Electrical Technology (667)
5th semester

Name of the subject	Subject Code
Electrical & Electronic Measurement -I	66751
Generation of Electrical Power	66752
Renewable Energy	66753
Digital Electronics & Microprocessor	66856
Environmental Studies	69054
Accounting Theory & Practice	65851

66751 Electrical & Electronic Measurement-I

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OBJECTIVES

Upon completion of this contents students will be able to achieve and acquire knowledge, skill and attitude in the area of Electrical and Electronic measurement-1 with special emphasis on;

- Accuracy, precision, sensitivity and error in electrical measuring instruments.
- Concept of operation of different types of electrical measuring instruments.
- Selection of correct type of meters for particular measurement.
- Measurement of power of single phase and three phase system.
- Concept of operation of energy meter.

SHORT DESCRIPTION

Fundamentals of measurements; Indicating instruments; Digital instruments; Current & voltage measuring instruments; Measurement of electrical power; Energy meters.

DETAIL DESCRIPTION

Theory:

1. Recognize the basic concept of measurements.

1.1 Define measurements of electrical quantities.

1.2 Discuss significance of measurements.

1.3 Describe the terms accuracy, precision, sensitivity and resolution or discrimination.

1.4 Distinguish between accuracy and precision.

1.5 Demonstrate errors in measurements.

1.6 State true value, loading effect. static error or absolute error, relative error, static correction, limiting error and percentage limiting error.

1.7 Describe the loading effects due to shunt connected instruments.

1.8 Explain the loading effects due to series connected instruments.

1.9 Solve problems related to errors in measurement.

2. Interpret the classification of measuring instrument.

2.1 Describe measuring instrument.

2.2 Name different types of measuring instruments.

2.3 Demonstrate absolute and secondary instruments.

2.4 List secondary instruments according to their mode of operation and functions.

2.5 Explain indicating, recording and integrating instruments.

2.6 Describe the various effects of current or voltage utilized in measuring instrument upon which their operation depends.

3. Understand the principle of operation of indicating instruments.

3.1 List different types of torque applied in indicating instrument which act upon their moving system.

3.2 Describe deflecting torque and controlling torque.

3.3 Explain spring control and gravity control system.

3.4 Distinguish between spring control and gravity control system.

3.5 Explain damping torque.

3.6 Sate different types of damping system

3.7 Compare air friction damping, fluid friction damping and eddy current damping

3.8 Solve problems related to spring control and gravity control system.

4. Perceive the constructional features of measuring instruments.

4.1 Name the essential parts of measuring instruments.

4.2 Describe the parts of the instrument such as supporting, moving system, balancing, permanent magnets, pointer, scale, zero-adjuster, cases, etc.

