BANGLADESH TECHNICAL EDUCATION BOARD
Agargaon, Dhaka-1207

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

POWER TECHNOLOGY

TECHNOLOGY CODE: **671**

5th SEMESTER

DIPLOMA IN ENGINEERING
PROBIDHAN-2016

POWER TECHNOLOGY (671)

5th 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	67151	Power plant engineering	3	3	4	60	90	25	25	200
2	67152	Boiler operation & maintenance	2	3	3	40	60	25	25	150
3	67153	Engine Overhauling & Inspection	2	6	4	40	60	50	50	200
4	66271	Service Station Operation & Estimating	2	6	4	40	60	50	50	200
5	69054	Environmental Studies	2	0	2	40	60	0	0	100
6	65851	Accounting Theory & practice	2	3	3	40	60	50	0	150
Total			**13**	**21**	**20**	**260**	**390**	**200**	**150**	**1000**

67151 Power Plant Engineering

T	P	C
3	3	4

AIMS

To provide the students with an opportunity to acquire knowledge, skill and attitude in the area of power plant engineering with special emphasis on:

- sources of energy
- Thermal power plant
- gas turbine power plant
- hydroelectric power plant
- nuclear power plant
- non-conventional source of energy

SHORT DESCRIPTION

Fundamentals of power plant; Thermal power plant; Diesel power plant; Gas turbine power plant; Hydroelectric power plant; Nuclear power plant; Solar power plant; Wind energy; Biomass energy; Economic power plant.

DETAIL DESCRIPTION

Theory:

1. Understand the fundamentals of power plant.

1.1 State the meaning of power plant.
1.2 Outline the importance of power plant in day today life and future trend.
1.3 List the various sources of energy.
1.4 Mention the sources of energy available in Bangladesh.
1.5 List the conventional and non-conventional sources of energy.
1.6 Mention the factors for improving the generation of electric power.
1.7 Extract the safety rule of power plant.
1.8 Compare the conventional and non-conventional energy.

2. Understand the features of thermal power plant.

2.1 Selection of site for thermal power plant.
2.2 Draw the schematic diagram of a thermal power plant.
2.3 Mention classification of thermal power plant.
2.4 List the boiler mounting and accessories.
2.5 Describe the operation of a thermal power plant.
2.6 Describe the process of coal handling, storage and feeding.
2.7 Describe the operation of pulverized coal burner.
2.8 Outline the importance of chimney.
2.9 Express the deduction of formulae to calculate chimney height.
2.10 Solve problems by using the formula of chimney design.

3. Understand the features of diesel power plant.

3.1 Describe the operation of a diesel power plant.
3.2 Describe the cooling systems used in a stationary diesel engine.
3.3 Describe the various methods used for starting of diesel plant.
3.4 Point out the factors to be considered in selecting the site of a diesel power plant.
3.5 Mention the advantages and disadvantages of a diesel power plant.
3.6 Describe the starting and shut down procedure of a diesel power plant.

4. Understand the features of gas turbine power plant.

4.1 State what is meant by a gas turbine power plant.
4.2 Mention the various types of gas turbine power plant.
4.3 Describe the operation of open and closed cycle type gas turbine plant.
4.4 Describe a simple open type gas turbine cycle by using inter cooler, reheater and re-generator.
4.5 Mention the advantages and disadvantages of open and closed cycle of gas turbine power plant.
4.6 Describe the gas turbine cycle efficiency.
4.7 Describe the construction and operation gas engine power plant.
4.8 Mention the advantages and disadvantages of gas turbine power and gas engine power plant.
4.9 Describe the starting and shut down procedure of gas turbine and gas engine power plant.
4.10 Calculate the power developed in a gas turbine power plant.

5. Understand the features of hydro-electric power plant.

5.1 State the meaning of hydro-electric power plant.
5.2 Describe the operating principle of hydro-electric power plant.
5.3 Describe the various types of hydro-electric power plant.
5.4 Describe the elements of hydro-electric power plant viz reservoir, dam, forebay, water way, surge tank, penstock, spill way, draft tube.
5.5 Explain the performance of a water turbine.
5.6 Calculate the power (HP & KW) developed in a hydro-electric plant.
5.7 Mention the factors to be considered in selecting the site of a hydel power plant.
5.8 Compare the hydel power plant with steam power plant.

6. Understand the features of nuclear power plant.

6.1 Explain fission, fusion & chain reaction.
6.2 Describe the essential units of a nuclear plant.
6.3 Describe the working principle of some common type nuclear reactor, such as BWR, PWR, SGR & FBR.
6.4 Describe the method of waste disposal.
6.5 Describe the safety measure of a nuclear power plant.
6.6 Mention the advantages and disadvantages of nuclear power plant.
6.7 Mention the factors to be considered in selecting the site of a nuclear power plant.
6.8 Point out the maintenance and safety procedure of a nuclear power plant.
6.9 State the future of nuclear power plant in Bangladesh.

7. Understand the feature of solar power plant.

7.1 Define solar energy.
7.2 State the solar radiation at earth's surface.
7.3 Discuss the solar radiation geometry viz Declination, Hour angle, Altitude angle, Incident angle, Zenith angle, Solar azimuth angle.
7.4 Apply the solar energy in respective feild viz Space heating & cooling, Photo-voltaic electric conversion, Solar distillation, Solar cooking & furnace, Solar pumping & green house, Agriculture & industrial process heat.
7.5 Describe the Construction and working principle of typical flat plate collector and solar concentrate collector.
7.6 Draw a Block diagram of solar power plant.
7.7 Describe the advantages and disadvantages of solar power plant.
7.8 Discuss the Limitation of using of solar energy.

8. Understand the features of wind energy.

8.1 Mention the factors to be considered in selecting the site for the wind mill power plant.
8.2 Mention the components of a wind mill power plant.
8.3 Illustrate the Block diagram of a wind mill power plant.
8.4 Use of wind mill power plant.
8.5 Describe the principle of electricity generation with the help of wind energy.

9. Understand the features of Biomass energy.

9.1 State the Common species recommended for biomass.
9.2 Describe the Method for obtaining energy from biomass.
9.3 Classify of biomass- Gasified, Fixed bed and fluidized.
9.4 Apply the used of gasifier.
9.5 Describe the Agriculture wastes as a biomass.
9.6 List of Biomass digester.
9.7 Compare the biomass with conventional fuels.

