	Athour	Title	Publication
01	G. V. Kumbhojkar	Companian to basic Maths	Phadke Prakashan
02	Murary R Spigel	Vector & Tensor Analysis	Schaum's Outline Series
03	Md. Abu Yousuf	Vector & Tensor Analysis	Mamun Brothers
04	Rahman & Bhattacharjee	Co-ordinate Geometry & Vector Analysis	H.L. Bhattacharjee
05	Md. Nurul Islam	Higher Mathematics	Akkhar Patra Prakashani

65922	PHYSICS-2	T	P	C
		3	3	4

OBJECTIVES

- To develop a foundation in scientific principles and processes for the understanding and application of technology.
- To develop an understanding of fundamental scientific concepts through investigation and experimentation.
- To provide a common base for further studies in technology and science.
- To develop the basic knowledge of modern physics.

SHORT DESCRIPTION

Thermometry and Heat Capacity; Expansion of materials (effect of heat); Heat transfer; Humidity; Nature of heat and Thermodynamics; Photometry; Reflection of light; Refraction of light; Electron , photon and Radio activity; Theory of Relativity.

DETAIL DESCRIPTION

THEORY

1. THERMOMETRY AND HEAT CAPACITY

1.1 Define heat and temperature.
1.2 Mention the units of measurement of heat and temperature.
1.3 Distinguish between heat and temperature.
1.4 Identify the range of the Celsius scale determined by the boiling point and melting point of water
1.5 State the construction and graduation of a mercury thermometer.
1.6 Define specific heat capacity, thermal capacity and water equivalent with their units.
1.7 Prove the total heat gained by an object is equal to the sum of the heat lost by all the surrounding objects.
1.8 Explain the principle of calorimetry.
1.9 Define various kinds of specific latent heat.
1.10 Determine the latent heat of fusion of ice and latent heat of vaporization of water.
1.11 Determine the specific heat of a solid by calorimeter.

2. EFFECT OF HEAT ON DIMENSION OF MATERIALS

2.1 Show that different materials change in size at different amounts with the same heat source.
2.2 Explain the meaning of differential expansion in bimetallic strip, thermostats, compensated pendulum etc.
2.3 Explain the methods of overcoming problems caused by the expansion of materials in buildings, machinery, railway lines and bridges.
2.4 Mention the units co-efficient of linear, superficial and cubical expansion of solids.
2.5 Define the co-efficient of linear, superficial and cubical expansion of solids.
2.6 Relation between the co-efficient of linear, superficial and cubical expansion of solids.
2.7 Define real and apparent expansion of liquid.
2.8 Relation between the real and apparent expansion of liquid.

3. HEAT TRANSFER

3.1 Identify the phenomena of heat transferring from hot bodies to cold bodies.
3.2 Explain the methods of heat transfer by conduction, convection and radiation with examples of each type of transfer.
3.3 Define thermal conductivity (K) and Co-efficient of thermal conductivity.
3.4 Find the unit and dimension of Co-efficient of thermal conductivity.
3.5 List the factors which determine the quantity of heat (Q) flowing through a material.
3.6 Show that the quantity of heat flowing through a material can be found from

$$Q = \frac{KA\,(\theta_H - \theta_C)t}{d}$$

3.7 State Stefan-Boltzman Law and wien's law.
3.8 State Newton's law of cooling.
3.9 Explain Green house effect.

4. HUMIDITY

4.1 Define Standard Temperature and Pressure.
4.2 Define Humidity, Absolute Humidity, Relative Humidity and Dewpoint.
4.3 Relation between vapour pressure and air pressure.
4.4 Determine Humidity by wet and dry bulb hygrometer.
4.5 Explain few phenomena related to hygrometry.

5. NATURE OF HEAT AND THERMODYNAMICS

5.1 Describe the caloric theory and kinetic theory of heat.
5.2 Explain the mechanical equivalent of heat.
5.3 State and Explain the first law of thermodynamics .
5.4 Explain Isothermal and adiabatic change.
5.5 Explain Specific heat of a gas, Molar specific heat or molar heat capacity.
5.6 Relate between pressure and volume of a gas in adiabatic Change i, e;$PV\gamma$=const.
5.7 State and Explain Reversible process and irreversible process.
5.8 State & explain 2^{nd} law of thermodynamics
5.9 Entropy: Definition, unit and significant.
5.10 Explain Change of entropy in a reversible and irreversible process.
5.11 Give an example of increase of entropy in irreversible process.

