

4-YEAR DIPLOMA IN ENGINEERING PROGRAM

MACHANICAL TECHNOLOGY

**SYLLABUS
(COURSE STRUCTURE-2010)**

**SEVENTH & EIGHTH
SEMESTER**

Mechanical Technology (70)

7th Semester

Sl. No	Subject code	Name of the subject	T P C			MARKS				
						Theory		Practical		
						Cont. assess	Final exam.	Cont. assess	Final exam.	
1.	7071	Machine Design	3	3	4	30	120	25	25	200
2.	7072	Tool Design	2	6	4	20	80	50	50	200
3.	7073	Manufacturing Process	3	0	3	30	120	-	-	150
4.	7074	Production Planning & Control	3	0	3	30	120	-	-	150
5.	7075	Basic Mechatronics	3	3	4	30	120	25	25	200
6.	7076	Mechanical Engineering Project	0	6	2	-	-	50	50	100
7.	5853	Entrepreneurship	2	0	2	20	80	-	-	100
		Total	16	18	22	160	640	150	150	1100

Mechanical Technology (70)

8th Semester

Sl. No	Subject code	Name of the subject	T P C			MARKS				
						Theory		Practical		
						Cont. assess	Final exam.	Cont. assess	Final exam.	
1.	7081	Industrial Training			6			180	120	300
		Total			6					300

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SEVENTH SEMESTER

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4-YEAR DIPLOMA IN ENGINEERING PROGRAM

MACHANICAL TECHNOLOGY

**SYLLABUS
(COURSE STRUCTURE-2010)**

SEVENTH SEMESTER

7071 MACHINE DESIGN

T	P	C
3	3	4

AIMS

- To be able to understand the basic concepts and principles of design of simple machine elements.
- To be able to understand the basic concept, Principles and technique of designing of different machine elements.
- To be able to understand the basic concept, principles and technique of selecting safe stress of different machine elements.
- To be able to understand the basic concept, principles and techniques of computing strength equations considering the theories of failures and be able to determine the size of machine elements.
- To be able to develop knowledge, skill and attitude of designing simple machine elements.

SHORT DESCRIPTION

Stresses in machine elements; Causes of failure of machine member; Pressure vessels; Screwed joints; Knuckle joint; Shaft; keys; couplings; Power screw; Belt & ropes; Springs; Gears; Clutches and Brakes.

DETAIL DESCRIPTION

Theory :

- 1 **Understand the analysis of stresses induced in machine elements & causes of failure of machine elements.**
 - 1.1 Identify machine elements.
 - 1.2 Describe working stress and factor of safety.
 - 1.3 Select suitable factor of safety for static, dynamic and fatigue loading.
 - 1.4 Describe thermal stress, impact stress, bending stress and torsional shear stress, combine stress.
 - 1.5 Define failures of machine elements.
 - 1.6 Define stress concentration factors.
 - 1.7 Select stress concentration factors for both static and fatigue loading.
- 2 **Understand pressure vessels.**
 - 2.1 Define pressure vessel.
 - 2.2 Distinguish between thin and thick pressure vessels.
 - 2.3 Define hoop stress.
 - 2.4 Identify longitudinal and circumferential stresses.
 - 2.5 Express the deduction of the equation relating to longitudinal and circumferential stresses for design pressure vessels.
 - 2.6 Solve problems related to the design of thin pressure vessels considering internal pressure.
- 3 **Understand the principle of designing screwed joints.**
 - 3.1 Define screw thread.
 - 3.2 Describe screw thread terminology.
 - 3.3 State common types of screw fastening.
 - 3.4 Describe the designation of screw thread.
 - 3.5 Mention the stress developed in screwed fastening.
 - 3.6 Mention the formula of axially loaded screwed joints.

- 3.7 Mention the formula of essentially loaded screwed joints.
 - 3.8 Solve problems related to screwed joints.
- 4 Understand the principles of designing knuckle joint.**
- 4.1 State knuckle joint.
 - 4.2 Sketch different types of knuckle joints.
 - 4.3 Identify knuckle joints.
 - 4.4 Express the derivation of the strength equations of knuckle joints.
 - 4.5 Solve problems related to the design of different components of knuckle joints.
- 5 Understand the principles of designing shafts.**
- 5.1 Distinguish among spindle, shaft and axle.
 - 5.2 Identify loading of shafts.
 - 5.3 Compute design stresses for shafts.
 - 5.4 Determine the effect of torque, bending moment, axial thrust, combined torque and bending moment.
 - 5.5 Calculate the diameter of a shaft (solid or hollow) subjected to the above loading.
 - 5.6 Solve problems related to the design of shafts.
- 6 Understand the principle of designing key & coupling.**
- 6.1 Define key & coupling.
 - 6.2 Identify different types of key & coupling.
 - 6.3 Calculate strength equations for keys, bolts and flanges of flange couplings.
 - 6.4 Calculate the sizes of keys and different dimensions of coupling
 - 6.5 Solve the problems relating to the design of keys and couplings.
- 7. Understand the principle of designing power screws.**
- 7.1 Define power screw.
 - 7.2 State the uses of power screw.
 - 7.3 Identify screw threads used in power screws.
 - 7.4 Mention the advantages and disadvantages of different threads used in power screws.
 - 7.5 Identify stresses induced in screw threads.
 - 7.6 Express the deduction of the formula for calculating torques to raise and to lower loads by screw threads.
 - 7.7 Calculate the efficiency of screw threads.
 - 7.8 Explain self locking and overhauling of screw threads.
 - 7.9 Solve problems related to the design of power screw threads.
- 8. Understand the principles of designing belts and ropes.**
- 8.1 Define belt and rope.
 - 8.2 State the uses of belt and rope.
 - 8.3 Identify the different types of belt and rope.
 - 8.4 Explain different types of belt drive.
 - 8.5 Express the deduction of the formula for calculating the power transmitted by belts and ropes.
 - 8.6 Identify the centrifugal tension in belt drives.
 - 8.7 Express the deduction of the formula for calculating the velocity ratio of belt drive without belt slip and considering belt slip.
 - 8.8 Find the conditions for maximum power transmission.
 - 8.9 Express the deduction of the formula for calculating the cross section of belts and ropes to transmit a certain power.
 - 8.10 Solve problems relating to the design of belts and ropes.
- 9. Apply the principles of designing springs.**