10. Understand the features of economic power plant.

10.1 List of commonly used terms viz connected load, firm power, cold reserve, hot Reserve, spinning reserve.
10.2 Mention the term used in system operation viz Load curve, load duration curve, integrated duration curve. (Simple numerical based on plotting above curves).
10.3 Describe the Factors affecting the cost of power plant viz Average demand, Maximum demand, plant capacity factor & plant use factor, Diversity factor& load factor.
10.4 Explain load dispatch, center-capacity and load scheduling.
10.5 Explain load management of power plant.
10.6 Solve problems related to power plant economics.

PRACTICAL:

1. **Study the boiler of your institute.**
   - 1.1 Identify the type of boiler.
   - 1.2 Identify the boiler accessories and mounting.
   - 1.3 Identify the pressure gauge type of condenser.
   - 1.4 Identify the fuel firing system of boiler.
   - 1.5 Find out the manufacture's specification of boiler.
2. **Study the steam turbine of your institute.**
   - 2.1 Identify the type of steam turbine.
   - 2.2 Identify the components of steam turbine.
   - 2.3 Identify the governing system of turbine.
   - 2.4 Find out the manufacture's specification of steam turbine.
3. **Study the gas turbine model of your institute.**
   - 3.1 Identify the type of gas turbine.
   - 3.2 Identify the components of gas turbine.
   - 3.3 Start the gas turbine model with compressed air.
   - 3.4 Observe the operation of gas turbine.
   - 3.5 Stop the gas turbine.
4. **Study the pelton wheel model/ module of your institute.**
   - 4.1 Identify the components of pelton wheel.
   - 4.2 Operate the pelton wheel at different speed.
   - 4.3 Observe the operation of the wheel.
   - 4.4 Stop the pelton wheel.
5. **Study the Kaplan / Francis turbine model.**
   - 5.1 Identify the components of Kaplan/Francis turbine.
   - 5.2 Operate the Kaplan/Francis turbine.
   - 5.3 Observe the operation of Kaplan/Francis turbine.
   - 5.4 Stop the Kaplan/Francis turbine.
6. **Study the steam power plant.**
   - 6.1 Draw the schematic diagram of a typical steam power plant.
   - 6.2 Identify vapor cycle components.
   - 6.3 List the boiler accessories and boiler mountings used in the plant.
   - 6.4 List the boiler auxiliaries used in the plant.
   - 6.5 Identify the cooling system used in the plant.
7. **Study the hydro-electric power plant.**
   - 7.1 Draw the schematic diagram of a typical hydro-electric power plant.
   - 7.2 Identify the elements of the plant from the diagram.
8. **Study the gas turbine power plant.**
   - 8.1 Draw the schematic diagram of a gas turbine power plant.
   - 8.2 Identify the elements of gas turbine from the diagram.
   - 8.3 Identify the refinement component of the gas turbine cycle.
9. **Study the diesel power plant.**
   - 9.1 Draw the schematic diagram of a diesel power plant.
   - 9.2 Identify the components of diesel power plant.
   - 9.3 Identify the cooling system of diesel power plant.
   - 9.4 Identify the lubricating system of diesel engine.
   - 9.5 Identify the starting system of diesel power plant.
10. **Visit a thermal power plant and submit a report about the plant.**
11. **Visit a biomass/ biogas plant of municipal waste or elsewhere.**

REFERENCE BOOKS

1. Power Plant Engineering - Dr. Mohis Varma.
2. Power Plant Engineering - T. H. Moorse.
3. Power Plant Engg. & Economy - Willium & Vapot.
4. Power Plant Theory & Design - Phlips.

5. Power Plant Engineering - G. R. Nagpal.
6. A Course in Power Plant Engineering –Arora & S. Domkundwar.
7. Power Plant Engineering – H. B. Keswani.
8. Non-Conventional Energy sources - Prof. G. D. Rai, Khanna, New Delhi
9. Renewable Energy - Godfrey Boyle, Oxford University Press
10. Solar Energy - S P Sukhatme, Tata Mc Grawhill Publishing co. Ltd.

67152 Boiler Operation & Maintenance

T	P	C
2	3	3

AIMS

To provide the students with an opportunity to acquire knowledge, skill and attitude in the area of boiler operation & maintenance with special emphasis on:

- Boiler Fundamentals
- Water treatment
- Fundamentals of Combustion
- Burner Operation and Control
- Boiler Testing & maintenance
- Boiler Room Safety
- Cause and Effect Case Study

SHORT DESCRIPTION

Fundamentals of boiler; Boiler Auxiliaries; Boiler controls and safety devices; Basic knowledge of water treatment; Boiler Combustion; Inspection and testing before start up; Operation of boilers; Maintenance of boiler; Interlocking protection and troubleshooting; Fire prevention and plant safety; Specifications for boiler.

DETAIL DESCRIPTION

Theory:

1. **Understand the feature of Boiler.**
   - 1.1 Define boiler.
   - 1.2 Classification of boilers.
   - 1.3 Discuss the different types of boiler
   - 1.4 Explain boiler Blow-down.
   - 1.5 Define boiler capacity.
   - 1.6 Discuss boiler scaling.
   - 1.7 Mention the utility of boiler.
   - 1.8 State the operational procedure of boiler operation.
   - 1.9 Merits and demerits of fire tube and water tube boiler.
   - 1.10 Explain boiler efficiency.
2. **Understand the Boiler Auxiliaries, controls and safety devices.**
   - 2.1 List of the Boiler Mountings and Accessories.
   - 2.2 Describe the working and function of Boiler Mountings and Accessories.
   - 2.3 Describe the Maintenance procedure of boiler mountings.
   - 2.4 List the control and safety devices in a boiler
   - 2.5 Explain the different control units in a boiler
   - 2.6 Discuss the safety devices in a boiler.
   - 2.7 Describe the draft equipment and control.
3. **Understand the feature of boiler combustion.**
   - 3.1 Define the basic theory of combustion.
   - 3.2 List the components of air compressor.

3.3 Types of air compressor.
3.4 Describe the Construction & function of air compressor.
3.5 List the combustion parts viz Burner, servomotor, blower, injector
3.6 Describe the Construction & function of combustion parts.
3.7 Find the Causes and prevention of furnace explosions.