6. PHOTOMETRY

6.1 Define light, medium (transparent, translucent, opaque), luminous & non-luminous bodies, parallel, convergent & divergent of rays.
6.2 Show the travel of light in straight line.
6.3 Define photometry, luminous intensity, luminous flux, brightness and illuminating power.
6.4 Mention relation between luminous intensity & illuminating power.
6.5 Explain inverse square law of light.
6.6 Describe the practical uses of light waves in engineering.

7. REFLECTION OF LIGHT

7.1 Define mirror (plane & spherical), image (real & virtual) and magnification of images.
7.2 Describe the reflection of light.
7.3 State the laws of reflection of light.
7.4 Express the verification of laws of reflection.
7.5 Define pole, principal axis, center of curvature, radius of curvature, principal focus in case of concave & convex mirrors.
7.6 Find the relation between focal length & radius of curvature of a concave & convex mirror.
7.7 Express the general equation of concave and convex mirror.

8. REFRACTION OF LIGHT

8.1 Define refraction of light Give examples of refraction of light
8.2 State the laws of refraction and Express the verification of laws of refraction
8.3 Define absolute and relative refractive index and Relate absolute and relative refractive index
8.4 Explain the meaning of total internal reflection and critical angle and Relate total internal reflection and critical angle.
8.5 Give examples of total internal reflection.
8.6 Describe refraction of light through a prism.
8.7 Express the deduction of the relation between refractive index, minimum deviation and angle of the prism.
8.8 Define lens and mention the kinds of lens.
8.9 Identify and List uses of lens.
8.10 Express the deduction of the general equation of lens (Concave & convex).

9. ELECTRON, PHOTON AND RADIO-ACTIVITY

9.1 Describe Electrical conductivity of gases.
9.2 Describe Discharge tube.
9.3 Cathode ray : Definition and its properties
9.4 X-ray : Definition, properties & uses
9.5 Discuss Photo electric effect .
9.6 Derive Einstein's photo electric equation
9.7 Define and explain radio-activity.
9.8 Describe radio-active decay law.
9.9 Define half-life and mean-life of radio-active atoms.
9.10 Define nuclear fission and fusion.

10. THEORY OF RELATIVITY

10.1 Define Space, time and Mass.
10.2 Define rest mass.
10.3 Express the theory of relativity.
10.4 Explain special theory of relativity and its fundamental postulate.
10.5 Mention different Kinds of theory of relativity.
10.6 The Relativity of Length - Length contraction.
10.7 The Relativity of Time – Time dilation.
10.8 Deduce Einstein's mass -energy relation

PRACTICAL

1. Compare the operation of common thermometers.
2. Determine the co-efficient of linear expansion of a solid by Pullinger's apparatus.
3. Measure the specific heat capacity of various substances.(Brass, steel).
4. Determine the latent heat of fusion of ice.
5. Determine the water equivalent by calorimeter.
6. Compare the luminous intensity of two different light sources.
7. Verify the laws of reflection.
8. Find out the focal length of a concave mirror.
9. Determine the refractive index of a glass Slab.
10. Determine the angle of Minimum deviation and refractive index of a glass prism by using I-D graph.

REFERENCE BOOKS:

1. Higher Secondary Physics – Second Part - by Dr. Shahjahan Tapan
2. A Text Book of Heat and Thermodynamics - by N Subrahmanyam and Brij Lal
3. A Text Book of Optics - by N Subrahmanyam and Brij Lal
4. Higher Secondary Physics -Second Part - by Prof. Golam Hossain Pramanik
5. Higher Secondary Physics -Second Part - by Ishak Nurfungnabi
6. Thermodynamics - by K K Ramalingam

66611	COMPUTER APPLICATION	T	P	C
		0	6	2

OBJECTIVES

- **SHORT DESCRIPTION**

DETAIL DESCRIPTION

1. Operate a personal Computer

1.1 Start up a Computer

1.1.1 ***Peripherals*** are checked and connected with system unit
1.1.2 Power cords / adapter are connected properly with computer and power outlets socket
1.1.3 Computer is switched on gently.
1.1.4 PC ***desktop / GUI settings*** are arranged and customized as per requirement.

1.2 Operate Computer

1.2.1 Files and folders are created.
1.2.2 Files and folders are ***manipulated*** as per requirement.
1.2.3 Properties of files and folders are viewed and searched.
1.2.4 Control panel settings are practiced.
1.2.5 ***Memory devices*** are formatted as per requirement.

1.3 Shutdown computer

1.3.1 unsaved file and folders are closed
1.3.2 Open software is closed and hardware devices are switched off.
1.3.3 Computer is switched off gently.
1.3.4 Power at the respective power outlets is switched off.