- 9.1 Identify different types springs.
 - 9.2 Recognise the stress induced in helical and leaf springs.
 - 9.3 Explain the terms spring index, scale of spring and resilience.
 - 9.4 Recognise the end conditions of helical compression springs.
 - 9.5 Calculate wire dia, coil dia, spring index, spring rate, solid height, free height, number of coils and resistance of helical coil compression springs.
 - 9.6 Calculate the load shared by the two concentric helical compression springs, stresses induced in them and the deflections of them.
 - 9.7 Solve problems relating to the design of helical and leaf springs.
- 10. Understand the principles of designing Spur gears & helical gears.**
- 10.1 Describe different types of gears.
 - 10.2 Identify the spur gears and helical gears.
 - 10.3 Explain the terms relating to spur gears and helical gears.
 - 10.4 Express the deduction of the formula for calculating the minimum number of teeth to avoid interference.
 - 10.5 Express the deduction of strength equation for spur gear tooth and helical gear tooth.
 - 10.6 Solve problems relating to the design of spur gears and helical gears.
- 11. Apply the principles of designing clutches and brakes.**
- 11.1 Identify the different types of clutches and brakes.
 - 11.2 Recognise the functions of clutches and brakes.
 - 11.3 Calculate the braking torque for brakes and frictional torque for clutches.
 - 11.4 Calculate the forces required to operate the clutches and brakes.
 - 11.5 Design the sizes of bands and shoes of brakes and the sizes of clutch plates.
 - 11.6 Solve problems relating to the design of clutches and brakes
- Practical:**
- 1 Perform the designing and drawing of shafts.**
 - 1.1 Search and make lists of shafts used in different machines in different workshops and laboratories of the institute.
 - 1.2 Design and draw a shaft.
 - 2 Design and draw a standard hexagonal headed bolt and hexagonal nut.**
 - 2.1 Design and draw a standard hexagonal headed bolt with standard metric thread.
 - 2.2 Design and draw a standard hexagonal nut with standard metric thread.
 - 2.3 Search and make lists of different types of threads used in different machines in different workshops and laboratories of the institute.
 - 3 Perform the designing and draw a knuckle joint**
 - 3.1 Design and draw a standard knuckle joint.
 - 3.2 Search and make lists of knuckle joints used in different machines in different workshops and laboratories of the institute.
 - 4 Perform designing and drawing a standard flange coupling.**
 - 4.1 Design and draw a standard flange coupling.
 - 4.2 Search and make lists of couplings used in different machines in different workshops and laboratories of the institute.
 - 5 Make a power screw.**
 - 5.1 Design a power screw.
 - 5.2 Draw a detail drawing of a power screw as per design.
 - 5.3 Collect necessary materials for making power screw.
 - 5.4 Assemble and disassemble a power screw.
 - 6 Make a helical spring.**
 - 6.1 Design a helical spring.
 - 6.2 Draw a helical spring as per design.
 - 6.3 Make a model of helical spring.

7 Make helical gear.

- 7.1 Design a helical gear.
- 7.2 Draw a helical gear as per design.
- 7.3 Prepare a blank for producing helical gear.
- 7.4 Make a helical gear.

Reference Book:

- 1. A text book of Machine Design- R.S. Khurmi & P.K. Gupta.
- 2. Machine Design- Nagpal.

7072 TOOL DESIGN

T P C
2 6 4

AIMS

- To be able to understand the basic concepts, principles and techniques of using different tools, work holders and other specific tools.
- To be able to understand the basic concepts, principles and techniques of various types of cold and hot working operations. .
- To be able to develop knowledge, skill and attitude of application and precaution in the use of robots.
- To be able to develop knowledge, skill and attitude of construction of jigs and fixtures.

SHORT DESCRIPTION

Tools of tool maker; Construction and operation of tools; Tooling materials and heat, temperature; Materials of cutting tool; Chip and chip formation; Design concepts of material cutting tools; Location and clamping method; Jigs and fixtures; Press operation.

DETAIL DESCRIPTION

Theory:

1 Understand the tools of tool maker.

- 1.1 Define tools of tool maker
- 1.2 Describe different types of tool for tools maker.
- 1.3 List the tools of the tool maker.
- 1.4 Describe the necessity for the tool designer to be familiar with the tool room equipment used by the tool maker.
- 1.5 Describe the uses of different tools of the tool maker.
- 1.6 Differentiate between dial test indicator and regular indicator.
- 1.7 Describe the processes of hand finishing and polishing.
- 1.8 Identify screws and dowels.