4. Understand the feature of Inspection and operation of boiler.

4.1 List of the visual inspection equipment.
4.2 Describe the inspection procedure of inspected equipment.
4.3 Describe the procedure of Startup and shut down boiler.
4.4 Knowledge of thermal shock and water hammer.
4.5 Illustrate the Routine operation and checks.
4.6 Demonstrate the Response to emergency conditions.
4.7 Discuss the Cleaning and preparing a boiler for inspection.
4.8 Find the Causes and prevention of pressure-side explosions.
4.9 Take relative readings to monitor and improve boiler and plant efficiency.

5. Understand the basic knowledge of water treatment.

5.1 Define treat water and its impurities.
5.2 Discuss of water pH.
5.3 Illustrate the Boiler water corrosion.
5.4 Find the Boiler water conditioning.
5.5 Solve the Boiler water problems – sludge, scale and foaming.

6. Understand the feature of boiler Maintenance.

6.1 List of the maintenance items.
6.2 Describe the Frequently and not Frequently Repaired during Major Overhaul (Steam Drum, Evaporator, Superheater, Economizer, Water Level)
6.3 Demonstrate the Maintenance Process and Quality Standards (Steam Drum, Evaporator, Superheater, Economizer, Water Level)
6.4 Show the Common Faults and Solutions for the (Steam Drum, Evaporator, Superheater, Economizer, Water Level)
6.5 Illustrate the Acceptance after Steam Drum, Evaporator, Superheater, Economizer and Water Level Maintenance.

7. Understand the feature of Hydro-static Test.

7.1 Demonstrate the Objectives for Hydro-static Test.
7.2 Classification of Hydro-static Test.
7.3 Illustrate the Conditions for Hydro-static Test.
7.4 Find the Standards for Hydro-Static Test
7.5 Discuss the Inspection before Tests.
7.6 Describe the Preparation before the Test.
7.7 Describe the Safety Precautions for Hydro-Static Test.

8. Interlocking protection and troubleshooting.

8.1 List the Interlocking Protection Power equipment.
8.2 Find the condition of LL and HL Feed water system.
8.3 Find the interlock condition of Combustion system.
8.4 Described interlock condition of the Steam system.
8.5 Discuss the dry or wet preservation to Furnace blow-out & maintenance.

9. Understand the feature of Fire prevention and plant safety.

9.1 Define the fire prevention and plant safety.
9.2 Classifications of fires.
9.3 Types of firefighting equipment.
9.4 Demonstrate the General plant safety and housekeeping.
9.5 Describe the Safety Consideration for Maintenance.
9.6 Describe the Safety Measures during Maintenance.

10. Understand the concept of Furnace Wall and Pipe Heat Insulation Maintenance.

10.1 Study the Strengthen Insulation Supporting Part and Holding Parts.
10.2 Demonstrate the Holding Part Design of Insulation Structure.
10.3 Describe the insulating Layer Construction.
10.4 Describe the Iron Wire Network Construction.
10.5 Explain the procedure of Surface Painting.

11. Specifications for Boiler

11.1 Table of designed parameters
11.2 Table of safety valve parameters
11.3 Table of operating and setting parameters
11.4 Brief introduction to structure
11.5 Boiler drum & internal configurations (specific dimension subjected to boiler pressure, etc.)
11.6 Water cooling system
11.7 Super-heater, Economizer
11.8 Burning unit, Chamber wall, Platform ladder
11.9 Other relevant accessories

PRACTICAL:

1. Study the boiler of your institute.

1.1 Identify the type of boiler.
1.2 Identify the boiler accessories and mounting.
1.3 Identify the pressure gauge type of condenser.
1.4 Identify the fuel firing system of boiler.
1.5 Find out the manufactures specification of boiler.

2. Frequently Repaired Items in Superheater during Overhaul

2.1 External cleaning of heating surfaces.
2.2 Anti-abrasion and anti-explosion inspection and handling.
2.3 Pipe clamp inspection and handling.
2.4 According to chemical and metallography analysis requirements, cut the pipe and conduct inner inspection.
2.5 Random check for the foreign steel welding seams.
2.6 Measure pipe and inspect abrasion.
2.7 Inspect and repair hanging and supports and the comb-shaped clamps which is used during clamp replacement.

3. Frequently Repaired Items in Economizer during Overhaul

3.1 According to chemical requirements, check economizer inner part for scaling and remove it.
3.2 Economizer hanging and support inspection.
3.3 Calibrate and maintain expansion indicator.

3.4 Economizer maintenance and insulating layer recovery.

4. Safety Measures during Desuperheater Maintenance

4.1 Main steam valve and its bypass, feedwater valve and emergency water discharge valve must be closed tightly, locked or hung with the warning “No opening”. The front dampers of intermittent blow-down main valve and superheater drainage main valve must be closed tightly.

4.2 In order to hang the desuperheater, the handrail must be removed.

4.3 Before working or knocking off, cover the plug of desuperheater, the outlet pipe and paste sealing strip onto it to prevent foreign matters from falling in.

4.4 When lifting the desuperheater core, keep its balance avoiding abrasion and crash to prevent desuperheater cooling water from damage.

4.5 Be careful when working and prevent falling from happening.

4.6 The platform must be tight and safe which must be able to bear the weight of personnel, maintenance tools and working parts.

4.7 During maintenance, the maintenance tools and the disassembled spare parts of devices must be placed in a tidy and clear way.

5. Water Level Maintenance

5.1 Check the external bolts, bolt caps and welding parts for severe deformation, rust. If the rust is not severe, clean it with steel brush. Otherwise, replace it.

5.2 Inspect the external corrosion. In case of rusted part, paint it to prevent the corrosion from spreading.

5.3 Inspect the corrosion on inner surface.

5.4 Inspect the contacting surface of the bushing in liquid room.

5.5 Check the bolts and bolt cap for cracks, corrosion and looseness or over-tightening. The bolt must be rotated freely.

5.6 Inspect the dust condition on the glass of each illuminator.

6. Air Compressor System Preparations for Startup

6.1 Check electrical connection are reliable;

6.2 Check oil level to ensure there is oil level to be seen from oil lens or oil level higher than the lower edge of the lens.

6.3 Put through water pipe (water cooling unit)

6.4 Open non-return vent valve.

6.5 Power on, stop motor immediately after startup to check if the rotation direction is the same with the arrow indicated, if not, reconnect the wire.

6.6 During full load operating, the oil level must be seen from the lens, if not, stop the compressor and fill lube oil till full load running level up to 2/3 to 3/4 of the observation lens.