4.3 Discuss the torque weight ratio.

4.4 Explain the principle of operation of ammeter and voltmeter.

4.5 Distinguish between the working principle of ammeter and voltmeter.

4.6 List the various types of ammeter and voltmeter.

5. Interpret the principle of operation of moving iron instruments.

5.1 Describe the construction and working principle of moving iron attraction type instruments.

5.2 Derive the torque equation of moving iron attraction type instruments.

5.3 Describe the construction and working principle of repulsion type moving iron instrument.

5.4 Derive the torque equation of repulsion type moving iron instrument.

5.5 List the advantages and disadvantages of moving iron instruments.

5.6 Discuss errors in moving iron instruments.

5.7 Solve problems related to of moving iron instruments.

6. Conceive the principle of operation of moving coil instruments.

6.1 Describe the construction and working principle of permanent magnet moving coil instruments.

6.2 Derive the torque equation of the moving coil instrument.

6.3 Mention the advantages and disadvantages of permanent magnet moving coil instruments.

6.4 Describe the construction and working principle of dynamometer type moving coil instruments.

6.5 Indicate the arrangement of coils of dynamometer type instruments for measurements of current and voltage.

6.6 Discuss the errors of moving coil instruments.

6.7 Solve problems related to torque equation of moving coil instruments.

7. Understand the principle of operation of electrostatic voltmeter.

7.1 Describe the construction and working principle of a quadrant type voltmeter.

7.2 Describe the construction and working principle of attracted disc type voltmeter.

7.3 Mention the advantages of electrostatic voltmeter.

7.4 List the limitations of electrostatic voltmeter.

7.5 Mention the uses of electrostatic voltmeter.

8. Recognize the operation of dynamometer type wattmeter.

8.1 Describe the construction and principle of operation of dynamometer type wattmeter.

8.2 List the advantages of dynamometer type wattmeter.

8.3 Specify the disadvantages of dynamometer type wattmeter.

8.4 Compare induction type wattmeter with dynamometer wattmeter.

9. Conceive the operation of induction type wattmeter.

9.1 Describe the construction of induction type wattmeter.

9.2 Describe the principle of operation of induction type wattmeter.

9.3 List the advantages of induction type wattmeter.

9.4 List the disadvantages of induction type wattmeter

10. Interpret the concept of measurement of single phase power.

10.1 Derive the equation, P = EI Cos□.

10.2 Demonstrate the circuit diagram connecting wattmeter in a single phase circuit.

10.3 Explain the errors involved in connecting wattmeter in a single phase circuit.

10.4 Mention the function of compensating coil in wattmeter connection.

10.5 Solve problems on error calculation in single phase power measurement.

11. Apply the principle of power measurement in three phase circuit.

11.1 List the method for the measurement of power in three phase circuit.

11.2 Describe the method for measurement of three phase power by two wattmeter.

11.3 Derive the equation for power and power factor in two wattmeter method.

11.4 Describe the method of three phase power measurement by one watt meter.

11.5 Describe the method of 1-□ reactive power measurement by single phase VAR meter.

11.6 Describe the method of 3- □ reactive power measurement.
11.7 Solve problems for the calculation of power and power factor.

12. Recognize the operation of energy meter.
12.1 Describe the principle of operation of energy meter.
12.2 List the different types of energy meter.
12.3 Explain the working principle of motor meter.
12.4 Describe the construction and working principle of mercury motor meter.
12.5 Explain mercury meter modified as watt hour meter.
12.6 Explain the friction compensation in mercury motor meter.
12.7 Describe the construction and working principle of induction motor meter.
12.8 Explain errors in induction motor meter.
12.9 Describe working principle of poly phase induction type energy meter.
12.10 Sketch the connection diagram of poly phase induction type energy meter.

13. Perceive the concept of testing of energy meter.
13.1 Explain the necessity of testing of energy meter.
13.2 List the apparatus required for testing of energy meter.
13.3 State the methods of testing of energy meter.
13.4 Explain the short period testing using a standard wattmeter.
13.5 Solve problems related to energy meter testing.

14. Conceive the concept of digital instrument and digital display.
14.1 Explain the principle of operation of digital instruments.
14.2 Describe the advantages of digital instruments.
14.3 Compare digital instruments with the Analog instruments.
14.4 Mention the different types of digital display system.
14.5 Describe seven segment display and 3□5 dot matrix display.
14.6 Demonstrate the construction of liquid crystal display.
14.7 Express the operation of gas discharge plasma display.
14.8 Explain resolution in digital meter and sensitivity of digital meters.

15. Interpret the concept of digital voltmeter and digital energy meter.
15.1 Explain the operation of transistor voltmeter (TVM).
15.2 Describe the operation of ramp type digital voltmeter (RDVM).
15.3 Enumerate the operation of successive approximation digital voltmeter.
15.4 Describe the principle of operation of digital single phase energy meter
15.5 Describe the block diagram of a digital single phase energy meter
15.6 Explain the principle of operation of digital three phase energy meter
15.7 Describe the block diagram of a digital three phase energy meter.
15.8 Explain the basic information about prepaid metering system.

PRACTICAL:

1. Find various types of measuring instruments.

1.1 Select at least eight different measuring instruments.

1.2 Identify the types of given instruments for measuring electrical quantities.

1.3 Observe the ranges of instruments.

2. Study the operation of indicating, integrating, recording and digital instruments.

2.1 Choose one indicating, one integrating, one recording and one digital instrument.

2.2 Select the tools and materials required.

2.3 Connect each instrument to the supply system with proper load, if necessary.

2.4 Observe the operation of moving system of each instrument.

3. Observe the parts of different types of measuring instruments.

3.1 Select two types of measuring instruments.

3.2 Disassemble the magnet, moving iron parts, controlling and damping parts, pointer, scale and case.

3.3 Analyze the balancing system of the moving parts.

3.4 Assemble the parts as original.

4. Select the correct type of ammeter and voltmeter.

4.1 Collect some ammeters and voltmeters.

4.2 Collect required numbers of tools to open ammeters and voltmeter.

4.3 Disassemble the parts of the instrument.

4.4 Identify the controlling and damping system.

4.5 Identify the parts of the meter.

4.6 Identify the types of meter.

4.7 Reassemble the meters

5. Study the wattmeter.

5.1 Select proper tools and wattmeter.

5.2 Disassemble the different parts of the wattmeter.

5.3 Identify the different parts of the wattmeter.

5.4 Identify the types of wattmeter.

5.5 Reassemble the wattmeter.

6. Measure the single phase power by ammeter, voltmeter and wattmeter.

6.1 Sketch the circuit diagram for measuring single phase power by ammeter, voltmeter and wattmeter.

6.2 List and collect tools, equipment and materials required.

6.3 Prepare the circuit according to the circuit diagram using necessary equipment.

6.4 Check the circuit before energizing.

6.5 Record the meter readings.

6.6 Calculate the power and power factor from the data obtained.

6.7 Determine error from calculation.

6.8 Draw vector diagram from the data obtained.

7. Measure the three phase power by two wattmeter method.

7.1 Draw the circuit diagram for measuring power by two wattmeter of a three phase system.

7.2 List and collect tools, equipment and materials for the experiment.

7.3 Prepare the circuit according to the circuit diagram using required equipment.

7.4 Check the circuit before energizing.

7.5 Record the reading from the meters.

7.6 Calculate the power and power factor.

7.7 Determine error from calculation.

7.8 Draw vector diagram using relevant data as obtained.

8. Measure the three phase power by one wattmeter method.

8.1 Sketch the circuit diagram for measuring power by one wattmeter of a three phase system.

8.2 List and collect tools, equipment and materials for the experiment.

8.3 Prepare the circuit according to the circuit diagram using proper equipment.

8.4 Check the circuit before energizing it.

8.5 Record the reading from the meter.

8.6 Calculate the power.

8.7 Draw vector diagram using relevant data as obtained.

9. Study the different parts of an energy meter.

9.1 Select one energy meter and tools required.

9.2 Disassemble the different parts of the energy meter.

9.3 Identify the parts of the meter.

9.4 Identify the type of the energy meter.

9.5 Reassemble the meter.

10. Measure the energy of a single phase circuit by energy meter.

10.1 Sketch the circuit diagram for measuring energy in a single phase circuit by energy meter.

10.2 Select tools, equipment, materials and a load.

10.3 Connect the equipment as per the circuit diagram.

10.4 Record reading from the meter.

11. Measure the energy of a three phase circuit by a three phase energy meter.

11.1 Sketch the circuit diagram.

11.2 Select and collect tools, equipment, materials and a three phase load.

11.3 Connect the equipment according to the circuit diagram.

11.4 Record reading from the meter.

12. Test an energy meter for finding its error.

12.1 Draw the circuit diagram for testing an energy meter.

12.2 Select an energy meter and one wattmeter.

12.3 Select and collect tools, equipment and materials for the experiment.

66752 Generation of Electrical Power

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OBJECTIVES

Upon completion of contents students will be able to achieve and acquire knowledge, skill and attitude in the area of Generation of Electrical Power with special emphasis on;

- Overview of Electrical power and energy
- Main features of power generation.
- Power plant economics.
- Authorities responsible for generation of electrical energy in Bangladesh.

SHORT DESCRIPTION

Sources of energy; Power plants: Types & working principle; Selection of power plants & site; Power plant economics and Authority for generating power.

DETAIL DESCRIPTION

Theory:

1. Concept of power and energy.

1.1 State the concept of sources of Energy

1.2 List the common sources of energy.

1.3 Describe the different types of energy.

1.4 Discuss the concept of conventional sources of Energy

1.5 Mention the conventional sources of energy available in Bangladesh with their locations.

2. Clarify the types and characteristics of power plants.

2.1 Investigate the concept of power plant engineering

2.2 Describe basic operation of a power plant.

2.3 Explain the importance of power plants.

2.4 Describe the uses of power plants.

2.5 Name the different types of power plants.

2.6 Mention the names of power plants of Bangladesh with their location and rating.

3. Realise the working principal and details of Boiler.

3.1 Define Boiler.

3.2 Explain the different types of Boiler.

3.3 Describe the Construction and working principle of water tube boiler.

3.4 Describe the Construction and working principle of fire tube boiler.

3.5 Explain the working principle of boiler auxiliaries and accessories.

3.6 Discuss the feed water treatment process.

4. Perceive of the principle of operation of a steam power plant.

4.1 Explain the working principle of a steam power plant.

4.2 Enumerate the different types of vapour cycle with P-V diagram.

4.3 Describe the different types of steam generator.

4.4 Explain the working principle of steam generator.

4.5 Describe the working principle of different types of steam turbine including starting and shutdown procedure.

4.6 Sketch a schematic diagram of a steam power plant and label its different sections.

5. Understand the principle of operation of a Diesel power plant.

5.1 Explain the working principle of a Diesel power plant.

5.2 Identify the areas of application of diesel power plant.

5.3 Describe the constructional features of a modern diesel engine used for a diesel generating station.

5.4 Point out starting and stopping procedure of a diesel generator.

5.5 Illustrate the fuel storage and handling method for large scale diesel power plant.

6. Familiarize the principle of operation of Gas turbine power plant.

6.1 Explain working principle of simple open cycle gas turbine with P-V diagram.

6.2 Describe working principle of simple closed cycle gas turbine with P-V diagram

6.3 Demonstrate the different types of Gas turbine.

6.4 Sketch a schematic diagram of a gas turbine power plant and label its different sections.

6.5 Identify the applications of a gas turbine power plant in Bangladesh.

6.6 List the advantages and disadvantages of a gas turbine power plant.

7. Recognize the operation of a hydro-electric power plant.

7.1 Explain the working principle of a hydro-electric power plant.

7.2 Describe different types of hydro-electric power plants with sketches.

7.3 Define catchment area.

7.4 Interpret different sections of a hydro-electric power plant with schematic diagram.

7.5 Describe different types of water turbine generally used in hydro-electric plant.

7.6 Explain the governing principle of a water turbine with a schematic diagram.

7.7 Solve problems related to hydro-electric power plant.

8. Interpret the principle of operation of a nuclear power plant.

8.1 Explain the elements of a nuclear power station with schematic diagram.

8.2 Illustrate the chain reaction.

8.3 List the name of four types of reactor used in a nuclear power station.

8.4 Explain the constructional features of each type of reactor.

8.5 Describe the working principle of each type of reactor.

8.6 Identify the advantages & disadvantages of nuclear power plant.

8.7 List large nuclear power plants in the world.

8.8 Analyze the nuclear power plant established in Bangladesh.

9. Perceive the process of selection of a power plant and its site.

9.1 List the different factors to be considered for selecting a steam, diesel, hydro-electric, gas and nuclear power plant.