2 Understand the construction and operation of jig-boring

- 2.1 Construction of jig-boring
- 2.2 Describe the main operations of jig-boring.
- 2.3 Describe the constructional precaution of jig bushing.
- 2.4 List the points to be considered for manufacturing punches and dies.
- 2.5 Application of the jig-boring
- 2.6 List the tools for locating holes.
- 2.7 Describe briefly operations of hole location.

3 Understand the designing concepts of material as cutting tools.

- 3.1 Describe the basic requirement of cutting tools.
- 3.2 List the elements of cutting process.
- 3.3 Describe the geometry of cutting Tools.
- 3.4 Function of different cutting angles.
- 3.5 Explain the velocity relation of cutting tools.
- 3.6 Describe thermal aspects of metal cutting.
- 3.7 List the causes of tool wear and failure & their controlling aspect.

4 Understand the chip and chip formation.

- 4.1 Describe chips formation.
- 4.2 List different types of chips.

4.3 Describe the mechanism of chip formation.

4.4 Explain the geometry of chip formation.

5 Understand the location and clamping methods.

5.1 Describe the freedom of movements.

5.2 Describe the six point locations.

5.3 Explain the method of movement restriction for any object.

5.4 Differentiate clamp, locators and holders.

5.5 Identify suitable clamps and locators for various jobs.

6 Understand the basic concept of jigs and fixtures.

6.1 Describe jigs and fixtures.

6.2 Differentiate between jigs and fixtures.

6.3 Describe jig bushing.

6.4 List different types of jigs and jig bushing.

6.5 List different types of fixtures.

6.6 Describe the construction of different types of jigs.

6.7 Describe the construction of different types of fixtures

7 Understand the fundamentals of press tools.

7.1 Introduction of press.

7.2 Classification of press according to frame, power and speed of work.

7.3 Construction of mechanical and hydraulic press.

7.4 Working principle of mechanical and hydraulic press

7.5 Merits and demerits of hot and cold working press.

8 Understand the press operations.

8.1 Describe blanking & piercing dies, bending dies, forming dies and rubber dies.

8.2 Describe drawing operations.

8.3 Describe the method of preparing economical strip layout.

8.4 Describe the method of determining blank size.

8.5 Define capacity of press.

8.6 Describe the action of shearing force, bending force, drawing force and stripping force in press operation.

8.7 Explain the necessity of auxiliary press tools e. g. pilots, strippers, pressure pads, knockout and pineer pads.

9 Understand the concept of plastics as tooling materials.

9.1 Introduction plastics tools.

9.2 Plastics commonly used as tooling materials.

9.3 Application of epoxy plastic tools.

9.4 Construction methods of plastic tooling.

9.5 Metal forming operations with

9.6 Calculating forces for pressure pads

10 Understand of die and punch.

10.1 Define die and punch

10.2 Classification of die and punch.

10.3 Shearing action in die and punch operation.

10.4 purpose of die clearance

10.5 Merit and demerits of simple die, compound die, progressive die, combination die.

Practical:

1 Make a single point cutting tool by using mild steel bar.

- 1.1 Draw working drawing of a single point lathe cutting tool.
- 1.2 Collect the raw materials for single point cutting tool
- 1.3 Grind the bar to angles as per specification.
- 1.4 Measure the angles to verify the correctness.

2 Make twist drill bit by using mild steel rod.

- 2.1 Develop a layout of the drill bit.
- 2.2 Construct spiral flutes, margin, land, shank, tang and neck.
- 2.3 Grind and measure the cutting angles.

3 Make a straight shank reamer.

- 3.1 Develop the layout of the reamer.
- 3.2 Form the helical flutes and straight shank.
- 3.3 Check the correctness of measurement.

4 Make an automatic gravity punch by using mild steel rod.

- 4.1 Draw the working drawing of the punch.
- 4.2 Collect the raw materials.
- 4.3 Select the sequence of operations.
- 4.4 Make the parts as per drawing.
- 4.5 Assemble the parts and make a unit.

5 Make a box jig.

- 5.1 Design a model of box jig.
- 5.2 Develop the working drawing of the jig.
- 5.3 Collect the raw materials.
- 5.4 Write down the schedule of work and select the steps of operation.
- 5.5 Produce the parts.
- 5.6 Assemble the parts and inspect the workability of jig.

6 Make a simple die and punch.

- 6.1 Design a model of simple die and punch.
- 6.2 Draw a working drawing as per design.
- 6.3 Collect the raw materials as per drawing.
- 6.4 Write down the schedule of work and select the steps of operation.
- 6.5 Produce various parts as specified.
- 6.6 Assemble the parts for a unit.
- 6.7 Test the workability of the model.

7 Make a flat cold chisel.

- 7.1 Draw the working drawing of the job and collect the materials.
- 7.2 Produce a hexagonal shank.
- 7.3 Build up cutting edge and head.
- 7.4 Measure the cutting angle.

8 Design a urethane/epoxy resin forming die/mold.

- 8.1 Draw the working drawing of the job and collect the materials.
- 8.2 Produce a master pattern as per design.
- 8.3 Mix base materials (resin) with curing agent/hardener as per recommended ratio and pouring into the master pattern.
- 8.4 Machine the cast plastic blank as per drawing to produce the required die/mold.