6.7 Restart the compressor and slowly close the check valve till exhaust pressure up to the rated value.

6.8 Inspect to ensure all systems are of normal state and free of oil, air and water leakages as well as abnormal sounds.

6.9 Close non-return vent valve, check to ensure if unloading pressure is in accord with setting value, if not, reset again.

6.10 Shut down the compressor.

7. Dismantling Safety Valve Maintenance Procedure.

7.1 Make match marking on valve body and cap. Put the valve rod in open state.

7.2 Remove the gearing and dismantle it.

7.3 Remove gland cover and clean up padding.

7.4 Remove valve cap and clean up padding.

7.5 Screw out valve rod and dismount valve head. Keep it safely.

8. Removing Safety Valve Maintenance Procedure.

8.1 Removing rod jaw pin, yoke lever, bonnet, valve-stem nut cotter and valve-stem nut.

8.2 Remove fastening screw for nozzle ring and check position.

8.3 Remove fastening screw for regulating ring.

REFERENCE BOOKS

1. Heating Boiler Operator's Manual - Mohammad A Malek.
2. Boiler Operator's Handbook - Kenneth E heselton.
3. Boiler Operator's Guide - Anthony Kohan.
4. Boiler Operator's workbook - R. Dean Wilson.

67153 Engine Overhauling & Inspection

T	P	C
2	6	4

AIMS

To provide the students with an opportunity to acquire knowledge, skill and attitude in the area of automobile engine overhauling and inspection with special emphasis on:

- engine removal process from chassis
- engine top overhauling
- major overhauling
- inspection and maintenance of all engine components

SHORT DESCRIPTION

Features of overhauling and inspection; Test required for overhauling; Process of engine removal and cleaning; Process of engine top overhauling; Overhauling of cylinder, piston & connecting rod assembly; Overhauling of cam shaft, crankshaft and timing gear assembly; Feature of gasket; Lubricating system overhauling, Cooling system overhauling; Fuel system overhauling; Ignition system overhauling, Engine conversion.

DETAIL DESCRIPTION

Theory:

1. Understand the features of overhauling and inspection.

1.1 Define the terms overhauling and inspection.
1.2 Identify the types of overhauling.
1.3 List the symptoms of overhauling.
1.4 Outline the importance of inspection.
1.5 Identify the types of inspection.
1.6 Mention the causes of top, minor & major overhauling.
1.7 Distinguish the top, minor & major overhauling.
1.8 Mention the steps of overhauling.

2. Understand the test required for overhauling.

2.1 Describe the procedure of cylinder compression test.
2.2 Describe the procedure of cylinder leakage test.
2.3 Describe the procedure of engine vacuum test.

3. Understand the process of engine removal and cleaning.

3.1 Mention the steps of preparation for engine removing.
3.2 Describe the procedure of engine removing from chassis.
3.3 List the steps of precaution during engine removal from chassis.
3.4 Describe the methods of cleaning engine parts by steam, kerosene, gasoline, compressed air and various cleaning agents.

4. Understand the process of engine top overhauling.

4.1 Describe procedure of removing cylinder head from engine block.
4.2 Describe removal of valves and rocker arm mechanism.

4.3 Describe the procedure of de-carbonizing.
4.4 Describe the inspection procedure of cylinder head and valve guides.
4.5 Describe the removing and replacing of an engine valve guide.
4.6 Describe the procedure of inspection, testing & replacing a valve springs.
4.7 Describe the procedure of replacing valve seat insert and installing new inserts.
4.8 Describe procedure of adjusting tappet clearance of I-head, L-head, T-head and F-head engine.
4.9 Describe the procedure of inspecting hydraulic valve lifter.

5. Understand overhauling of cylinder, piston & connecting rod assembly.

5.1 Describe the procedure for removal of oil pan assembly.
5.2 Describe the procedure of removing cylinder ridge.
5.3 Describe the procedure of removing and inspection a piston and connecting rod assembly.
5.4 Describe the procedure of measuring of used engine cylinder for determining taper and out of round wear.
5.5 Describe the procedure for replacing connecting rod and piston assembly.
5.6 Describe the procedure for inspecting bearing clearance and adjusting connecting rod bearing in various methods.
5.7 Describe the procedure of connecting rod alignment.

6. Understand the overhauling of cam shafts, crank shaft and timing gear assembly.

6.1 Describe the procedure of removing cam shaft and inspect cam shaft bearings.
6.2 Describe the checking procedure of timing gear backlash.
6.3 Describe the procedure of installing timing chain.
6.4 Describe the procedure of replacing and setting a timing gear.
6.5 Describe the procedure of checking valve timing of In-Line engine without dismantling the engine.
6.6 Describe the testing procedure of crank shaft.
6.7 Describe the inspection of a worn bearing.
6.8 Describe the procedure of checking a cylinder head and block for fine crack.

7. Understand the features of gasket.

7.1 Mention the uses of gasket in an automobile.
7.2 Identify the types of gasket used in automobile.
7.3 Name the materials used in gasket making.
7.4 Describe preparation of a gasket.

8. Understand the features of lubricating system overhauling.

8.1 Describe replacing procedure of oil filter.
8.2 Describe the procedure of overhauling lube-oil pump-gear type, rotor type and plunger type.
8.3 Describe the precaution of overhauling a lube oil pump.

9. Understand the features of cooling system overhauling.

9.1 Describe the procedure of inspecting and adjusting fan belt.
9.2 Describe the removing and testing thermostat.
9.3 Describe the inspection procedure of leakage in the cooling system.
9.4 Describe the procedure of overhauling water pump.
9.5 Describe the procedure of checking and replacing radiator pressure cap.
9.6 Describe the process of cleaning radiator and water jacket.

10. Understand the features of fuel system overhauling.

10.1 Describe the procedure of disassembling and reassembling conventional carburetor and complex type carburetor to find out faults with remedies.
10.2 Describe the test procedure of pressure and vacuum of gasoline fuel pump.
10.3 Describe the procedure of disassembling and reassembling of in- line type high pressure fuel pump and find out the faults with remedies.
10.4 Describe the procedure of disassembling and reassembling of distributor type high pressure fuel pump.
10.5 Describe the procedure of disassembling and reassembling of unit injector type high pressure fuel pump.
10.6 Describe the phasing and calibration of high pressure pump.
10.7 Describe the procedure of disassembling and reassembling of injector and find out the faults with injector tester.
10.8 Describe the testing procedure of EFI injector.