9.2 Mention the factors to be considered for selecting the site for a steam, diesel, hydro-electric, gas turbine and nuclear power plant.

9.3 Sketch the different power plants of Bangladesh with their types, capacities and location in a map.

10. Conceive the concept of power plant economics.

10.1 Describe plant depreciation.

10.2 List the factors influencing the rate or tariff designing of electrical energy.

10.3 Describe the different method of rate or tariff for electrical energy.

10.4 Demonstrate the operating costs of a Steam, Diesel, and Gas power plant.

10.5 Describe the operating costs of a hydro-electric and nuclear power plant.

10.6 Point out the advantages of interconnection of different power plants.

10.7 Solve problems related to rate or tariff of electrical energy.

11. Realize the concept of Load management.

11.1 Outline the effects of variable loads on power generation economy.

11.2 Discuss the following terms: Ideal and actual load curve, annual load curve, peak load, load factor, maximum demand, demand factor, capacity factor, use factor and diversity factor.

11.3 Explain load despatch, centre-capacity and load scheduling.

11.4 Describe off peak and peak-hour

11.5 Explain load shading and load management.

11.6 Solve problems related to power plant economics

12. Recognize authority for generating bulk and consumer supply of electrical power.

12.1 Identify the authorities for power supply in Bangladesh.

12.2 Explain grid system.

12.3 List the functions of public & private sector in the field of power generation in Bangladesh.

12.4 Draw the organogram of Rural Electrification Board (REB) and BPDB with its consumers.

12.5 Describe the operation of DPDC, OZOPADICO, NWPGCO, NWPDCO, EGCB, RPCL, APSCO etc.

12.6 Identify the jurisdiction of Dhaka Electric Supply Company (DESCO).

12.7 Identify the function and jurisdiction of Power Grid Company of Bangladesh (PGCB).

12.8 Describe the existing private sector power station in Bangladesh and their future growth.

PRACTICAL:

1. Select a particular type of power plant in an area.

1.1 Assess the probable load of the proposed locality for which the power station is supposed to be installed.

1.2 List the existing communication system of the area.

1.3 Assess the cost of land in the area.

1.4 Make a topographic survey of the area.

1.5 Find the location of the sources and nature of energy available for the area.

1.6 Select the type of power plant for the area.

1.7 Justify the reasons for selecting the power plant.

2. Select size, type and rating of a generator for a particular power plant.

2.1 Survey the electrical load of the area to be electrified by the power plant.

2.2 Select a power plant on the basis of economy of the power sources available.

2.3 Specify the size of the power plant on the basis of load survey.

2.4 Determine the voltage rating of the power plant on the basis of distribution.

2.5 Justify the reasons for the selection made.

3. Locate the main power plants of Bangladesh with sources of natural energy by tracing a map of Bangladesh.

3.1 Trace a map of Bangladesh showing important places.

3.2 Locate the power plants and power sources symbolically in the map.

3.3 Write the name of the places where the power plants and power sources are located.

3.4 Indicate the rivers adjacent to the power plants.

3.5 Show the legends demonstrating the symbols.

4. Perform the dismantle and reassemble a boiler.

4.1 Select and collect the tools.

4.2 Read the manual carefully.

4.3 Dismantle the boiler.

4.4 Identify the different parts.

4.5 Clean the tubes with steel brush.

4.6 Clean inside of the boiler with cotton waste.

4.7 Reassemble carefully the dismantled parts.

4.8 Sketch a neat diagram showing all parts of the boiler.

5. Operate a diesel electric power plant.

5.1 Collect the required instruments for starting a diesel electric power plant.

5.2 Check all accessories.

5.3 Check fuel level and cooling water.

5.4 Check the specific gravity of the electrolyte of the storage battery.

5.5 Start the engine coupled with generator.

5.6 Verify the metering panel and gauges.

5.7 Run the generator at no load.

5.8 Increase engine speed with gradually apply electrical load.

5.9 Record all meters and gauge readings.

5.10 Record voltmeter reading at rated speed.

6. Operate a turbine.

6.1 Identify the different components of the turbine.

6.2 Follow all instructions and precautions for starting the turbine and make it ready for starting.

6.3 Start and operate the turbine for warming up and gradually increase the speed to rated RPM.

6.4 Couple the turbine with load.

6.5 Record the relevant data.

6.6 Observe all precautions and shut down the turbine.

6.7 Deduce the BHP of the turbine.

7. Plot the load curve of a power plant.

7.1 Collect data of a particular power plant.

7.2 Process the supplied data of a particular power plant for a given period.

7.3 Plot a load curve according to the processed data on a graph with suitable scale.

7.4 Locate peak load from load curve.

8. Plot load duration curve of a power plant.

8.1 Collect data of a particular power plant.

8.2 Process the supplied data of a particular power plant for a given period.

8.3 Plot a load duration curve according to the processed data on a graph with suitable scale.

8.4 Show the peak hour from load duration curve

8.5 Calculate the utility factor.

9. Find average load and load factor from the load curve.

9.1 Observe the load curves, chronological and load duration curves plotted before.

9.2 Find the average load of the plant using relevant formula and proper information from the curves.

9.3 Locate Maximum demand and calculate cumulative load from load curve.

9.4 Calculate load factor, utility factor and capacity factor by using load curve.

9.5 Justify load factor, utility factor and capacity factor according to the national standard.

10. Sketch the layout diagram of a known power plant.

10.1 Visit a nearby power station.

10.2 Identify the different sections of the power plant.

10.3 Sketch the layout diagram of different sections of the plant visited.

10.4 Prepare a neat integrated sketch of the layout diagram of the plant visited.

11. Download and present video clips for different types of power plant operation.

11.1 Search and download clips of power plant operation.

11.2 Present the video clips of each power plant operation.

11.3 Show the feedback from presentation.

66753 Renewable Energy

OBJECTIVES

Upon completion of these content students will be able to achieve and acquire knowledge, skill and attitude in the area of Renewable Energy with special emphasis on;

- Overview of renewable energy.
- Main features of renewable energy generation.
- Challenges and problems associated with the use renewable energy in Bangladesh.
- Availability and implementation of potential renewable energy.

SHORT DESCRIPTION

Sources of Renewable energy; Types of renewable energy; Solar energy, Wind power, Fuel cells, Biomass, Geo-thermal and alternative fuels for transportation.

DETAIL DESCRIPTION

Theory:

1. Overview of Renewable energy.

1.1 Concept of Renewable energy

1.2 Discuss historical overview of renewable energies.

1.3 State brief description of green power.

1.4 Describe the different sources of renewable energy.

1.5 Assess renewable energy systems for their environmental, economic and Political impacts.

1.6 List global renewable energy scenario and scenario of Bangladesh.

2. Understand the concept of non conventional renewable energy sources.

2.1 List non conventional renewable energy sources.

2.2 Discuss potential renewable energy sources of Bangladesh.

2.3 Describe measurement of solar radiation and solar radiation at earth surface.

2.4 Explain the uses of solar radiation (solar P-V submersible water pumping, solar cooker, solar P-V home lighting for rural application, solar P-V charging station, solar P-V powered Refrigerator, solar dryer and commercially used generation of electrical energy).