REFERENCE BOOKS

1. Tools Design, by Donaldson – 3rd edition.
2. Job / Experiment, by Technical Education Board.

7073

MANUFACTURING PROCESS

T	P	C
3	0	3

AIMS

- To be able to understand the basic concepts, principles and techniques of manufacturing processes and system.
- To be able to develop the knowledge of nature and properties materials.
- To be able to understand the principles and techniques of making appropriate parts or elements of machines observing the proper methods.
- To be able to develop the knowledge to hot and cold working metal.
- To be able to understand the polymeric materials and their manufacturing processes.
- To be able to understand the plastic materials and their manufacturing processes.
- To be able to understand the corrosion of metals and their protection.
- To be able to understand different surface treatment processes.

SHORT DESCRIPTION

Manufacturing process & system; Hot working process; Cold working process; Corrosion of metals; Electro plating; Surface treatment; polymerization; plastic materials, contemporary casting processes, welding and joining processes of plastic materials; Glass; Ceramics.

DETAIL DESCRIPTION

Theory:

1 Understand the manufacturing process & system.

- 1.1 Define manufacturing process.
- 1.2 Explain the concept of manufacturing process.
- 1.3 Mention the different types of manufacturing process.
- 1.4 State the manufacturing system with block diagram.
- 1.5 Define reverse engineering.
- 1.6 Discuss the importance of reverse engineering in Bangladesh perspect.
- 1.7 Define concurrent engineering.
- 1.8 Describe four phases of concurrent engineering.
- 1.9 Describe the criteria for determining the economical product.
- 1.10 Explain scope and benefits of manufacturing process.

2 Understand the cold working process.

- 2.1 Define cold working process.
- 2.2 Mention different types of cold working process.
- 2.3 Explain the controlling parameters of cold working process.
- 2.4 Explain the effects of cold working process.
- 2.5 Describe the procedure of cold working process.
- 2.6 Describe the advantages of cold working process.
- 2.7 Describe the limitation of cold working process.
- 2.8 List the machines and accessories used in cold working process
- 2.9 Merits & demerits of plating on cold working process

2.10 List the name of products of cold working process.

3 Understand the hot working process.

- 3.1 Define hot working process.
- 3.2 Mention different types of hot working process.
- 3.3 Explain the controlling parameters of hot working process.
- 3.4 Explain the effect of hot working of materials.
- 3.5 Describe the procedure of hot working process.
- 3.6 Mention the advantages of hot working process.
- 3.7 Describe the limitation of hot working process.
- 3.8 List the machines and accessories used in hot working process
- 3.9 Merits and demerits of plating on hot working process
- 3.10 List the name of products of hot working process.

4 Understand the corrosion of metals.

- 4.1 Define of corrosion.
- 4.2 List different types of corrosion.
- 4.3 Explain the mechanism of corrosion.
- 4.4 Explain the controlling parameters of corrosion.
- 4.5 Explain the electro-chemical process of corrosion of the following materials:
 - (a) metal
 - (b) plastic
 - (c) ceramic.
- 4.6 Describe the preventive methods of corrosion.
- 4.7 Describe the different types of corrosive environment.
- 4.8 Describe the application methods of protective coating.
- 4.9 Explain electro-motive chart of corrosion.
- 4.10 Describe the process of vacuum metalizing.

5 Understand the fundamental aspect of electroplating.

- 5.1 Explain the meaning of electroplating.
- 5.2 Describe the principles of electroplating.
- 5.3 Narrate the objectives of electroplating.
- 5.4 Describe steps of pre-preparation of electroplating
- 5.5 Explain pickling, polishing, bobbing for electroplating.
- 5.6 State the meaning of electro-polishing and ultrasonic cleaning.
- 5.7 Describe the construction of electroplating equipment.
- 5.8 Describe the application method of electroplating.
- 5.9 Mention electroplating machinery and accessories
- 5.10 Discuss hazards of electroplating.

6 Understand the surface treatment processes.

- 6.1 Describe the necessity of surface treatment.
- 6.2 Describe various surface treatment processes.
- 6.3 Describe the importance of cleaning for surface treatment.
- 6.4 Explain anodic and cathodic coating.
- 6.5 Explain methods of electro-deposition.
- 6.6 Explain hot dipping processes.
- 6.7 Describe the metal spray processes.
- 6.8 Explain metal cladding and anodized coating.
- 6.9 Describe the electro-static coating process.
- 6.10 Differentiate paints and varnishes.

7 Understand the polymeric materials.

- 7.1 Define and classify polymer.
- 7.2 Define and classify polymerization
- 7.3 Show the addition and condensation polymerization with molecular formula.
- 7.4 Mention the ingredients of polymer.
- 7.5 Describe the characteristics of polymer.
- 7.6 Mention the source of the raw materials of polymer.
- 7.7 Describe the different manufacturing procedures of polymer.
- 7.8 Usages limitation of polymer:
- 7.9 Effects of polymers on environments.
- 7.10 Application of polymers.

8 Understand the plastic materials.

- 8.1 Define and classify plastics.
- 8.2 Differentiate thermo-plastics and thermosetting plastics.
- 8.3 State the characteristics of plastic.
- 8.4 Mention the ingredients of plastic.
- 8.5 Name the different components of die and mold.
- 8.6 Describe the following moulding methods:
 - (a) Compression moulding
 - (b) Extrusion moulding
 - (c) Transfer moulding
 - (d) Injection moulding
 - (e) Laminating plastics
 - (f) blow moulding and
 - (g) Vacuum forming.
- 8.7 Describe the joining of plastics.
 - (a) mechanical fasteners
 - (b) welding of plastics
 - (c) Solvent
- 8.8 Narrate the importance of recycling of plastic
- 8.9 Identify the different types of plastics
- 8.10 Mention uses of plastic materials.