11. Understand ignition system overhauling.

11.1 Describe the disassembling, inspecting and assembling of ignition system.
11.2 Describe the procedure of checking the ignition system components.
11.3 Describe the procedure of checking ignition system by automotive scanner.
11.4 Explain the test for missing cylinder.

12. Understand the Concept of Engine Conversion

12.1 Define the objectives of engine conversion.
12.2 List the name of components required for conversion.
12.3 Describe the functions of each components required for conversion.
12.4 Describe the operation of conversion system with block diagram.

PRACTICAL:

1. Remove engine from chassis.

1.1 Disconnect the all external connections to the engine.
1.2 Drain out the coolant and lubricants of the engine.
1.3 Remove all external accessories of the engine.
1.4 Remove engine from the chassis with the help of hydraulic floor jack or portable crane.
1.5 Clean the engine by steam cleaner or by any other cleaner.

2. Perform top overhauling.

2.1 Remove cylinder head cover or tappet cover.
2.2 Measure the tightening torque of head bolts.
2.3 Remove the head bolts as per prescribed rule or sequence and remove the cylinder head.
2.4 Disassemble the components of cylinder head and clean them.
2.5 Inspect cylinder head and other components viz: valve, valve spring, valve guide, rocker arm, rocker arm shaft, etc. for their work ability.
2.6 Assemble the components of cylinder head and keep it in safe side.
2.7 Follow safe and systematic procedure of overhauling.

3. Remove the oil pan and accessories.

3.1 Remove the oil pan and keep the bolts in it.
3.2 Remove oil pump with strainer.
3.3 Remove timing chain / gear cover and other accessories.

4. Remove the piston and connecting rod assembly.

4.1 Inspect ring ridge of cylinder.
4.2 Remove cylinder ring ridge (if any) by a ridge remover.
4.3 Measure the tightening torque of big end bearing cap and mark the piston.
4.4 Loosen the nut bolt of connecting rod and remove bearing cap with bearing.
4.5 Remove the piston assembly from crankshaft.
4.6 Dismantle the piston, connecting rod and piston rings.
4.7 Clean and inspect them for their work ability.
4.8 Follow safe and systematic procedure.

5. Remove and inspect the crankshaft assembly.

5.1 Remove fly wheel.
5.2 Remove timing chain or gear cover.
5.3 Measure the tightening torque of main journal bearing cap and remove the bearing caps with marking.
5.4 Remove the crankshaft.
5.5 Clean and inspect the work ability of crankshaft.
5.6 Measure taper and out of round of crank shaft.
5.7 Follow safe and systematic procedure.

6. Remove and inspect the camshaft and bearing assembly.

6.1 Remove camshaft.
6.2 Remove camshaft bearing.
6.3 Clean and inspect camshaft and camshaft bearing for their work ability.
6.4 Follow safe and systematic procedure.

7. Perform inspection of cylinder and cylinder blocks.

7.1 Inspect cylinder bore of taper and out round wear.
7.2 Inspect cylinder bore for glazing and other condition.
7.3 Inspect cylinder block for fine crack.
7.4 Remove and replace cylinder liner.
7.5 Follow safe and systematic procedure.

8. Perform servicing lubricating system overhauling.

8.1 Disassemble lube oil pump and check side clearance, teeth clearances, end clearance and compare the reading with manufacturers wear limit.
8.2 Assemble lube oil pump.
8.3 Remove and replace oil filter.
8.4 Adjust oil pressure.
8.5 Clean the oil strainer and fit it with pump.

9. Perform the servicing of cooling system overhauling.

9.1 Test a thermostat of cooling system.
9.2 Flush the engine water jacket and radiator.
9.3 Remove water pump, dismantle and examine all parts for crank and wear.
9.4 Test the leakage of cooling system by using a pressure tester.

10. Perform petrol fuel system overhauling.

10.1 Check delivery pressure and discharge rate of gasoline fuel pump.
10.2 Overhaul a carburetor and replace the defective parts and gasket.
10.3 Test the injector pattern and quantity of injected fuel by EFI tester

11. Perform Diesel fuel system overhauling.

11.1 Test phasing and calibration of high-pressure fuel pump.

11.2 Test the injector pattern of fuel by injector tester.

12. Perform ignition system overhauling.

12.1 Align CB point and adjust the gap.

12.2 Clean spark plugs and adjust gap.

12.3 Set the ignition timing and test with ignition timing gun.

12.4 Test primary circuit for short circuit and high resistance.

13. Perform assembling of complete engine.

13.1 Assemble the engine step by step.

13.2 Follow safe and systematic procedure.

14. Perform the installation of engine on chassis.

14.1 Re-install the engine with proper tools and equipment.

14.2 Refit all external accessories of the engine.

14.3 Connect all electrical and mechanical linkage.

REFERENCE BOOKS

1. Automobile Machine - Crouse & Alinger.
2. Automobile Engine Overhauling - A. W. Judge.
3. Automobile Engine Maintenance & Repair - Venk and Billet.
4. Automotive Fundamentals - F. Nash

66271 Service Station Operation & Estimating

T	P	C
2	6	4

AIMS

To provide the students with an opportunity to acquire knowledge, skill and attitude in the area of automotive service station operation with special emphasis on:

- fundamental of service station
- planning and site selection of service station
- organogram and management of service station
- Servicing & maintenance different systems of automobile.
- Engine tuning.

SHORT DESCRIPTION

Fundamentals of service station; Planning and site selection of service station; Organogram of service station; Management of service station; Estimating and costing; Insurance claim; Tools and equipment: servicing and maintenance of automobile, Engine tuning, Tire construction & servicing. Estimating.

DETAIL DESCRIPTION

Theory

1. **Understand the fundamentals of service station.**
   - 1.1. Define service station.
   - 1.2. Mention the purpose of service station.
   - 1.3. Mention the classification of the service station.
   - 1.4. Mention the services offered by different types of service station and garage.
2. **Understand the planning and site selection of service station.**
   - 2.1. Mention the steps in planning a service station.
   - 2.2. Identify the sections of an ideal service station.
   - 2.3. List the factors to be considered before selecting a service station.
   - 2.4. Describe a good site plan of a service station considering entry, exit and parking.
   - 2.5. Draw the layout of a modern service station showing its different sections with dimensions.
3. **Understand the organogram of service station.**
   - 3.1. List the different types and number of employee required for an ideal service station.
   - 3.2. Describe the organization chart of an ideal service station.
   - 3.3. Define the terms: job description, job specification and personnel specification of the employees.
   - 3.4. Prepare a job description, job specification and personnel specification of a diploma engineer employed in a service station.