2.5 Mention four types of solar electric application

3. Conceive the concept of solar power generation.

3.1 Discuss solar insolation and heat transfer

3.2 Describe operating principle of solar cell.

3.3 Demonstrate different types of solar cell.

3.4 Describe principle of solar thermal power generation.

3.5 Explain solar collector: solar pool heater, solar hot water heaters, solar air panels and transpired air collectors.

3.6 Discuss passive solar heating and Day lighting.

3.7 Illustrate solar active space heating and solar cooling.

3.8 Enumerate sizing, storage of energy and system efficiency.

4. Interpret wind energy generation.

4.1 Discuss the concept of wind energy conversion system.

4.2 Interpret small scale system, intermediate scale system and large scale system of wind energy generation.

4.3 Describe the different components of wind machine.

4.4 Demonstrate different types of wind machines.

4.5 Discuss different types of wind energy conversion system.

4.6 Point out wind energy prospects of Bangladesh (coastal regions).

5. Recognize Photovoltaic's Cells.

5.1 Discuss the basic principles of Photovoltaic's cell.

5.2 Mention the types of Photovoltaic's cell.

5.3 Describe the photo voltaic energy conversion system

5.4 Describe the application of photo voltaic energy conversion system -Residential, Community and central station.

5.5 State the environmental impacts of fossil fuels vs. photovoltaic's and fuel cells.

6. Perceive Fuel Cells.

6.1 Discuss the concept of Fuel cell.

6.2 Mention the types of Fuel cell.

6.3 Describe the photon exchange membrane fuel cell (PEMFC) and phosphoric acid fuel cell (PAFC).

6.4 Describe the solid acid fuel cell (SAFC) and alkaline fuel cell (AFC).

6.5 Describe the High Temperature Fuel Cell: Solid Oxide Fuel Cell (SOFC), Molten carbonate fuel cells (MCFC) etc.

6.6 Mention the uses of PEMFC, PAFC, SAFC, SOFC, MCFC and AFC.

7. Conceive Biomass and Geothermal energy generation.

7.1 Discuss the concept of Biomass energy system.

7.2 Mention the sources of Biomass.

7.3 List the Biomass yields.

7.4 Explain Biomass conversion system: Thermal, Chemical, Biochemical and Electrochemical conversion.

7.5 Brief the Geothermal energy.

7.6 Describe different types of Geothermal energy.

7.7 Explain Geothermal electricity production and Geothermal heat pumps.

8. Realize non conventional sources of energy.

8.1 Describe wave energy generation.

8.2 Describe tidal energy generation.

8.3 Describe Ocean thermal energy conversion (OTEC).

9. Understand non conventional sources of energy.

9.1 State the concept of Waste-to-Energy (Municipal Solid Waste)

9.2 Sketch the block diagram and mention the steps how waste to energy plant works.

9.3 List the advantages of Waste-to-Energy (Municipal Solid Waste).

9.4 Analyze economic and environmental impact for sample Renewable Energy.

9.5 State the barriers to implementation of renewable energies and its remedies.

10. Recognize the transportation and alternative fuels.

10.1 Define alternative fuels for transportation.

10.2 Identify the alternative fuels for transportation.

10.3 Describe utility of hydrogen, ethanol, bio-diesel and propane as alternative fuels.

10.4 Explain benefit and challenges for using alternative fuels.

10.5 Mention the environmental impact of conventional fuels vs alternative fuels for transportation.

PRACTICAL:

1. Evaluate a solar energy system for its cost effectiveness.

1.1 Visit a nearby solar plant.

1.2 Identify the different sections of the plant.

1.3 Prepare a neat integrated sketch of the layout diagram of the plant visited.

1.4 Evaluate cost effectiveness of a solar energy plant.

2. Measure open circuit voltage and short circuit current of a solar panel.

2.1 Select the appropriate solar panel, Battery, Cable, multi-meter etc.

2.2 Identify the different part of solar panel.

2.3 Complete the connection according to circuit diagram.

2.4 Record data in the table.

3. Measure voltage and current for series and parallel combination of solar panel.

3.1 Select the appropriate solar panel, Battery, Cable, multi-meter etc.

3.2 Connect the three or more solar panel in series.

3.3 Record data in the table

3.4 Connect the three or more solar panel in parallel.

3.5 Record data in the table.

4. Prepare a circuit for DC lighting system by solar panel.

4.1 Select the appropriate solar panel, controller, Battery, Cable, multi-meter, etc.

4.2 Identify the different section of dc lighting system.

4.3 Make the connection according to circuit diagram.

4.4 Measure the dc voltage.

4.5 Develop another circuit diagram for charging a mobile by solar panel.

5. Prepare a circuit for AC lighting system by solar panel.

5.1 Sketch a circuit diagram for AC lighting system by solar panel.

5.2 Select the appropriate solar panel, controller, Battery, inverter, Cable, multi-meter etc.

5.3 Identify the different section of AC lighting system.

5.4 Complete connection according to circuit diagram.

5.5 Measure the AC voltage.

6. Design a photovoltaic system.

6.1 Calculate the electrical load of a nearby area.

6.2 Select the appropriate rating of cell, Battery, Cable etc.

6.3 Sketch the layout diagram.

6.4 Connect the components properly.

6.5 Draw the current-voltage curve and power-voltage curve.

7. Sketch the layout diagram of a wind power plant.

7.1 Visit a nearby wind plant.

7.2 Identify the different sections of the plant.

7.3 Prepare a neat integrated sketch of the layout diagram of the plant visited.

8. Measure the voltage of alkaline fuel cell (AFC).

8.1 Select the appropriate alkaline fuel cell (AFC), Battery, Cable, multi-meter, etc.

8.2 Record the data before charging.

8.3 Connect the alkaline fuel cell (AFC) with a charger.

8.4 Record the data after charging.

9. Find out which organic waste produce more biogas.

9.1 Collect different type of waste from municipal.

9.2 Keep the waste in a lab.

9.3 Measure the biogas for different wastes.

9.4 Record the data in the table.

10. Measure the power of a fuel cell

10.1 Set the fuel cell in the normal way.

10.2 Connect the voltmeter to the cell and measure the no load voltage

10.3 Complete the connection according to diagram.

10.4 Record the data in a table.

10.5 Calculate the power from table.

11. Download and present video clips for different types of non conventional energy.

11.1 Search and download clips of non conventional energy.

11.2 Present the video clips of each non conventional energy.

11.3 Show the feedback from presentation.

Digital Electronics & Microprocessors

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OBJECTIVES

Upon completion of this content student will be able to achieve and acquire knowledge, skills and attitude in the area of Digital Electronics and Microprocessors special emphasis on:

- Number system, Binary arithmetic and codes
- Logic gates and Sequential logic circuits
- Semi conductor memories, A/D and D/A converters
- Microprocessors

SHORT DESCRIPTION

Basic Digital Circuits; Numbers systems and codes; Combinational logic circuits; Flip-flops and shift registers; Counters; A/D and D/A converters; Semiconductor memories; 8085, 8086 microprocessors.