9 Understand the fundamental aspects of glass.

- 9.1 State the characteristics of glass.
- 9.2 Mention the ingredients of glass.
- 9.3 Explain the controlling parameter of glass
- 9.4 Describe powder formation of glass ingredients.
- 9.5 Describe the construction of glass melting/annealing furnace.
- 9.6 Describe the process of mixing and melting of glass ingredients.
- 9.7 Explain fabrication of glass articles.
- 9.8 Describe the flame cutting process of glass.
- 9.9 Describe the process of annealing of glass articles.
- 9.10 Classify the glass products and their application.

10 Understand the fundamental aspects of ceramics.

- 10.1 State the characteristics of ceramics as materials.
- 10.2 Narrate the ingredients of ceramics.
- 10.3 Mention the source of ceramic raw materials
- 10.4 Explain the controlling parameter of ceramics
- 10.5 Describe sieving and mixing of ceramic powders.
- 10.6 Describe the process of preparation of ceramic powder.
- 10.7 Describe the forming technique of ceramic products
- 10.8 Explain screening, de-airing and separating water.

10.9 Describe the process of :

- (a) molding
- (b) drying
- (c) finishing and
- (d) firing articles

10.10 Classify the ceramic products and their application.

7074 PRODUCTION PLANNING AND CONTROL

T	P	C
3	0	3

AIMS

- To be able to understand the concepts, principles and techniques in terms of production in appreciating to choose efficient methods of production.
- To be able to understand the concepts, principles and techniques of production planning with a purpose in selecting appropriate site to set up a new factory.
- To be able to interpret new condition on a practical field for solving production problems.
- To be able to understand the production principles, techniques and their effect in production.
- To be able to appreciate the importance of familiarization with the various activities involved in the method and planning of production.

SHORT DESCRIPTION

Production system; Division of labor; Production planning; Localization of industry; Time study and motion study; Selection of factory site; Factory building; Plant layout; Equipment layout; Operation of factory; Production control; Quality control; Cost control; Inventory control; Materials handling; Case study.

DETAIL DESCRIPTION

- 1 **Understand different production systems.**
 - 1.1 Describe the scope and activity of production systems.
 - 1.2 Describe the factors to be considered in production.
 - 1.3 Distinguish job, batch and mass production.
 - 1.4 Describe the scale of production.
 - 1.5 Mention merits and demerits of small scale production.
 - 1.6 Mention the merits and demerits of large scale production.
- 2 **Understand the importance and scope of production planning.**
 - 2.1 Define production planning.
 - 2.2 Describe importance of production planning.
 - 2.3 State the different types and techniques of production planning.
 - 2.4 Describe routing and scheduling procedures.
 - 2.5 Describe machine loading.
 - 2.6 Describe products despatching and follow up it.
 - 2.7 State the benefits of production planning.
 - 2.8 Describe job planning, execution of job and monitoring.
 - 2.9 Describe recording and feed back.
- 3 **Understand the importance of localization of industry.**
 - 3.1 Describe localization of industry.
 - 3.2 Describe the factors which effect the localization of industry.
 - 3.3 Narrate the advantages of proper localization of industry.
- 4 **Understand the importance of time and motion study.**
 - 4.1 Define motion study, micro-motion study and time study.
 - 4.2 Describe work simplification.

- 4.3 Describe the uses of equipment of motion study.
 - 4.4 Describe the different techniques of motion study.
 - 4.5 Describe time study procedures and its limitations.
 - 4.6 Describe GANT chart and the THERBLIGS.
 - 4.7 Distinguish between time study and motion study.
 - 4.8 Determine the standard time for a job with the help of stop-watch method.
- 5 Understand the importance of selection of factory site.**
- 5.1 Describe the basis of site selection of a factory.
 - 5.2 Describe the factors for correct selection of factory site.
 - 5.3 Narrate the advantages of correct site selection.
- 6 Understand the importance of factory building.**
- 6.1 State the characteristics of factory building.
 - 6.2 State the different types of factory building.
 - 6.3 Describe the factors involved in selecting factory building.
 - 6.4 Mention the advantages and disadvantages of different types of building.
- 7 Understand the importance of plant layout.**
- 7.1 Explain plant lay out.
 - 7.2 Describe the fundamental factors of plant layout.
 - 7.3 Describe the different types of manufacturing plants.
 - 7.4 Relate the influences of processes on plant layout.
 - 7.5 Explain the necessity of studies of plant layout.
- 8 Understand the importance of equipment layout.**
- 8.1 Define equipment layout.
 - 8.2 Identify the factors to be considered for equipment layout.
 - 8.3 Enumerate the different types of equipment layout.
 - 8.4 Compare product and process layout.
- 9 Understand the techniques involved in operation of factory.**
- 9.1 Define operation, operation sheet and operation schedule.
 - 9.2 Prepare operation sheet.
 - 9.3 Prepare operation schedule.
 - 9.4 Distinguish between process chart and flow diagram.
- 10 Understand the importance of production control.**
- 10.1 Define production control.**
 - 10.2 Describe the factors involved in production control.**
 - 10.3 Narrate the advantages of production control.**
- 11 Understand the importance of quality control.**
- 11.1 Define quality control.
 - 11.2 Describe objectives and principle of quality control.
 - 11.3 Describe procedure of quality control.
 - 11.4 Describe the benefits of quality control.
 - 11.5 Discuss the role of quality control department.
- 12 Understand the importance of cost control.**
- 12.1 Define cost control.
 - 12.2 State the objectives of cost control.
 - 12.3 Describe the procedures of cost control.