4. **Understand the management of service station.**
   - 4.1. Define the terms: management, store keeping, inventory, job card, bin card, goodwill and VAT.
   - 4.2. Mention the functions of store keeping in a garage or service station.
   - 4.3. Prepare various types of forms and job cards for better store recording.
   - 4.4 Mention the laws and rules of taxation on automotive service work.
   - 4.4. Identify the points for developing better goodwill between the customers and suppliers.
   - 4.5. Identify the incentive measure necessary in service station operation.

5. **Understand the estimating and costing of services in a service station.**
   - 5.1. Define the term estimating and costing.
   - 5.2. Distinguish between estimating and costing.
   - 5.3. Identify different types of costing of service in a service station.
   - 5.4. Describe the process of job estimating and costing.

6. **Understand the insurance claim process for service station.**
   - 6.1. Define insurance.
   - 6.2. Mention the functions of insurance.
   - 6.3. Explain the insurance of motor vehicle.
   - 6.4. Explain the insurance of workshop equipment and injured employees.
   - 6.5. Describe the insurance claim procedure.

7. **Understand the tools and equipment for service station.**
   - 7.1. List the tools and equipment for different sections of the service station.
   - 7.2. List the special tools and equipment required for special services in the service station.
   - 7.3. Describe the operation of air compressor, hydraulic bottle jack, hydraulic trolley jack, hydraulic lift and electric motor operated car lift.

8. **Understand the servicing of automobile.**
   - 8.1. Describe the cleaning / washing and drying procedure of a vehicle.
   - 8.2 Describe the polishing procedure of a vehicle body.
   - 8.2. Describe the procedure of changing engine oil, gear oil, automatic transmission fluid (ATF), differential oil & oil filter.
   - 8.3. Describe the procedure of greasing of automobile chassis.
   - 8.4. Describe the servicing procedure of carburetor & EFI engine fuel system.
   - 8.5. Describe the procedure of diesel engine fuel system servicing.
   - 8.6. Describe the procedure of servicing engine cooling system.
   - 8.7. Describe the procedure of servicing electrical equipment of a car.
   - 8.8. Describe the servicing of automotive brake system.
   - 8.9. Describe the servicing procedure of power transmission system.
   - 8.10. Describe the procedure of wheel alignment & balancing

9. **Understand the construction & servicing of tire.**
   - 9.1 Define tubed & tubeless tire.
   - 9.2 Mention the functions of tire.
   - 9.3 List the parts of tire.
   - 9.4 Explain Radial & Bias ply tire.
   - 9.5 Mention advantages & disadvantages of redial and Bias ply tire.
   - 9.6 Explain tire tread pattern.
   - 9.7 Explain tire specification.
   - 9.8 Explain tire rotation procedure.
   - 9.9 Mention the causes of abnormal tire wear.

10. Understand tire Vulcanizing.

10.1 Define tire Vulcanizing.

10.2 Mention the type of tire vulcanizing.

10.3 Describe the different types of tire vulcanizing method.

11. Understand wheel balancing.

11.1 Define wheel balancing.

11.2 Classify wheel balancing procedure.

11.3 Mention the necessity of wheel balancing.

11.4 Describe the different type of wheel balancing procedure.

12. Understand the aspect of engine maintenance.

12.1 Mention the meaning of maintenance.

12.2 Outline the importance of engine maintenance

12.3 Mention the types of engines maintenance.

12.4 Explain the preventive maintenance of IC engine.

12.5 Explain the daily maintenance of IC engine.

12.6 Explain the routine/schedule maintenance of IC engine.

12.7 Explain the typical preventive daily schedule maintenance chart of IC engine.

12.8 Define engine tuning

12.9 Describe the procedure of engine tuning.

PRACTICAL:

1. Study the tools and equipment of service station.

1.1. Identify the tools and equipment for different types of work in a service station.

1.2. Identify the special tools and equipment for special work of service station.

2. Study the hydraulic bottle jack or hydraulic trolley jack.

2.1 Identify the components of a jack.

2.2 Service a hydraulic bottle jack.

2.3 Service a hydraulic trolley jack.

3. Perform servicing of an electric motor operated car lift / hoist.

3.1. Identify the components of the lift.

3.2. Clean the required components.

3.3. Apply grease to required components.

4. Perform cleaning and greasing of a vehicle.

4.1. Clean the dirt from vehicle by cold water or steam.

4.2. Wipe the water particles from auto body.

4.3. Apply grease at different greasing point of the vehicle.

4.4. Apply polish on vehicle body.

5. Perform following test of and adjustment of I.C engine.

5.1 Measure tappet clearance and adjust tappet clearance of a petrol/diesel engine.

5.2 Test engine timing belt-tension and adjust belt tension of a petrol/diesel engine.

6. Service the gasoline fuel system.

6.1 Identify the component of gasoline fuel system.

6.2 Remove & reinstall fuel filter.

6.3 Remove, clean and reinstall the air filter element

6.4 Clean and adjust the carburetor properly.

7. Service the EFI engine fuel system.

7.1 Clean and test the injector of EFI engine.

7.2 Test the fuel pump performance of EFI engine.

8. Service the diesel fuel system.

8.1 Identify the components of the diesel fuel system.

8.2 Remove & reinstall the fuel filter(s).

8.3 Remove, clean and reinstall the air filter element.

8.4 Remove air from the fuel line.

8.5 Adjust the injection pressure.

9. Service the lubricating system.

9.1. Identify the components of lubricating system.

9.2. Drain the engine oil

9.3. Remove and reinstall the lube oil filter.

9.4. Flush the lubricating system.

9.5. Remove and reinstall the main engine oil seals.

9.6. Refill the engine oil.

10. Service the cooling system.

10.1 Identify the components of cooling system.

10.2 Adjust fan belt tension.

10.3 Test cooling system for leakage.

10.4 Flush the radiator.

10.5 Flush the water jacket.

10.6 Remove, test and install the thermostat valve.

10.7 Fill up the cooling system with coolant.

11. Service the ignition system.

11.1 Identify the components of ignition system.

11.2. Clean, align and adjust the CB point.

11.3 Clean the spark plug and adjust spark plug gap.

11.4. Test and adjust the ignition timing.

11.5 Test the condenser of ignition system.

11.6 Test the ignition coil of ignition system.

11.7 Test the spark intensity of the ignition system & test for missing cylinder.

12. Service the charging system.

12.1. Identify the components of charging system.

12.2. Test the alternator output.

12.3. Clean, toping up and test the condition of battery.

12.4. Charge the battery.

12.5. Test the alternator regulator for its workability.

13. Service the automotive brake system.

13.1. Identify the components of brake system.

13.2. Disassemble, clean and assemble a master cylinder.

13.3. Disassemble, clean and assemble the wheel cylinders.

13.4. Clean the brake shoe and brake drum.

13.5. Remove air from brake system.

13.6. Adjust the different clearances of brake system.

14. Perform the wheel alignment.

14.1. Inflate all the wheel properly.

14.2. Test the camber angle, toe-in and toe-out on turn.

14.3. Adjust the camber angle, toe-in and toe-out.

15. Perform wheel balancing.

15.1. Remove and inflate all the wheel properly.

15.2. Test the wheel for unbalance.

15.3. Balance the wheel with accurate weight.

16. Perform the tire rotation.

16.1 Draw the perfect tire rotation diagram.

16.2. Rotate the tire as per diagram.

16.3. Tighten the wheel properly.

16.4. Inflate the tire accurately and test with tire pressure gage.

17. Perform the tube vulcanizing.

17.1. Remove the tube from tire.

17.2. Detect the place of leakage.

17.3. Clean and roughen the leakage surface.

17.4. Vulcanize the leakage.

18. Repair the tubeless tire.

18.1. Detect the place of leakage.

18.2. Clean and roughen the leakage area.

18.3. Insert plug of accurate size.

REFERENCE BOOKS

1. Automotive Mechanics - Crouse and Anglin.
2 Audel Automobile Guide - Frederick E. Bricker.
3. Service Station Operation - Md. Radwanoor Rahman.
4. Garage and Service Station Hand Book - JOHN QUEENBOROUGH
5. Automobile Engineering - K. K Ramalingan.

69054 Environmental Studies

T	P	C
2	0	2

AIMS

- To be able to understand the basic concepts of environment and environmental pollution.
- To be able to understand the concepts of ecology and ecosystems
- To be able to understand the basic concepts of environmental degradation relating to industrial production.
- To be able to understand the major environmental issues and problems.
- To be able to understand legislative measures to protect environment.

SHORT DESCRIPTION

Basic concepts of environment; natural resources; biogeochemical cycling; ecology and ecosystem; air; water; soil; solid waste management; development and environment; global environmental challenges; legislative protection of environment.

DETAIL DESCRIPTION

1. **Understand the multidisciplinary nature of environmental studies.**
   - 1.1. Define environment, nature, pollution, pollutant, contaminant.
   - 1.2. Describe the scope of environmental studies.
   - 1.3. Describe the importance of environmental studies.
   - 1.4. Describe the formation and structure of the Earth.
   - 1.5. Describe the earth's natural system.
   - 1.6. Describe the changing attitudes to the natural world.
   - 1.7. Mention the main components of environment.
   - 1.8. Define natural and man-made environment.
   - 1.9. Distinguish between natural and man-made environment.
2. **Understand the natural resources.**
   - 2.1. Define natural resources.
   - 2.2. Classify natural resources.
   - 2.3. Describe forest resources.
   - 2.4. Describe water resources.
   - 2.5. Describe mineral resources.
   - 2.6. Describe food resources.
   - 2.7. Describe energy resources.
   - 2.8. Describe land resources.
   - 2.9. Describe environmental problem relating to resources use.
   - 2.10. Describe the role of an individual in conservation of natural resources.
3. **Understand the biogeochemical cycling.**
   - 3.1. Define biogeochemical cycle.
   - 3.2. Describe hydrologic cycle.
   - 3.3. Describe carbon cycle.
   - 3.4. Describe nitrogen cycle.
   - 3.5. Describe oxygen cycle.

3.6. Describe phosphorus cycle.
3.7. Describe sulfur cycle.
3.8. Describe nutrient cycle.

4. Understand the ecology and ecosystem.

4.1. Define ecology and ecosystem.
4.2. Structure and function of an ecosystem.
4.3. Describe the components of ecosystem.
4.4. Explain the stability of ecosystem.
4.5. Describe ecological factors.
4.6. Describe interdependency between abiotic and biotic component.
4.7. Describe the meaning of following terms: species, population, community, ecological succession, community periodicity, climax community, ecological niche, habitat, plankton, nekton, ecological indicator, evolution, adaptation, producers, consumers, decomposers, food chains, food webs, ecological pyramids, bio-concentration, bio-magnification, biodiversity, threatened species, endanger species, extinct species, exotic species, biodiversity conservation and biogeography.
4.8. Describe energy flow in the ecosystem.
4.9. Describe the ecosystem of pond, ocean, estuary, grassland, cropland, forest, desert and mangrove.

5. Understand the air as a component of environment.

5.1. Define air.
5.2. Describe the composition of the clean dry atmospheric air at ground level.
5.3. Describe the atmospheric structure.
5.4. Define air pollution.
5.5. Describe major air pollutants and their impacts.
5.6. Describe the sources of air pollutants.
5.7. Explain the formation of photochemical smog and its effects.
5.8. Describe the effects of air pollution on vegetation, animal, human health and materials and resources.
5.9. Define sound and noise.
5.10. Describe the classification of sound.
5.11. Describe the effects of noise.

6. Understand the water as a component of environment.

6.1. Define water.
6.2. Describe the characteristics of water.
6.3. Describe the sources of water.
6.4. Describe the uses of water.
6.5. Explain that the water is a universal solvent.
6.6. Define water pollution, biological oxygen demand (BOD), effluent treatment plant (ETP).
6.7. Describe the sources of water pollution.
6.8. Describe the effects of water pollution.

7. Understand the soil as a component of environment.

7.1. Define soil.
7.2. Describe the constituents of soil.
7.3. Define soil pollution.
7.4. Describe causes soil degradation.
7.5. Describe the sources of soil pollution.
7.6. Describe the effects of soil pollution.