DETAILS DECEPTION

Theory:

1. Understand Number systems and codes.

1.1 Describe binary, octal and Hexadecimal Number systems.

1.2 Convert one number system to another.

1.3 Compute binary, Octal and hexadecimal arithmetic.

1.4 Describe BCD Code, Excess- 3 Code, Gray Code, Alphanumeric Codes.

1.5 Convert one type of code to another.

1.6 Describe the method of error detection and correction by using Parity bit.

1.7 Describe the function of Hamming code.

1.8 Describe the applications of codes.

2. Understand the basic digital circuits.

2.1 Describe the digital signals.

2.2 State the main features of digital systems.

2.3 Describe AND, OR, NOT, NAND, NOR and XOR operations.

2.4 Describe the realization of basic logic operations using NAND and NOR gates.

2.5 Describe the Boolean algebraic theorems.

2.6 Simplify the logic expressions by using Boolean algebra.

2.7 Simplify the logic expressions by using Karnaugh map (up to 4 Variables).

2.8 Describe the characteristics of digital ICs.

2.9 Describe different types of digital logic families.

3. Understand Combinational Logic circuits.

3.1 Describe the operation of a digital multiplexer and demultiplexer.

3.2 Describe the operation of half adder and full adder.

3.3 Describe the operation of half subtractor and full subtractor.

3.4 Explain the function of arithmetic logic unit (ALU) with block diagram.

3.5 Describe the operation of digital comparators.

4. Understand Flip-Flops and shift registers.

4.1 Describe the operation of a sequential circuit with block diagram.

4.2 Describe the working principle of clocked SR flip-flop, D-type flip-flop and T-type flip-flop J-K flip-flop, Master-slave flip-flop.

4.3 State the applications of flip-flops.

4.4 Describe the function of registers.

4.5 Describe the operation of shift registers.

4.6 Mention the applications of shift registers.

4.7 List some common ICs used as flip-flops and shift registers.

5. Understand the Counters.

5.1 Describe the operation of ripple or asynchronous counters.

5.2 Describe the principle of UP/DOWN counters.

5.3 Describe the modulus of the Counter.

5.4 Describe the operation of synchronous counters.

5.5 Explain the function of universal counter.

5.6 Describe the principle of ring counter.

5.7 List some common ICs used as a counter with block diagram.

6. Understand D/A converter.

6.1 Mention the principle of level conversion.

6.2 Describe the principle of D/A conversion.

6.3 Mention the types of D/A converter.

6.4 Explain the operation of a binary weighted D/A and R-2R ladder D/A converter.

6.5 State the terms – resolution, percentage of resolution, accuracy.

6.6 Offset error and settling time as specification of D/A converter.

6.7 State the application field of D/A converter.

6.8 List the application of popular D/A converter ICS.

7. Understand A/D converter.

7.1 State the principle of A/D conversion.

7.2 List the type of A/D converter.

7.3 State the working principle of 3-bit parallel A/D converter.

7.4 Describe the operation of Digital Ramp A/D converter

7.5 Explain the principle of operation of successive approximation, dual slope and Flash A/D converter.

7.6 State the terms – resolution, accuracy, and conversion time as specification of A/D converter.

7.7 List the applications of popular A/D converter ICS.

7.8 Describe the operation of sample & hold circuits and its application.

8. Understand the features of Semiconductor Memories.

8.1 Describe the operation of a memory device with block diagram.

8.2 Describe the concept of READ and WRITE operation of memories.

8.3 Mention the classification of memories.

8.4 Mention the characteristics of memories.

8.5 Explain the principle of sequential memory.

8.6 Mention the characteristics of ROM, PROM, EPROM, EEPROM and Flash memory.

8.7 Mention the principle of static and dynamic RAM.

8.8 List some commercial memory ICs.

9. Understand the features of Microprocessor.

9.1 Define Microprocessor.

9.2 List 8-bit, 16-bit, 32 bit and 64-bit Microprocessors.

9.3 Describe the architecture of 8085 microprocessor.

9.4 Describe the pin diagram and function of each pin of Intel 8085 microprocessors.

9.5 Describe the registers of Intel 8085 microprocessors.

9.6 Describe the block diagram of a micro computer.

9.7 Differentiate between microprocessors and micro computer.

10. Understand the Programming of 8085 Microprocessors.

10.1 Describe the instruction set of 8085 microprocessors.

10.2 Explain the addressing modes of Intel 8085 microprocessors.

10.3 Mention the simple programs using 8085 instructions.

11. Understand the 8085 Microprocessors system.

11.1 Define Bus multiplexing.

11.2 Explain the process of multiplexing AD7 -AD_0 bus using latch.

11.3 Describe the technique of generate control signals.

11.4 Mention the function of interrupt controls and serial I/O controls.

11.5 Differentiate between memories mapped I/O and standard I/O.

11.6 Discuss the function of programmable peripheral Interface (PPI), programmable DMA controller and programmable interrupt controller (PIC).