- 12.4 Describe the advantages of cost control.
- 13 Understand the necessity of inventory control.**
- 13.1 Define inventory control.
 - 13.2 State the objectives of inventory control.
 - 13.3 Describe the different types of inventory control methods.
 - 13.4 Enumerate the advantages of inventory control.
 - 13.5 Describe the effects of inventory control for store management.
- 14 Understand the effects of material handling .**
- 14.1 Describe the principles, laminations and advantages of management.
 - 14.2 Make materials handling layout.
 - 14.3 Explain the factors to be considered for materials handling and handling equipment.
 - 14.4 Classify handling equipment.
 - 14.5 Describe derrick, Ganty cranes and lifting devices.
 - 14.6 Classify conveyors.
 - 14.7 Describe the uses and maintenance of conveyors.
 - 14.8 Explain economic considerations of using conveyors & other devices.
 - 14.9 Explain safety requirements.
- 15. Understand case study**
- Define case study.
- Explain the necessity of case study.
- Explain 'SIX M'.
- Study specific Cases relating Production.

REFERENCE BOOKS

1. Production Planning Control and Industrial management
 - K.C Jain
 - L.N Aggarwal
2. The principle of Industrial management
 - Alford and Betty
3. উৎপাদন ব্যবস্থাপনা
 - নাহিম আনজুম
4. কারবার ব্যবস্থাপনা
 - দুর্গা দাস ভট্টাচার্য

7075	BASIC MECHATRONICS	T 3	P 3	C 4
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AIMS

To be able to understand mechatronics with the basic skill required for the synergistic integration of technical & engineering with electronics & intelligent computer control in the manufacture of products and process.

SHORT DESCRIPTION

Concept of mechatronics; System integration; Sensor & transducer; Displacement, position & proximity sensor; Different types of sensors; Signal conditioning; Digital & analogue signal; Pneumatic & hydraulic actuation system; Electric actuator; Basic system of model; Closed loop controllers; Microcomputer system Microcontroller; Programmable logic controller (PLC); Machine vision.

DETAIL DESCRIPTION

Theory:

- 1 Understand the concept of mechatronics.**
 - 1.1 Define mechatronics.
 - 1.2 Explain mechatronics as the basis of industrial development.
 - 1.3 Discuss the integration of electronics with mechanical engineering.
 - 1.4 Discuss the use of mechatronics in computer integrated manufacturing environment.
- 2 Understand system.**
 - 2.1 Describe system.
 - 2.2 State measurement system.
 - 2.3 Explain control system.
 - 2.4 State open and closed loop system.
 - 2.5 Describe basic elements of closed loop system.
 - 2.6 Describe sequential controllers.
- 3 Understand the sensor & transducer.**
 - 3.1 Define sensor.
 - 3.2 Define transducer.
 - 3.3 Classify the transducer.
 - 3.4 State the performance terminology related to sensor.
 - 3.5 State static characteristics of sensor & transducer.
 - 3.6 State dynamic characteristics of sensor & transducer.
- 4 Understand displacement, position & proximity sensor.**
 - 4.1 Define displacement, position & proximity sensor.
 - 4.2 State the condition of selecting of different types of sensors.
 - 4.3 Mention the name of different types of displacement sensors.
 - 4.4 Mention the name of different types of position sensor.
 - 4.5 Mention the name of different types of proximity sensor.
 - 4.6 Describe different types of sensors (such as potentiometer, straingauge, capacitive, Differential eddy current proximity, Fractal, Bimetallic strips, Resistance temperature detectors (RTDs), LVDT, Thermister; Transistor, Thermocouple, light sensor).
- 5 Understand the signal conditioning.**

- 5.1 Define signal conditioning.
 - 5.2 Describe signal conditioning process.
 - 5.3 Explain the principles of operational amplifier.
 - 5.4 Explain the diagram of pin connection for operational amplifier.
 - 5.5 Describe different types operational amplifier.
- 6 Understand the digital & analogue signals & their conversions.**
- 6.1 State digital & analogue signals.
 - 6.2 Describe process of conversion from analogue to digital.
 - 6.3 State sampling theorem.
 - 6.4 Describe the process of conversion from digital to analogue.
 - 6.5 Explain analogue to digital conversion and digital to analogue conversion.
 - 6.6 State the function of multiplexer.
- 7 Understand the pneumatic & hydraulic actuation system.**
- 7.1 Define actuation system.
 - 7.2 Describe the power supply system of pneumatic & hydraulic actuation system.
 - 7.3 State the directional control valve.
 - 7.4 Identify the symbol of different valves used in pneumatic & hydraulic actuation system.
 - 7.5 Describe different types of valves.
 - 7.6 Describe the actuator sequential operation of cylinder.
 - 7.7 Describe process control valve.
 - 7.8 Describe valve bodies and plugs.
 - 7.9 Describe fluid control system.
 - 7.10 Describe the rotary actuator.
- 8 Understand the electrical actuator.**
- 8.1 Mention the name of basic devices which are included in electrical actuation system.
 - 8.2 Describe the sequence of operation of the relay control system.
 - 8.3 Describe diodes, thyristor & triacs and explain their characteristics.
 - 8.4 Explain the bipolar transistor.
 - 8.5 Distinguish between Mosfer transistor and bipolar transistor.
 - 8.6 State solenoids.
 - 8.7 Control of solenoids.
 - 8.8 Define steeper motor.
 - 8.9 Describe different types of steeper motor.
 - 8.10 Describe the excitation procedure of steeper motor.
 - 8.11 Describe the control of steeper motor.
- 9 Understand the basic system of model.**
- 9.1 Define modeling.
 - 9.2 Mention the purpose of basic system models.
 - 9.3 Describe the elements of mechanical system .
 - 9.4 Describe the elements of electrical system.
 - 9.5 State the structure of mechanical system.
 - 9.6 Explain modeling of measurement system.
 - 9.7 Discuss the importance of Laplace transformation pairs.
 - 9.8 State transfer function.
 - 9.9 Explain model diagram.
 - 9.10 Explain zeroth & fast order system.
- 10 Understand the closed loop controllers.**
- 10.1 State continuous & discrete process.