2. Type text and documents in English and Bangla.

2.1 Install the Typing Tutor software

2.1.1 Required ***Hardware*** and ***software*** are ready to use.
2.1.2 Typing tutor software are collected and selected
2.1.3 English Typing tutor software is installed.
2.1.4 Specialized Bangla Typing tutor software is installed.

2.2 Practice text typing in English and Bangla

2.2.1 Typing tutor software is started.
2.2.2 English Home key drilling are practiced systematically
2.2.3 Intermediate level typing speed(25 cps) are achieved.
2.2.4 Specialized Bangla Typing tutor / software are installed.
2.2.5 Bangla Home key typing are practiced systematically
2.2.6 Text documents are typed repeatedly for increasing typing speed.

2.3 Type documents

2.3.1 ***Word processor*** is started.
2.3.2 Text document are typed.
2.3.3 Intermediate level typing speed (30 cps) in English and (20 cps) in Bangla are achieved.

3. Operate Word Processing Application

3.1 **Create documents**:

3.1.1 Word-processing application are opened.
3.1.2 ***Documents*** are created.
3.1.3 Data are added according to information requirements.
3.1.4 Document templates Used as required.
3.1.5 Formatting tools are used when creating the document.
3.1.6 Documents are Saved to directory.

3.2 Customize basic settings to meet page layout conventions:

3.2.1 Adjust page layout to meet information requirements
3.2.2 Open and view different toolbars
3.2.3 Change ***font format*** to suit the purpose of the document
3.2.4 Change alignment and line spacing according to document information requirements
3.2.5 Modify margins to suit the purpose of the document
3.2.6 Open and switch between several documents

3.3 Format documents

3.3.1 Use formatting features and styles as required.
3.3.2 Highlight and copy text from another area in the document or from another active document
3.3.3 Insert headers and footers to incorporate necessary data
3.3.4 Save document in another ***file format***
3.3.5 Save and close document to ***a storage device.***

3.4 Create tables:

3.4.1 Insert standard table into document
3.4.2 Change cells to meet information requirements
3.4.3 Insert and delete columns and rows as necessary
3.4.4 Use formatting tools according to style requirements

3.5 Add images:

3.5.1 Insert appropriate ***images*** into document and customize as necessary
3.5.2 Position and resize images to meet document formatting needs

3.6 Print information and Shutdown computer:

3.6.1 P*rinter* is connected with computer and power outlet properly.
3.6.2 Power is switched on at both the power outlet and printer.
3.6.3 Printer is installed and added.
3.6.4 Correct printer settings are selected and document is printed.
3.6.5 Print from the printer spool is viewed or cancelled and
3.6.6 Unsaved data is saved as per requirements.
3.6.7 Open software is closed and computer hardware devices are shut downed.
3.6.8 Power at the respective power outlets is switched off.

4. Operate Spreadsheet application

4.1 Create spreadsheets

4.1.1 Open spreadsheet application,
4.1.2 create spreadsheet files and enter numbers, text and symbols into cells according to information requirements
4.1.3 Enter ***simple formulas and functions*** using cell referencing where required
4.1.4 Correct formulas when error messages occur
4.1.5 Use a range of common tools during spreadsheet development
4.1.6 Edit columns and rows within the spreadsheet
4.1.7 Use the auto-fill function to increment data where required
4.1.8 Save spreadsheet to directory or folder

4.2 Customize basic settings:

4.2.1 Adjust page layout to meet user requirements or special needs
4.2.2 Open and view different toolbars
4.2.3 Change font settings so that they are appropriate for the purpose of the document
4.2.4 Change ***alignment*** options and line spacing according to spreadsheet ***formatting features***
4.2.5 ***Format*** cell to display different styles as required
4.2.6 Modify margin sizes to suit the purpose of the spreadsheets
4.2.7 View multiple spreadsheets concurrently

4.3 Format spreadsheet:

4.3.1 Use formatting features as required
4.3.2 Copy selected formatting features from another cell in the spreadsheet or from another active spreadsheet
4.3.3 Use ***formatting tools*** as required within the spreadsheet
4.3.4 Align information in a selected cell as required
4.3.5 Insert headers and footers using formatting features
4.3.6 Save spreadsheet in another format
4.3.7 Save and close spreadsheet to ***storage device***

4.4 Incorporate object and chart in spreadsheet:

4.4.1 Import an object into an active spreadsheet
4.4.2 Manipulate imported ***object*** by using formatting features
4.4.3 Create a chart using selected data in the spreadsheet
4.4.4 Display selected data in a different chart
4.4.5 Modify chart using formatting features

4.5 Create worksheets and charts

4.5.1 Worksheets are created as per requirement
4.5.2 Data are *entered*
4.5.3 ***Functions*** are used for calculating and editing logical operation
4.5.4 ***Sheets*** are formatted as per requirement.