11.7 Discuss the function of Programmable Interval Timer and Programmable Communication Interface.

11.8 Draw an 8085 based micro computer system.

12. Understand the features of 16-bit Microprocessors.

12.1 Describe the architecture of 8086 microprocessor.

12.2 Describe the pin diagram and function of each pin of Intel 8086 microprocessors.

12.3 Describe the registers of Intel 8086 microprocessors.

12.4 Explain the addressing modes of the Intel 8086 microprocessors.

12.5 Mention the simple programs using the 8086 instructions.

PRACTICAL:

1. Verify the truth tables of logic gates (OR, AND, NOT, NAND & NOR)

1.1 Select logic gate ICs.

1.2 Select appropriate circuits, required tools, equipments and materials.

1.3 Insert the selected IC to the Breadboard.

1.4 Connect the circuits as per diagram on trainer board.

1.5 Switch on the DC power supply,

1.6 Verify the truth tables.

2. Show the operation of NAND & NOR gate as universal gates.

2.1 Select logic gate IC of NAND gate & NOR gate.

2.2 Select appropriate circuits, required tools, equipments and materials.

2.3 Insert the selected IC to the Breadboard.

2.4 Connect the circuits as per diagram for AND OR & NOT gate on trainer board.

2.5 Switch on the DC power supply,

2.6 Verify the truth tables of AND OR & NOT gate operation.

3. Verify the functions of half adder & half sub tractor.

3.1 Select ICs.

3.2 Draw the pin diagram and internal connection.

3.3 Draw appropriate circuits.

3.4 Select required tools, equipments and materials.

3.5 Connect the circuits as per diagram on trainer board.

3.6 Switch on the DC power supply,

3.7 Verify the truth tables.

4. Verify the functions of full adder & full sub tractor.

4.1 Select ICs.

4.2 Draw the pin diagram and internal connection.

4.3 Draw appropriate circuits.

4.4 Select required tools, equipments and materials.

4.5 Connect the circuits as per diagram on trainer board.

4.6 Switch on the DC power supply.

4.7 Verify the truth tables.

5. Verify the truth table of different J-K flip-flops.

5.1 Select appropriate ICs.

5.2 Draw the pin diagram and internal connection.

5.3 Draw appropriate circuits.

5.4 Select required tools, equipments and materials.

5.5 Connect the circuits as per diagram on trainer board.

5.6 Switch on the DC power supply.

5.7 Verify the truth tables.

6. Verify the operation of Shift register.

6.1 Select a SIPO shift register IC.

6.2 Connect the SIPO shift register circuits on Digital Trainer Board.

6.3 Apply clock input pulse to the circuit and observe the operation.

6.4 Select a PISO shift register IC.

6.5 Connect the PISO shift register circuits on Digital Trainer Board.

6.6 Apply clock input pulse to the circuit and observe the operation.

7. Verify the operation of Binary counter.

7.1 Select 4-Bit ripple counter IC.

7.2 Connect the Up/Down ripple counter circuit on Digital Trainer Board

7.3 Apply clock input pulse to the circuit and observe the operation of up-counting and down counting.

7.4 Select MOD-10 counter IC.

7.5 Connect the Decade counter circuit on Digital Trainer Board.

7.6 Apply clock input pulse to the circuit and observe the Decade operation.

8. Verify the operation of D/A converter.

8.1 Select a D/A converter IC.

8.2 Connect a ladder R/2R D/A converter circuit on Digital Trainer Board.

8.3 Apply input data and clock pulses to the different input of the circuit.

8.4 Obserb the operation of the circuit and detect the output result of D/A converter.

9. Verify the operation of A/D converter.

9.1 Select an A/D converter IC.

9.2 Connect a 3-bit parallel A/D converter circuit on Digital Trainer Board.

9.3 Apply input data and clock pulses to the different input of the circuit.

9.4 Observe the operation of the circuit and detect the output result of A/D converter.

10. Verify the operation of SRAM & DRAM.

10.1 Select a SRAM IC.

10.2 Connect Static RAM circuit on Digital Trainer Board.

10.3 Apply input data and clock pulse to the circuit.

10.4 Observe the operation of the circuit and stored memory data in to the SRAM.

10.5 Select a DRAM IC.

10.6 Connect Dynamic RAM circuit on Digital Trainer Board.

10.7 Apply input data and clock pulse to the circuit.

10.8 Observe the operation of the circuit and stored memory data in to the DRAM.

11. Verify the operation of a EPROM .

11.1 Select an EPROM IC.

11.2 Connect EPROM circuit on Digital Trainer Board.

11.3 Apply input data and clock pulse to the circuit.

11.4 Observe the operation of the circuit and stored memory data in to the **EPROM**.

12. Verify the operation of 8085 Microprocessor.

12.1 Select 8085 microprocessor trainer board.

12.2 Solve simple arithmetic & logical problems.

12.3 Monitor the result in to the Matrix display/LCD display.

12.4 Solve simple I/O problems.

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

Theory:

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.

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.