8. Understand the concept of solid waste management.

8.1. Define solid waste, refuse, garbage, rubbish, trashes, demolition and construction waste, e-waste, agricultural waste, pathological waste, radioactive waste, hazardous waste, 3R, 4R.
8.2. List the sources of solid waste.
8.3. Mention the classification of solid waste.
8.4. Mention the methods of collection of solid waste.
8.5. Describe the recycling of solid wastes.
8.6. Describe resource recovery from solid waste.
8.7. Describe the potential method of disposal of solid waste.
8.8. Describe control measures of urban and industrial wastes.

9. Understand the development and environment.

9.1. Define environmental ethics and environmental stress.
9.2. Describe environmental stress.
9.3. Define sustainable development.
9.4. Define urbanization.
9.5. Describe the causes of urbanization.
9.6. Describe the effects of urbanization on environment.
9.7. Define industrialization.
9.8. Describe the causes of industrialization.
9.9. Describe the effects of industrialization on environment.

10. Understand the global environmental challenges.

10.1. Define greenhouse gas and greenhouse effects.
10.2. Make a list of greenhouse gases and their contribution on greenhouse effects.
10.3. Describe the causes and consequences of greenhouse effects.
10.4. Describe acid rain.
10.5. Describe importance of ozone layer.
10.6. Define ozone depleting substances (ODS).
10.7. Describe ozone layer depletion mechanism.
10.8. Describe hazardous waste.
10.9. Describe chemicals pesticides.
10.10. Describe radioactive pollution.
10.11. Describe natural disaster.

11. Understand the legislative protection of environment.

11.1. Define environmental impact assessment (EIA) and environmental auditing (EA).
11.2. Mention environmental act and legislations prescribed for air, noise, water, soil and wild life protection.
11.3. Describe environmental conservation act 1995 in Bangladesh.
11.4. Describe the environment conservation rule 1997 in Bangladesh.
11.5. Describe the environmental framework in Bangladesh.
11.6. Describe The Montreal Protocol and The Kyoto Protocol.
11.7. Describe role of an individual in prevention of pollution.

REFERENCES:

1. Fundamentals of Environmental Studies, Mahua Basu and S. Xavier, Cambridge.
2. Ecology and Environment, P.D. Sharma, Rastogi Publications.
3. Basics of Environmental Science, Michael Allaby, Routledge.
4. Environmental Science, Jonathan Turk and Amos Turk, Sauders golden sunburst series.

65851 Accounting Theory & Practice

T	P	C
2	3	3

AIMS

- To be able to understand the principles and practices of book keeping and accounting.
- To be able to understand the procedures of general accounting, financial accounting and their applications.
- To be able to understand the concept of income tax , VAT & Public works accounts.

Course Outlines

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

DESCRIPTION;

Theory

1. Concept of book keeping and accounting.

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

2. Transactions Analysis.

2.1 Define transactions and business transaction.
2.2 Describe the characteristics of transaction.
2.3 Discuss the classification of transaction.

3. Entry system of Accounting.

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

4. Classification of accounts.

4.1 Define accounts.
4.2 State the objectives of accounts.
4.3 Illustrate different type of accounts with example.
4.4 Define “Golden rules of Book keeping”.
4.5 State the rules for “Debit” and “Credit” in each class of accounts.
4.6 Define accounting cycle.

5. Journal.

5.1 Define Journal.
5.2 State the functions of Journal.
5.3 Mention the various names of Journal.
5.4 Interpret the form of Journal.

6. Ledger.

6.1 Define ledger.
6.2 Interpret the form of ledger.
6.3 State the functions of ledger.
6.4 Distinguish between Journal and Ledger.
6.5 Explain why ledger is called the king of all books of accounts.
6.6 Explain the following terms: Balance, Balancing; Debit balance; credit balance.

7. Cash book & Its Classification.

7.1 Define cash book.
7.2 Classification of cash book.
7.3 Explain cash book as both Journal and Ledger.
7.4 Define discount.
7.5 Explain the different types of discount.

8. Trial balance.

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

9. Final accounts.

9.1 State the components of final account.
9.2 Distinguish between trial balance and balance sheet.
9.3 Select the items to be posted in the trading account, profit & loss account and the balance sheet.
9.4 State the adjustment to be made from the given information below or above the trial balance.
9.5 Explain the following terms: revenue expenditure; capital expenditure; depreciation; annuity method diminishing balance method, machine hour method

10. Cost and financial accounting.

10.1 Define financial accounting.
10.2 State the objectives of financial accounting.
10.3 Define cost accounting.
10.4 State the elements of direct cost and indirect cost.
10.5 Discuss the capital budgeting
10.6 Explain the following terms:
a. Fixed cost b. Variable cost c. Factory cost d. Overhead cost e. Process cost
f. Direct cost g. Operating cost h. Standard cost

11. Income Tax

11.1 Define Income Tax.
11.2 State the objects of Income Tax.
11.3 Classification of assesses.
11.4 Taxable income of assesses.
11.5 Tax rebate.
11.6 Explain the following terms: Income tax year; assessment year, NBR.

12. Public works accounts.

12.1 State the important aspects of public works accounts.

12.2 Describe the main features of public works accounts.

12.3 Define Value Added Tex (VAT)

12.4 State the merits and demerits of VAT.

12.5 Explain the following terms :Revenue; Grant; Bill; Voucher.

PRACTICAL

1. Identify the transaction from given statements stating reasons.
2. Determine Debtor (Dr) and Creditor (Cr.) from given transactions applying golden rules.
3. Journalize from given transactions.
4. Prepare ledger from given transactions.
5. Prepare double column cash book from given transactions showing balances.
6. Prepare triple column cash book from given transaction and find out the balances.
7. Prepare analytical and imprest system of cash book.
8. Prepare trial balance from the given ledger balance.
9. Prepare trading account, profit & loss account and balance sheet from the given trial balance & other information.
10. Prepare cost sheet showing prime cost, factory cost, cost of production, total cost and selling price.

REFERENCE BOOKS

1. Book-keeping & Accounting - Prof. Gazi Abdus Salam
2. Principles of Accounting - Hafiz uddin
3. Cost Accounting - Prof. Asimuddin Mondol

৪. হিসাবরক্ষণ ও হিসাববিজ্ঞান - পরেশ মন্ডল

৫. উচ্চ মাধ্যমিক হিসাববিজ্ঞান - হক ও হোসাইন

৬. আয়কর - ড. মনজুর মোরশেদ