4.5.5 ***Charts*** are created.
4.5.6 Charts/ Sheets are previewed.

4.6 Print spreadsheet:

4.6.1 Preview spreadsheet in print preview mode
4.6.2 Select basic printer options
4.6.3 Print spreadsheet or selected part of spreadsheet
4.6.4 Submit the spreadsheet to ***appropriate person*** for approval or feedback

5. Operate Presentation Package:

5.1 Create presentations:

5.1.1 Open a presentation package application and create a simple design for a presentation according to organizational requirements
5.1.2 Open a blank presentation and add text and graphics
5.1.3 Apply existing styles within a presentation
5.1.4 Use presentation template and slides to create a presentation
5.1.5 Use various ***Illustrations*** and ***effects*** in presentation
5.1.6 Save presentation to correct directory

5.2 Customize basic settings:

5.2.1 Adjust display to meet user requirements
5.2.2 Open and view different ***toolbars*** to view options
5.2.3 Ensure ***font settings*** are appropriate for the purpose of the presentation
5.2.4 View multiple slides at once

5.3 Format presentation:

5.3.1 Use and incorporate organizational charts, bulleted lists and modify as required
5.3.2 Add ***objects*** and manipulate to meet presentation purposes
5.3.3 Import ***objects*** and modify for presentation purposes
5.3.4 Modify slide layout, including text and colors to meet presentation requirements
5.3.5 Use ***formatting tools*** as required within the presentation
5.3.6 Duplicate slides within and/or across a presentation
5.3.7 Reorder the sequence of slides and/or delete slides for presentation purposes
5.3.8 Save presentation in another ***format***
5.3.9 Save and close presentation to disk

5.4 Add slide show effects:

5.4.1 Incorporate preset animation and multimedia effects into presentation as required to enhance the presentation
5.4.2 Add slide transition effects to presentation to ensure smooth progression though the presentation
5.4.3 Test presentation for overall impact
5.4.4 Use onscreen navigation tools to start and stop slide show or move between different slides as required

5.5 Print presentation and notes:

5.5.1 Select appropriate print format for presentation
5.5.2 Select preferred slide orientation
5.5.3 Add notes and slide numbers
5.5.4 Preview slides and spell check before presentation
5.5.5 Print the selected slides and submit presentation to appropriate person for feedback

6. Access Information using Internet and electronic mail

6.1 Access resources from internet

6.1.1 Appropriate internet ***browsers*** are selected and installed
6.1.2 Internet browser is opened and web address / URL is written/selected in /from address bar to access ***information.***
6.1.3 ***Search engines*** are used to access information
6.1.4 Video / Information are Shared /downloaded / uploaded from / to web site/***social media.***
6.1.5 ***Web based resources*** are used.
6.1.6 Netiquette' (or web etiquette) principles are searched and followed

6.2 Use and manage Electronic mail

6.2.1 ***Email services*** are identified and selected to create a new email address
6.2.2 Email account is created
6.2.3 Document is prepared, attached and sent to different types of recipient.
6.2.4 Email is read, forwarded, replied and deleted as per requirement.
6.2.5 Custom email folders are created and ***manipulated***
6.2.6 Email message is printed

67032 FOUNDARY AND PATTERN MAKING T P C
2 3 3

AIMS

- 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 modern industry.

1.2 Classify foundry.

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

1.4 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.

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.

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

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 moulding 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.

8.6 List the charged materials used for different furnaces.

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

8.8 Define refractory materials and types of refractory materials.

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 affecting 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 limited 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 limitation of die casting.

13 Understand the mechanization of foundries.

13.1 Make plant layout for foundries.

13.2 Describe foundry mechanization.

13.3 Describe moulding sand preparation unit for foundry.

13.4 Describe equipment required for frame and dust extraction.

13.5 Explain the uses of natural gas in cupola furnace.

13.6 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 etc.

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 equipment.

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.

7.7 Make a casting by using crucible furnace.

8. Perform charging the cupola for casting operation (Industrial visit).

8.1 Check temperature from time to time with pyrometer.

8.2 Check and repair the cupola.

8.3 Prepare the cupola bed.

8.4 Determine the quantity of charging materials.

8.5 Fire the cupola.

8.6 Charge the cupola.

8.7 Check the temperature from time to time with pyrometer.

8.8 Open the tap hole and collect the molten metal in a hot ladle.

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 Jain