- 10.2 Define lag.
 - 10.3 Define steady state error.
 - 10.4 Find the unity feed of a system.
 - 10.5 Define different types of control mods.
 - 10.6 Describe different types of controller.
- 11 Understand the microcomputer system.**
- 11.1 Identify basic sections of computer.
 - 11.2 Explain the diagram of general computer system.
 - 11.3 Describe basic parts of CPU.
 - 11.4 Define memory.
 - 11.5 Classify different types of memory.
 - 11.6 Describe input / output unit.
 - 11.7 Define computer words.
 - 11.8 Describe different types of computer words.
 - 11.9 Define buses.
 - 11.10 Classify buses.
 - 11.11 Mention the function of buses.
 - 11.12 Classify different types of registers.
- 12 Understand the programmable logic controller (PLC).**
- 12.1 Define PLC.
 - 12.2 Mention the advantages of PLC.
 - 12.3 Describe the characteristics of PLC.
 - 12.4 Define the basic structure of PLC.
 - 12.5 Describe the method of input / output processing.
 - 12.6 Describe the programming of PLC.
 - 12.7 Describe logic function of PLC.
 - 12.8 Define latching & sequencing.
 - 12.9 Define memories.
 - 12.10 Define time circuit.
 - 12.11 Describe counter.
 - 12.12 Describe shift register.
- 13 Understand the microcontroller.**
- 13.1 Define microcontroller.
 - 13.2 List the building blocks of microcontroller.
 - 13.3 Describe pin diagram of the 8051 micro controller.
 - 13.4 Describe the memory Organization of the 8051.
 - 13.5 Describe the commonly used instruction of 8051.
 - 13.6 Describe the interfacing the 8051 with DC motor and stepper motor.
- 14 Understand the machine vision system.**
- 14.1 Define the machine vision.
 - 14.2 Define the machine vision system.
 - 14.3 Describe the principle of working of machine vision system.
 - 14.4 Describe the function of machine vision system.
 - 14.5 Identify the field of machine vision system.
 - 14.6 Explain application of machine vision system.

Practical:

1. Select electronic components used for automation.

2. Select the electrical and mechanical components used for automatic control.
3. Construct a control system incorporating electrical, Mechanical and electronic components.
4. Construct a photosensitive auto-stop mechanism for a lathe machine.
5. Construct an auto stop mechanism using timer circuit to stop a pump after certain time.
6. Construct a level indicator to show indication after reaching the required level and stooping the input valve.
7. Identify the automation mechanism involved NC (Numerical Control) machine.

Reference books:

1. W. Bolton-Applied Mechatronics.
2. De. Silva- Mechatronics.
3. Bishop- Mechatronics.

**7076 MECHANICAL ENGINEERING PROJECT T P C
 0 6 2**

AIMS

- To be able to develop knowledge, skill and attitude to apply subject knowledge in manufacturing of mechanical component.
- To be able to develop knowledge, skill and attitude to determine the economic benefit of the produced components using mechanical estimating subject.
- To be able to know that there are real possibilities for entrepreneurship and employment.

While doing the project work the following factors should be considered.

1. Component which is related to the mechanical engineering should be undertaken for the project work.
2. A technical report will be prepared.
3. In order to manufacture the product, a project planning document should be prepared considering the following points:-
 - (a) Pre Concept
 - (b) Market survey for raw materials& accessories.
 - (c) Equipment layout
 - (d) Estimating
 - (e) Flow diagram
 - (f) Procurement of raw materials
 - (g) Production processes
 - (h) Costing of the product

CONTENTS:

On the basis of the physical facilities and other facilities one or more than one product will be selected for production. The class teacher will act as manager and one or two students will act as foreman for the project class.

1 Perform the production and report writing of the perfect work.

- 1.1 Select any one or two products for the project work.
- 1.2 Make detailed working drawings of the selected product / products.
- 1.3 Prepare a list of raw-materials required for the manufacture of the product.
- 1.4 Draw a flow diagram of operations.
- 1.5 Set up relevant machines and equipment for producing the product.
- 1.6 Select jigs/fixtures or dies/molds or any other special tools if necessary.
- 1.7 Prepare a technical report on the project work / works on the basis of the following points:
 - (a) Name of project.
 - (b) Objectives
 - (c) Requirements:
 - (i) Machines
 - (ii) Materials

- (iii) Detail working drawing & assembly drawing.
- (iv) Flow diagram of operation
- (d) Estimating
- (e) Manufacturing procedures
- (f) Direct cost, indirect cost and overhead cost
- (g) OSH (occupational safety & health)
- (h) Conclusion
- (i) Reference

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ENTREPRENEURSHIP

T P C
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AIMS

- To be able to understand the concept of entrepreneurship & entrepreneur.
- To be able to understand the concept of environment for entrepreneurship.
- To be able to understand the sources of venture ideas in Bangladesh.
- To be able to understand the project selection.
- To be able to understand business planning.
- To be able to understand the case study

SHORT DESCRIPTION

Concepts of entrepreneurship & entrepreneur; Entrepreneurship & economic development; Environment for entrepreneurship; Entrepreneurship in the theories of economic growth; Sources of ventures ideas in Bangladesh; Evaluation of venture ideas; Financial planning; Project selection; Self employment; Entrepreneurial motivation; Business plan; Sources of assistance & industrial sanctioning procedure.

Insurance ; case study.

DETAIL DESCRIPTION

Theory :

1 Understand the basic concept of entrepreneurship & entrepreneur.

- 1.1 Define entrepreneurship & entrepreneur.
- 1.2 Discuss the characteristics and qualities of entrepreneur.
- 1.3 Mention the classification of entrepreneur.
- 1.4 Discuss the case entrepreneurship and mass entrepreneurship.
- 1.5 Discuss the necessity of entrepreneurship as a career.
- 1.6 Discuss the function of entrepreneur in developing countries.
- 1.7 Discuss the prospect of entrepreneurship development in Bangladesh.

2 Understand the concept of entrepreneurship and economic development.

- 2.1 Define economic development.
- 2.2 Discuss that the economic development is a process.
- 2.3 Describe the entrepreneurship as a factor of economic development.
- 2.4 Discuss the capital accumulation or rate of savings.
- 2.5 Discuss the role of entrepreneur in the technological development and their introduction into production Process.
- 2.6 Discuss the entrepreneur in the discovery of new sources of resources.
- 2.7 Discuss the entrepreneur in the discovery of new product.
- 2.8 Discuss the discovery of new markets.

3 Understand the concept of entrepreneurship in the theories of economic growth.

- 3.1 Define entrepreneurship in the theories of economic growth.
- 3.2 Discuss the theory of need for achievement of David MacClelland.
- 3.3 Discuss the Malthusian theory of population and economic growth.
- 3.4 Discuss the labour theory of production and limit to growth.
- 3.5 Discuss the Keynesian theory of employment and output.
- 3.6 Discuss the stage theory of growth.
- 3.7 Discuss the Schumpeterian theory of economic development.
- 3.8 Discuss the entrepreneurship motive in economic development.

4 Understand the sources of venture ideas in Bangladesh.

- 4.1 Define sources of venture ideas in Bangladesh.
- 4.2 Discuss different types of sources of venture ideas in Bangladesh.
- 4.3 Discuss informal sources of venture ideas in Bangladesh.

5 Understand the evaluation of venture ideas.

- 5.1 Define evaluation of venture ideas.
- 5.2 Discuss the factors that influence the selection of venture ideas.
- 5.3 Discuss the evaluating financial aspects of business.
- 5.4 Discuss the determinants of the firm size.

6 Understand the concept of project selection and financial planning.

- 6.1 Define project.
- 6.2 Discuss the idea of project.
- 6.3 Describe the guide lines for project ideas.
- 6.4 Discuss the sources of project ideas.
- 6.5 Discuss the evaluation of project ideas.
- 6.6 Describe the technical aspect of project.
- 6.7 Define financial planning.
- 6.8 Discuss the long term financial plan.
- 6.9 Discuss the short term financial plan.

7 Understand the concept of self employment.

- 7.1 Define self employment.
- 7.2 Describe different types of employment.
- 7.3 Describe the importance of business as a profession.
- 7.4 Discuss the reasons for success and failure in business.
- 7.5 Discuss the self assessment of entrepreneurial qualities.

8 Understand the concept of entrepreneurial motivation.

- 8.1 Define entrepreneurial motivation.
- 8.2 Discuss the achievement motivation theory.
- 8.3 Describe the means of improving achievement motivation.
- 8.4 Discuss the background of high need achievement.
- 8.5 Describe the problems associated with high need achievement.

9 Understand the business plan and the concept of the environment for entrepreneurship.

- 9.1 Define business plan.
- 9.2 Describe the importance of business plan.
- 9.3 Discuss the contents of business plan.
- 9.4 Describe the business plan proforma.
- 9.5 Define environment of business.
- 9.6 Describe the factors which effect environment on entrepreneurship
- 9.7 Discuss the aspects of business environment

10 Understand the concept of sources of assistance & industrial sanctioning procedure.

- 10.1 Define sources of assistance.
- 10.2 Describe different types of sources of assistance.
- 10.3 Describe entrepreneurship development cycle.
- 10.4 Discuss the aid of sources.
- 10.5 Discuss the industrial policy.
- 10.6 Describe the technique of industrial policy.
- 10.7 Define foreign aid.

11 Understand the insurance and premium.

- 11.1 Define insurance and premium
- 11.2 Describe the essential conditions of insurance contract.
- 11.3 Discuss various types of insurance.
- 11.4 Distinguish between life insurance and general insurance.

12 Understand the concept of case studies.

- 12.1 Define case study.
- 12.2 Discuss the objectives of case study.
- 12.3 Describe the method of case analysis.
- 12.4 Discuss the importance of case study.
- 12.5 Mention the advantages and disadvantages of case study